

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

Date: 11/3/21

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 11/3/21 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.

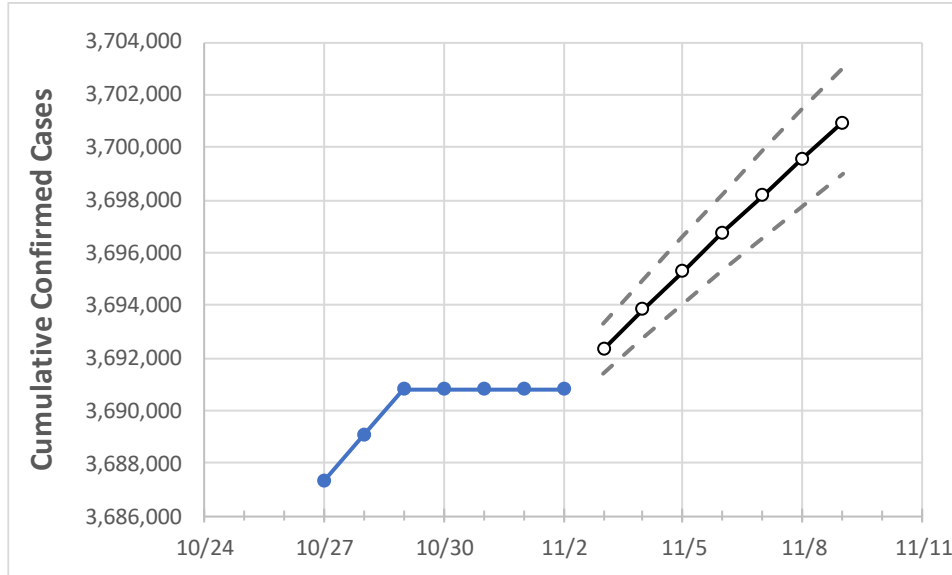
IEM's Modeling Lead

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.

Florida State Projections



	Actual Confirmed Cases On:				Projected Cases For:							
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9	
Florida	3,690,812	3,690,812	3,690,812	3,690,812	3,692,331	3,693,833	3,695,308	3,696,759	3,698,183	3,699,571	3,700,942	

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.

Florida Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9
Alachua	39,856	39,856	39,856	39,856	39,879	39,902	39,925	39,947	39,970	39,991	40,013
Broward	359,760	359,760	359,760	359,760	359,904	360,048	360,184	360,322	360,455	360,587	360,715
Charlotte	23,461	23,461	23,461	23,461	23,474	23,487	23,500	23,513	23,525	23,537	23,548
Collier	58,187	58,187	58,187	58,187	58,217	58,248	58,279	58,310	58,342	58,374	58,406
Duval	166,116	166,116	166,116	166,116	166,161	166,202	166,243	166,284	166,323	166,361	166,398
Hillsborough	242,701	242,701	242,701	242,701	242,814	242,925	243,032	243,136	243,237	243,337	243,433
Lake	55,018	55,018	55,018	55,018	55,065	55,115	55,164	55,214	55,263	55,313	55,364
Lee	127,297	127,297	127,297	127,297	127,384	127,473	127,563	127,655	127,749	127,843	127,936
Manatee	65,709	65,709	65,709	65,709	65,735	65,760	65,784	65,808	65,832	65,856	65,879
Miami-Dade	678,911	678,911	678,911	678,911	679,198	679,486	679,775	680,064	680,351	680,636	680,919
Okaloosa	34,637	34,637	34,637	34,637	34,654	34,671	34,689	34,707	34,724	34,742	34,760
Orange	230,361	230,361	230,361	230,361	230,458	230,553	230,646	230,736	230,824	230,911	230,995
Osceola	72,401	72,401	72,401	72,401	72,444	72,487	72,530	72,573	72,616	72,659	72,702
Palm Beach	227,675	227,675	227,675	227,675	227,773	227,869	227,963	228,056	228,146	228,236	228,323
Pasco	79,503	79,503	79,503	79,503	79,535	79,567	79,599	79,631	79,662	79,693	79,723
Pinellas	136,396	136,396	136,396	136,396	136,442	136,486	136,530	136,573	136,614	136,654	136,693
Polk	128,914	128,914	128,914	128,914	128,962	129,010	129,056	129,101	129,145	129,188	129,231
Sarasota	56,831	56,831	56,831	56,831	56,855	56,880	56,904	56,929	56,954	56,979	57,003
Seminole	62,319	62,319	62,319	62,319	62,347	62,376	62,404	62,431	62,458	62,485	62,512
St. Johns	40,993	40,993	40,993	40,993	41,016	41,039	41,061	41,083	41,106	41,128	41,150
Sumter	14,641	14,641	14,641	14,641	14,652	14,664	14,675	14,687	14,698	14,710	14,721
Volusia	76,489	76,489	76,489	76,489	76,550	76,611	76,670	76,730	76,788	76,847	76,905

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.

