

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

Date: 10/20/21

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 10/20/21 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.

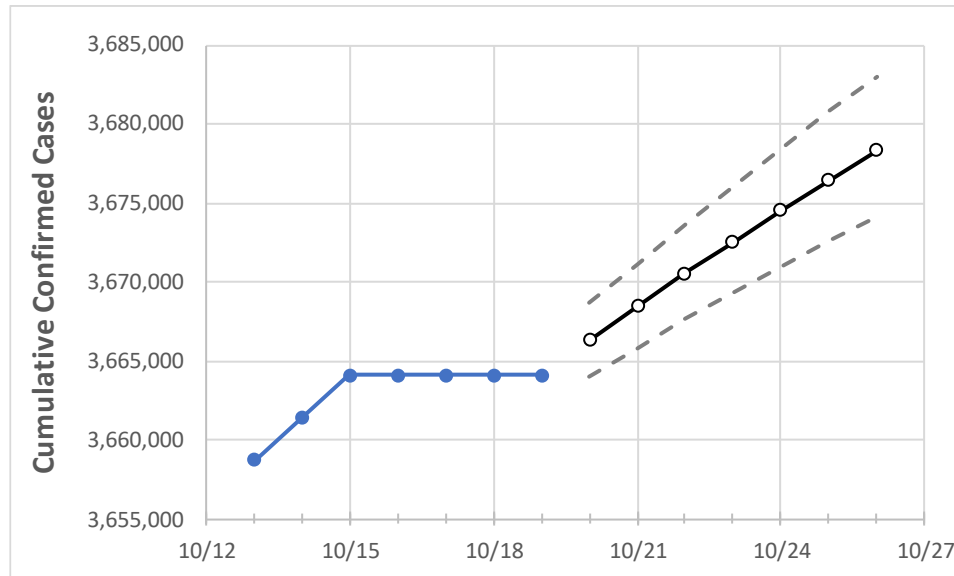
IEM's Modeling Lead

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:					
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27
Florida	3,664,097	3,664,097	3,664,097	3,664,097	3,666,286	3,668,447	3,670,530	3,672,523	3,674,521	3,676,426	3,678,318	3,680,213

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:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
Alachua	39,469	39,469	39,469	39,469	39,518	39,569	39,621	39,673	39,727	39,780	39,834
Broward	357,110	357,110	357,110	357,110	357,332	357,546	357,755	357,959	358,160	358,355	358,545
Charlotte	23,191	23,191	23,191	23,191	23,213	23,235	23,256	23,275	23,295	23,316	23,334
Collier	57,827	57,827	57,827	57,827	57,854	57,880	57,904	57,929	57,952	57,975	57,996
Duval	165,223	165,223	165,223	165,223	165,308	165,391	165,472	165,551	165,628	165,705	165,779
Hillsborough	240,451	240,451	240,451	240,451	240,639	240,823	241,002	241,181	241,351	241,519	241,685
Lake	54,432	54,432	54,432	54,432	54,476	54,519	54,559	54,599	54,638	54,676	54,712
Lee	126,320	126,320	126,320	126,320	126,381	126,440	126,498	126,553	126,606	126,659	126,708
Manatee	65,237	65,237	65,237	65,237	65,273	65,308	65,342	65,375	65,407	65,437	65,466
Miami-Dade	674,857	674,857	674,857	674,857	675,182	675,503	675,806	676,109	676,400	676,690	676,966
Okaloosa	34,414	34,414	34,414	34,414	34,433	34,453	34,471	34,489	34,507	34,524	34,541
Orange	228,543	228,543	228,543	228,543	228,708	228,868	229,027	229,183	229,335	229,484	229,631
Osceola	71,806	71,806	71,806	71,806	71,853	71,899	71,944	71,987	72,031	72,073	72,114
Palm Beach	225,870	225,870	225,870	225,870	226,042	226,209	226,373	226,534	226,694	226,848	227,000
Pasco	79,003	79,003	79,003	79,003	79,045	79,087	79,126	79,165	79,202	79,237	79,271
Pinellas	135,454	135,454	135,454	135,454	135,546	135,634	135,721	135,804	135,886	135,966	136,043
Polk	127,969	127,969	127,969	127,969	128,044	128,116	128,185	128,254	128,319	128,385	128,445
Sarasota	56,497	56,497	56,497	56,497	56,538	56,579	56,620	56,660	56,700	56,738	56,777
Seminole	61,847	61,847	61,847	61,847	61,892	61,935	61,977	62,019	62,060	62,100	62,138
St. Johns	40,676	40,676	40,676	40,676	40,712	40,748	40,782	40,817	40,851	40,884	40,916
Sumter	14,480	14,480	14,480	14,480	14,491	14,502	14,512	14,523	14,533	14,543	14,552
Volusia	75,476	75,476	75,476	75,476	75,532	75,587	75,640	75,691	75,741	75,790	75,836

