

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

Date: 12/7/20

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 12/7/20 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.

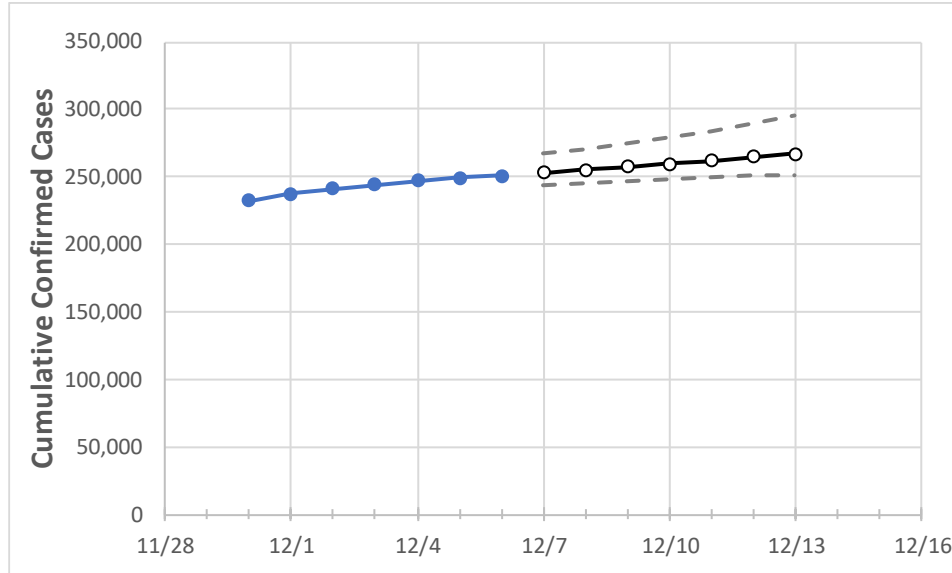
IEM's Modeling Lead

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:					
	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13
Louisiana	244,078	247,177	249,150	251,123	253,196	255,331	257,530	259,795	262,126	264,527	266,998

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 20%, and are often within 10%, of actual confirmed cases.

Louisiana Parishes

	Actual Confirmed Cases On:				Projected Cases For:						
	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13
Ascension Parish	5,927	6,074	6,124	6,174	6,210	6,247	6,283	6,320	6,357	6,394	6,432
Bossier Parish	6,596	6,734	6,805	6,875	6,926	6,976	7,027	7,079	7,130	7,182	7,235
Caddo Parish	14,090	14,271	14,363	14,454	14,546	14,640	14,734	14,829	14,925	15,022	15,119
Calcasieu Parish	10,856	10,939	10,998	11,056	11,109	11,163	11,218	11,274	11,331	11,388	11,446
East Baton Rouge Parish	20,746	20,941	21,071	21,200	21,341	21,486	21,636	21,790	21,948	22,110	22,278
Jefferson Parish	24,328	24,588	24,766	24,943	25,167	25,400	25,643	25,896	26,160	26,434	26,720
Lafayette Parish	12,674	12,877	12,966	13,054	13,190	13,331	13,477	13,627	13,783	13,944	14,111
Lafourche Parish	4,934	5,001	5,044	5,086	5,142	5,200	5,262	5,327	5,395	5,467	5,543
Orleans Parish	16,580	16,733	16,873	17,013	17,133	17,257	17,386	17,518	17,656	17,797	17,944
Ouachita Parish	10,482	10,648	10,755	10,861	10,961	11,065	11,171	11,280	11,391	11,506	11,624
Rapides Parish	6,528	6,562	6,593	6,624	6,661	6,699	6,737	6,776	6,815	6,855	6,896
St. Bernard Parish	1,910	1,921	1,934	1,946	1,964	1,983	2,003	2,024	2,046	2,070	2,095
St. Charles Parish	2,758	2,812	2,830	2,848	2,880	2,914	2,950	2,988	3,028	3,070	3,114
St. James Parish	1,014	1,035	1,054	1,073	1,084	1,097	1,110	1,125	1,140	1,157	1,175
St. John the Baptist Parish	2,076	2,094	2,106	2,118	2,132	2,145	2,160	2,174	2,189	2,204	2,220
St. Tammany Parish	10,983	11,128	11,217	11,305	11,444	11,590	11,742	11,901	12,067	12,240	12,421

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:											
	12/3	12/4	12/5	12/6	12/8				12/10				12/12			
Ascension Parish	5,927	6,074	6,124	6,174	6,247	(1,249)	[300]	{150}	6,320	(1,264)	[303]	{152}	6,394	(1,279)	[307]	{153}
Bossier Parish	6,596	6,734	6,805	6,875	6,976	(1,395)	[335]	{167}	7,079	(1,416)	[340]	{170}	7,182	(1,436)	[345]	{172}
Caddo Parish	14,090	14,271	14,363	14,454	14,640	(2,928)	[703]	{351}	14,829	(2,966)	[712]	{356}	15,022	(3,004)	[721]	{361}
Calcasieu Parish	10,856	10,939	10,998	11,056	11,163	(2,233)	[536]	{268}	11,274	(2,255)	[541]	{271}	11,388	(2,278)	[547]	{273}
East Baton Rouge Parish	20,746	20,941	21,071	21,200	21,486	(4,297)	[1,031]	{516}	21,790	(4,358)	[1,046]	{523}	22,110	(4,422)	[1,061]	{531}
Jefferson Parish	24,328	24,588	24,766	24,943	25,400	(5,080)	[1,219]	{610}	25,896	(5,179)	[1,243]	{622}	26,434	(5,287)	[1,269]	{634}
Lafayette Parish	12,674	12,877	12,966	13,054	13,331	(2,666)	[640]	{320}	13,627	(2,725)	[654]	{327}	13,944	(2,789)	[669]	{335}
Lafourche Parish	4,934	5,001	5,044	5,086	5,200	(1,040)	[250]	{125}	5,327	(1,065)	[256]	{128}	5,467	(1,093)	[262]	{131}
Orleans Parish	16,580	16,733	16,873	17,013	17,257	(3,451)	[828]	{414}	17,518	(3,504)	[841]	{420}	17,797	(3,559)	[854]	{427}
Ouachita Parish	10,482	10,648	10,755	10,861	11,065	(2,213)	[531]	{266}	11,280	(2,256)	[541]	{271}	11,506	(2,301)	[552]	{276}
Rapides Parish	6,528	6,562	6,593	6,624	6,699	(1,340)	[322]	{161}	6,776	(1,355)	[325]	{163}	6,855	(1,371)	[329]	{165}
St. Bernard Parish	1,910	1,921	1,934	1,946	1,983	(397)	[95]	{48}	2,024	(405)	[97]	{49}	2,070	(414)	[99]	{50}
St. Charles Parish	2,758	2,812	2,830	2,848	2,914	(583)	[140]	{70}	2,988	(598)	[143]	{72}	3,070	(614)	[147]	{74}
St. James Parish	1,014	1,035	1,054	1,073	1,097	(219)	[53]	{26}	1,125	(225)	[54]	{27}	1,157	(231)	[56]	{28}
St. John the Baptist Parish	2,076	2,094	2,106	2,118	2,145	(429)	[103]	{51}	2,174	(435)	[104]	{52}	2,204	(441)	[106]	{53}
St. Tammany Parish	10,983	11,128	11,217	11,305	11,590	(2,318)	[556]	{278}	11,901	(2,380)	[571]	{286}	12,240	(2,448)	[588]	{294}

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.