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

Date: 2/18/22

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 2/18/22 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.

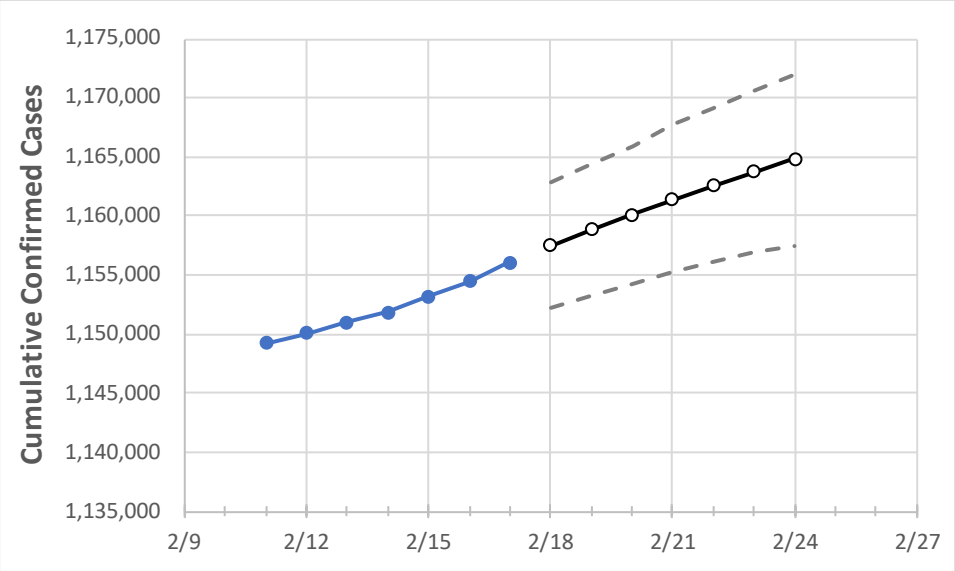
IEM's Modeling Lead

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:						
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24
Louisiana	1,151,858	1,153,232	1,154,448	1,156,065	1,157,499	1,158,827	1,160,140	1,161,372	1,162,540	1,163,789	1,164,847

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:						
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24
Ascension Parish	32,773	32,793	32,806	32,829	32,860	32,893	32,920	32,951	32,977	33,007	33,030
Bossier Parish	34,875	34,908	34,945	35,005	35,033	35,059	35,084	35,107	35,128	35,150	35,169
Caddo Parish	62,664	62,712	62,751	62,849	62,897	62,942	62,985	63,026	63,062	63,102	63,134
Calcasieu Parish	51,137	51,204	51,253	51,287	51,462	51,583	51,680	51,801	51,884	52,026	52,130
East Baton Rouge Parish	104,046	104,127	104,215	104,317	104,422	104,519	104,610	104,699	104,783	104,865	104,938
Jefferson Parish	106,774	106,899	107,002	107,093	107,177	107,260	107,338	107,412	107,482	107,553	107,619
Lafayette Parish	58,314	58,399	58,480	58,526	58,610	58,692	58,769	58,842	58,918	58,993	59,059
Lafourche Parish	25,857	25,880	25,920	25,957	25,989	26,019	26,047	26,075	26,100	26,126	26,151
Orleans Parish	82,047	82,111	82,183	82,267	82,364	82,457	82,539	82,626	82,711	82,784	82,859
Ouachita Parish	46,728	46,783	46,824	46,872	46,936	46,993	47,041	47,099	47,150	47,201	47,245
Rapides Parish	30,545	30,603	30,630	30,650	30,683	30,713	30,745	30,771	30,797	30,827	30,850
St. Bernard Parish	10,598	10,611	10,616	10,626	10,636	10,645	10,654	10,662	10,670	10,678	10,685
St. Charles Parish	13,023	13,033	13,044	13,055	13,065	13,075	13,083	13,092	13,100	13,108	13,115
St. James Parish	5,375	5,389	5,395	5,402	5,415	5,427	5,438	5,448	5,458	5,471	5,481
St. John the Baptist Parish	9,922	9,932	9,942	9,951	9,959	9,967	9,974	9,981	9,988	9,995	10,001
St. Tammany Parish	67,410	67,477	67,539	67,586	67,653	67,714	67,773	67,830	67,881	67,937	67,979

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:		
	2/14	2/15	2/16	2/17	2/19	2/21	2/23
Ascension Parish	32,773	32,793	32,806	32,829	32,893 (6,579) [1,579] {789}	32,951 (6,590) [1,582] {791}	33,007 (6,601) [1,584] {792}
Bossier Parish	34,875	34,908	34,945	35,005	35,059 (7,012) [1,683] {841}	35,107 (7,021) [1,685] {843}	35,150 (7,030) [1,687] {844}
Caddo Parish	62,664	62,712	62,751	62,849	62,942 (12,588) [3,021] {1,511}	63,026 (12,605) [3,025] {1,513}	63,102 (12,620) [3,029] {1,514}
Calcasieu Parish	51,137	51,204	51,253	51,287	51,583 (10,317) [2,476] {1,238}	51,801 (10,360) [2,486] {1,243}	52,026 (10,405) [2,497] {1,249}
East Baton Rouge Parish	104,046	104,127	104,215	104,317	104,519 (20,904) [5,017] {2,508}	104,699 (20,940) [5,026] {2,513}	104,865 (20,973) [5,034] {2,517}
Jefferson Parish	106,774	106,899	107,002	107,093	107,260 (21,452) [5,148] {2,574}	107,412 (21,482) [5,156] {2,578}	107,553 (21,511) [5,163] {2,581}
Lafayette Parish	58,314	58,399	58,480	58,526	58,692 (11,738) [2,817] {1,409}	58,842 (11,768) [2,824] {1,412}	58,993 (11,799) [2,832] {1,416}
Lafourche Parish	25,857	25,880	25,920	25,957	26,019 (5,204) [1,249] {624}	26,075 (5,215) [1,252] {626}	26,126 (5,225) [1,254] {627}
Orleans Parish	82,047	82,111	82,183	82,267	82,457 (16,491) [3,958] {1,979}	82,626 (16,525) [3,966] {1,983}	82,784 (16,557) [3,974] {1,987}
Ouachita Parish	46,728	46,783	46,824	46,872	46,993 (9,399) [2,256] {1,128}	47,099 (9,420) [2,261] {1,130}	47,201 (9,440) [2,266] {1,133}
Rapides Parish	30,545	30,603	30,630	30,650	30,713 (6,143) [1,474] {737}	30,771 (6,154) [1,477] {738}	30,827 (6,165) [1,480] {740}
St. Bernard Parish	10,598	10,611	10,616	10,626	10,645 (2,129) [511] {255}	10,662 (2,132) [512] {256}	10,678 (2,136) [513] {256}
St. Charles Parish	13,023	13,033	13,044	13,055	13,075 (2,615) [628] {314}	13,092 (2,618) [628] {314}	13,108 (2,622) [629] {315}
St. James Parish	5,375	5,389	5,395	5,402	5,427 (1,085) [260] {130}	5,448 (1,090) [262] {131}	5,471 (1,094) [263] {131}
St. John the Baptist Parish	9,922	9,932	9,942	9,951	9,967 (1,993) [478] {239}	9,981 (1,996) [479] {240}	9,995 (1,999) [480] {240}
St. Tammany Parish	67,410	67,477	67,539	67,586	67,714 (13,543) [3,250] {1,625}	67,830 (13,566) [3,256] {1,628}	67,937 (13,587) [3,261] {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.