IEM's AI Modeling: Short-term COVID-19 Projections
Date: 1/15/21

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 <u>not</u> 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 1/15/21 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
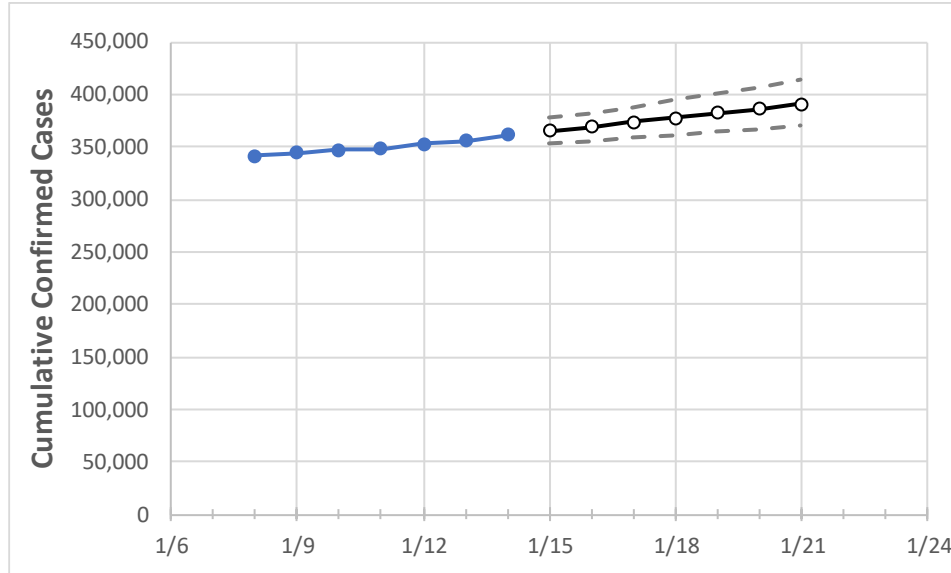
	Actual Confirmed Cases On:				Projected Cases For:						
	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19	1/20	1/21
Louisiana	348,234	352,939	355,835	361,148	365,113	369,161	373,414	377,601	381,986	386,399	391,007

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:						
	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19	1/20	1/21
Ascension Parish	8,745	8,918	9,041	9,246	9,378	9,511	9,649	9,794	9,942	10,099	10,260
Bossier Parish	10,102	10,260	10,368	10,455	10,576	10,696	10,821	10,948	11,081	11,211	11,346
Caddo Parish	19,894	20,077	20,341	20,490	20,711	20,935	21,169	21,407	21,650	21,898	22,150
Calcasieu Parish	15,294	15,528	15,641	15,809	15,963	16,118	16,277	16,439	16,614	16,791	16,974
East Baton Rouge Parish	27,887	28,306	28,562	29,529	29,827	30,140	30,464	30,793	31,132	31,483	31,853
Jefferson Parish	35,379	35,823	36,149	36,677	37,111	37,556	38,011	38,481	38,952	39,430	39,913
Lafayette Parish	18,439	18,678	18,820	18,968	19,130	19,292	19,460	19,635	19,805	19,971	20,148
Lafourche Parish	6,952	7,087	7,162	7,236	7,319	7,406	7,497	7,593	7,693	7,796	7,904
Orleans Parish	23,252	23,531	23,725	23,965	24,226	24,492	24,760	25,033	25,310	25,589	25,873
Ouachita Parish	15,401	15,554	15,634	15,795	15,923	16,056	16,184	16,320	16,457	16,600	16,734
Rapides Parish	9,281	9,521	9,584	9,670	9,787	9,904	10,017	10,148	10,283	10,422	10,559
St. Bernard Parish	2,735	2,777	2,821	2,847	2,890	2,935	2,979	3,026	3,074	3,125	3,178
St. Charles Parish	4,078	4,130	4,161	4,272	4,325	4,379	4,434	4,493	4,554	4,612	4,674
St. James Parish	1,490	1,524	1,540	1,563	1,583	1,604	1,625	1,648	1,671	1,696	1,722
St. John the Baptist Parish	2,925	2,947	2,963	2,997	3,023	3,050	3,076	3,104	3,132	3,158	3,186
St. Tammany Parish	17,336	17,601	17,756	18,481	18,789	19,118	19,459	19,811	20,187	20,562	20,965

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:		
	1/11	1/12	1/13	1/14	1/16	1/18	1/20
Ascension Parish	8,745	8,918	9,041	9,246	9,511 (1,902) [457] {228}	9,794 (1,959) [470] {235}	10,099 (2,020) [485] {242}
Bossier Parish	10,102	10,260	10,368	10,455	10,696 (2,139) [513] {257}	10,948 (2,190) [526] {263}	11,211 (2,242) [538] {269}
Caddo Parish	19,894	20,077	20,341	20,490	20,935 (4,187) [1,005] {502}	21,407 (4,281) [1,028] {514}	21,898 (4,380) [1,051] {526}
Calcasieu Parish	15,294	15,528	15,641	15,809	16,118 (3,224) [774] {387}	16,439 (3,288) [789] {395}	16,791 (3,358) [806] {403}
East Baton Rouge Parish	27,887	28,306	28,562	29,529	30,140 (6,028) [1,447] {723}	30,793 (6,159) [1,478] {739}	31,483 (6,297) [1,511] {756}
Jefferson Parish	35,379	35,823	36,149	36,677	37,556 (7,511) [1,803] {901}	38,481 (7,696) [1,847] {924}	39,430 (7,886) [1,893] {946}
Lafayette Parish	18,439	18,678	18,820	18,968	19,292 (3,858) [926] {463}	19,635 (3,927) [942] {471}	19,971 (3,994) [959] {479}
Lafourche Parish	6,952	7,087	7,162	7,236	7,406 (1,481) [355] {178}	7,593 (1,519) [364] {182}	7,796 (1,559) [374] {187}
Orleans Parish	23,252	23,531	23,725	23,965	24,492 (4,898) [1,176] {588}	25,033 (5,007) [1,202] {601}	25,589 (5,118) [1,228] {614}
Ouachita Parish	15,401	15,554	15,634	15,795	16,056 (3,211) [771] {385}	16,320 (3,264) [783] {392}	16,600 (3,320) [797] {398}
Rapides Parish	9,281	9,521	9,584	9,670	9,904 (1,981) [475] {238}	10,148 (2,030) [487] {244}	10,422 (2,084) [500] {250}
St. Bernard Parish	2,735	2,777	2,821	2,847	2,935 (587) [141] {70}	3,026 (605) [145] {73}	3,125 (625) [150] {75}
St. Charles Parish	4,078	4,130	4,161	4,272	4,379 (876) [210] {105}	4,493 (899) [216] {108}	4,612 (922) [221] {111}
St. James Parish	1,490	1,524	1,540	1,563	1,604 (321) [77] {38}	1,648 (330) [79] {40}	1,696 (339) [81] {41}
St. John the Baptist Parish	2,925	2,947	2,963	2,997	3,050 (610) [146] {73}	3,104 (621) [149] {74}	3,158 (632) [152] {76}
St. Tammany Parish	17,336	17,601	17,756	18,481	19,118 (3,824) [918] {459}	19,811 (3,962) [951] {475}	20,562 (4,112) [987] {493}

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.