Florida Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	10/30	10/31	11/1	11/2	11/4				11/6				11/8			
Alachua	39,856	39,856	39,856	39,856	39,902	(7,980)	[1,915]	{958}	39,947	(7,989)	[1,917]	{959}	39,991	(7,998)	[1,920]	{960}
Broward	359,760	359,760	359,760	359,760	360,048	(72,010)	[17,282]	{8,641}	360,322	(72,064)	[17,295]	{8,648}	360,587	(72,117)	[17,308]	{8,654}
Charlotte	23,461	23,461	23,461	23,461	23,487	(4,697)	[1,127]	{564}	23,513	(4,703)	[1,129]	{564}	23,537	(4,707)	[1,130]	{565}
Collier	58,187	58,187	58,187	58,187	58,248	(11,650)	[2,796]	{1,398}	58,310	(11,662)	[2,799]	{1,399}	58,374	(11,675)	[2,802]	{1,401}
Duval	166,116	166,116	166,116	166,116	166,202	(33,240)	[7,978]	{3,989}	166,284	(33,257)	[7,982]	{3,991}	166,361	(33,272)	[7,985]	{3,993}
Hillsborough	242,701	242,701	242,701	242,701	242,925	(48,585)	[11,660]	{5,830}	243,136	(48,627)	[11,671]	{5,835}	243,337	(48,667)	[11,680]	{5,840}
Lake	55,018	55,018	55,018	55,018	55,115	(11,023)	[2,646]	{1,323}	55,214	(11,043)	[2,650]	{1,325}	55,313	(11,063)	[2,655]	{1,328}
Lee	127,297	127,297	127,297	127,297	127,473	(25,495)	[6,119]	{3,059}	127,655	(25,531)	[6,127]	{3,064}	127,843	(25,569)	[6,136]	{3,068}
Manatee	65,709	65,709	65,709	65,709	65,760	(13,152)	[3,156]	{1,578}	65,808	(13,162)	[3,159]	{1,579}	65,856	(13,171)	[3,161]	{1,581}
Miami-Dade	678,911	678,911	678,911	678,911	579,486	(135,897)	[32,615]	{16,308}	580,064	(136,013)	[32,643]	{16,322}	580,636	(136,127)	[32,671]	{16,335}
Okaloosa	34,637	34,637	34,637	34,637	34,671	(6,934)	[1,664]	{832}	34,707	(6,941)	[1,666]	{833}	34,742	(6,948)	[1,668]	{834}
Orange	230,361	230,361	230,361	230,361	230,553	(46,111)	[11,067]	{5,533}	230,736	(46,147)	[11,075]	{5,538}	230,911	(46,182)	[11,084]	{5,542}
Osceola	72,401	72,401	72,401	72,401	72,487	(14,497)	[3,479]	{1,740}	72,573	(14,515)	[3,484]	{1,742}	72,659	(14,532)	[3,488]	{1,744}
Palm Beach	227,675	227,675	227,675	227,675	227,869	(45,574)	[10,938]	{5,469}	228,056	(45,611)	[10,947]	{5,473}	228,236	(45,647)	[10,955]	{5,478}
Pasco	79,503	79,503	79,503	79,503	79,567	(15,913)	[3,819]	{1,910}	79,631	(15,926)	[3,822]	{1,911}	79,693	(15,939)	[3,825]	{1,913}
Pinellas	136,396	136,396	136,396	136,396	136,486	(27,297)	[6,551]	{3,276}	136,573	(27,315)	[6,555]	{3,278}	136,654	(27,331)	[6,559]	{3,280}
Polk	128,914	128,914	128,914	128,914	129,010	(25,802)	[6,192]	{3,096}	129,101	(25,820)	[6,197]	{3,098}	129,188	(25,838)	[6,201]	{3,101}
Sarasota	56,831	56,831	56,831	56,831	56,880	(11,376)	[2,730]	{1,365}	56,929	(11,386)	[2,733]	{1,366}	56,979	(11,396)	[2,735]	{1,367}
Seminole	62,319	62,319	62,319	62,319	62,376	(12,475)	[2,994]	{1,497}	62,431	(12,486)	[2,997]	{1,498}	62,485	(12,497)	[2,999]	{1,500}
St. Johns	40,993	40,993	40,993	40,993	41,039	(8,208)	[1,970]	{985}	41,083	(8,217)	[1,972]	{986}	41,128	(8,226)	[1,974]	{987}
Sumter	14,641	14,641	14,641	14,641	14,664	(2,933)	[704]	{352}	14,687	(2,937)	[705]	{352}	14,710	(2,942)	[706]	{353}
Volusia	76,489	76,489	76,489	76,489	76,611	(15,322)	[3,677]	{1,839}	76,730	(15,346)	[3,683]	{1,842}	76,847	(15,369)	[3,689]	{1,844}

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.