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

Date: 2/11/22

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 2/11/22 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.

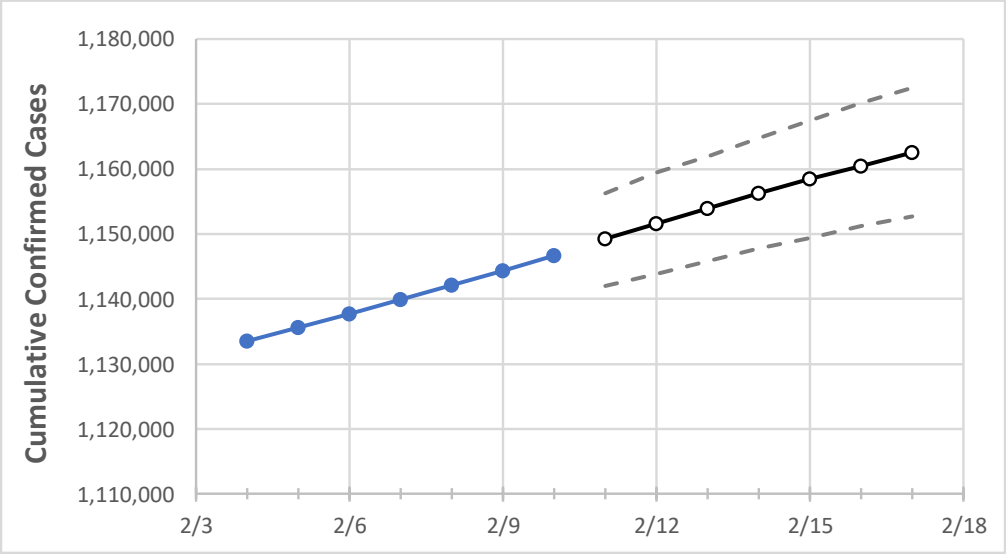
IEM's Modeling Lead

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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Louisiana	1,139,876	1,142,165	1,144,305	1,146,660	1,149,212	1,151,589	1,153,937	1,156,220	1,158,443	1,160,455	1,162,541

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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Ascension Parish	32,448	32,494	32,539	32,572	32,621	32,668	32,712	32,753	32,789	32,827	32,861
Bossier Parish	34,596	34,672	34,727	34,774	34,855	34,930	35,000	35,069	35,134	35,199	35,261
Caddo Parish	62,193	62,292	62,380	62,476	62,588	62,690	62,789	62,882	62,973	63,063	63,139
Calcasieu Parish	50,684	50,750	50,827	50,911	51,079	51,271	51,454	51,625	51,831	52,051	52,214
East Baton Rouge Parish	103,061	103,204	103,360	103,525	103,686	103,841	103,986	104,126	104,259	104,386	104,500
Jefferson Parish	105,909	106,083	106,242	106,417	106,585	106,733	106,880	107,019	107,148	107,284	107,404
Lafayette Parish	57,746	57,876	57,984	58,062	58,208	58,347	58,482	58,613	58,736	58,870	58,985
Lafourche Parish	25,542	25,593	25,652	25,738	25,796	25,856	25,910	25,962	26,015	26,067	26,111
Orleans Parish	81,040	81,225	81,344	81,619	81,779	81,926	82,064	82,211	82,330	82,468	82,582
Ouachita Parish	46,244	46,356	46,444	46,518	46,655	46,772	46,894	47,008	47,118	47,230	47,331
Rapides Parish	30,239	30,281	30,342	30,395	30,469	30,540	30,611	30,675	30,735	30,810	30,866
St. Bernard Parish	10,491	10,523	10,537	10,553	10,569	10,586	10,602	10,614	10,630	10,643	10,656
St. Charles Parish	12,922	12,944	12,967	12,980	12,996	13,013	13,027	13,042	13,057	13,069	13,082
St. James Parish	5,242	5,253	5,291	5,356	5,375	5,394	5,411	5,428	5,446	5,465	5,482
St. John the Baptist Parish	9,841	9,860	9,880	9,895	9,911	9,926	9,939	9,954	9,966	9,979	9,990
St. Tammany Parish	66,816	66,948	67,071	67,190	67,324	67,451	67,570	67,682	67,790	67,898	68,001

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:		
	2/7	2/8	2/9	2/10	2/12	2/14	2/16
Ascension Parish	32,448	32,494	32,539	32,572	32,668 (6,534) [1,568] {784}	32,753 (6,551) [1,572] {786}	32,827 (6,565) [1,576] {788}
Bossier Parish	34,596	34,672	34,727	34,774	34,930 (6,986) [1,677] {838}	35,069 (7,014) [1,683] {842}	35,199 (7,040) [1,690] {845}
Caddo Parish	62,193	62,292	62,380	62,476	62,690 (12,538) [3,009] {1,505}	62,882 (12,576) [3,018] {1,509}	63,063 (12,613) [3,027] {1,514}
Calcasieu Parish	50,684	50,750	50,827	50,911	51,271 (10,254) [2,461] {1,230}	51,625 (10,325) [2,478] {1,239}	52,051 (10,410) [2,498] {1,249}
East Baton Rouge Parish	103,061	103,204	103,360	103,525	103,841 (20,768) [4,984] {2,492}	104,126 (20,825) [4,998] {2,499}	104,386 (20,877) [5,011] {2,505}
Jefferson Parish	105,909	106,083	106,242	106,417	106,733 (21,347) [5,123] {2,562}	107,019 (21,404) [5,137] {2,568}	107,284 (21,457) [5,150] {2,575}
Lafayette Parish	57,746	57,876	57,984	58,062	58,347 (11,669) [2,801] {1,400}	58,613 (11,723) [2,813] {1,407}	58,870 (11,774) [2,826] {1,413}
Lafourche Parish	25,542	25,593	25,652	25,738	25,856 (5,171) [1,241] {621}	25,962 (5,192) [1,246] {623}	26,067 (5,213) [1,251] {626}
Orleans Parish	81,040	81,225	81,344	81,619	81,926 (16,385) [3,932] {1,966}	82,211 (16,442) [3,946] {1,973}	82,468 (16,494) [3,958] {1,979}
Ouachita Parish	46,244	46,356	46,444	46,518	46,772 (9,354) [2,245] {1,123}	47,008 (9,402) [2,256] {1,128}	47,230 (9,446) [2,267] {1,134}
Rapides Parish	30,239	30,281	30,342	30,395	30,540 (6,108) [1,466] {733}	30,675 (6,135) [1,472] {736}	30,810 (6,162) [1,479] {739}
St. Bernard Parish	10,491	10,523	10,537	10,553	10,586 (2,117) [508] {254}	10,614 (2,123) [509] {255}	10,643 (2,129) [511] {255}
St. Charles Parish	12,922	12,944	12,967	12,980	13,013 (2,603) [625] {312}	13,042 (2,608) [626] {313}	13,069 (2,614) [627] {314}
St. James Parish	5,242	5,253	5,291	5,356	5,394 (1,079) [259] {129}	5,428 (1,086) [261] {130}	5,465 (1,093) [262] {131}
St. John the Baptist Parish	9,841	9,860	9,880	9,895	9,926 (1,985) [476] {238}	9,954 (1,991) [478] {239}	9,979 (1,996) [479] {240}
St. Tammany Parish	66,816	66,948	67,071	67,190	67,451 (13,490) [3,238] {1,619}	67,682 (13,536) [3,249] {1,624}	67,898 (13,580) [3,259] {1,630}

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.