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:											
	10/16	10/17	10/18	10/19	10/21				10/23				10/25			
Alachua	39,469	39,469	39,469	39,469	39,569	(7,914)	[1,899]	{950}	39,673	(7,935)	[1,904]	{952}	39,780	(7,956)	[1,909]	{955}
Broward	357,110	357,110	357,110	357,110	357,546	(71,509)	[17,162]	{8,581}	357,959	(71,592)	[17,182]	{8,591}	358,355	(71,671)	[17,201]	{8,601}
Charlotte	23,191	23,191	23,191	23,191	23,235	(4,647)	[1,115]	{558}	23,275	(4,655)	[1,117]	{559}	23,316	(4,663)	[1,119]	{560}
Collier	57,827	57,827	57,827	57,827	57,880	(11,576)	[2,778]	{1,389}	57,929	(11,586)	[2,781]	{1,390}	57,975	(11,595)	[2,783]	{1,391}
Duval	165,223	165,223	165,223	165,223	165,391	(33,078)	[7,939]	{3,969}	165,551	(33,110)	[7,946]	{3,973}	165,705	(33,141)	[7,954]	{3,977}
Hillsborough	240,451	240,451	240,451	240,451	240,823	(48,165)	[11,560]	{5,780}	241,181	(48,236)	[11,577]	{5,788}	241,519	(48,304)	[11,593]	{5,796}
Lake	54,432	54,432	54,432	54,432	54,519	(10,904)	[2,617]	{1,308}	54,599	(10,920)	[2,621]	{1,310}	54,676	(10,935)	[2,624]	{1,312}
Lee	126,320	126,320	126,320	126,320	126,440	(25,288)	[6,069]	{3,035}	126,553	(25,311)	[6,075]	{3,037}	126,659	(25,332)	[6,080]	{3,040}
Manatee	65,237	65,237	65,237	65,237	65,308	(13,062)	[3,135]	{1,567}	65,375	(13,075)	[3,138]	{1,569}	65,437	(13,087)	[3,141]	{1,570}
Miami-Dade	674,857	674,857	674,857	674,857	675,503	(135,101)	[32,424]	{16,212}	676,109	(135,222)	[32,453]	{16,227}	676,690	(135,338)	[32,481]	{16,241}
Okaloosa	34,414	34,414	34,414	34,414	34,453	(6,891)	[1,654]	{827}	34,489	(6,898)	[1,655]	{828}	34,524	(6,905)	[1,657]	{829}
Orange	228,543	228,543	228,543	228,543	228,868	(45,774)	[10,986]	{5,493}	229,183	(45,837)	[11,001]	{5,500}	229,484	(45,897)	[11,015]	{5,508}
Osceola	71,806	71,806	71,806	71,806	71,899	(14,380)	[3,451]	{1,726}	71,987	(14,397)	[3,455]	{1,728}	72,073	(14,415)	[3,460]	{1,730}
Palm Beach	225,870	225,870	225,870	225,870	226,209	(45,242)	[10,858]	{5,429}	226,534	(45,307)	[10,874]	{5,437}	226,848	(45,370)	[10,889]	{5,444}
Pasco	79,003	79,003	79,003	79,003	79,087	(15,817)	[3,796]	{1,898}	79,165	(15,833)	[3,800]	{1,900}	79,237	(15,847)	[3,803]	{1,902}
Pinellas	135,454	135,454	135,454	135,454	135,634	(27,127)	[6,510]	{3,255}	135,804	(27,161)	[6,519]	{3,259}	135,966	(27,193)	[6,526]	{3,263}
Polk	127,969	127,969	127,969	127,969	128,116	(25,623)	[6,150]	{3,075}	128,254	(25,651)	[6,156]	{3,078}	128,385	(25,677)	[6,162]	{3,081}
Sarasota	56,497	56,497	56,497	56,497	56,579	(11,316)	[2,716]	{1,358}	56,660	(11,332)	[2,720]	{1,360}	56,738	(11,348)	[2,723]	{1,362}
Seminole	61,847	61,847	61,847	61,847	61,935	(12,387)	[2,973]	{1,486}	62,019	(12,404)	[2,977]	{1,488}	62,100	(12,420)	[2,981]	{1,490}
St. Johns	40,676	40,676	40,676	40,676	40,748	(8,150)	[1,956]	{978}	40,817	(8,163)	[1,959]	{980}	40,884	(8,177)	[1,962]	{981}
Sumter	14,480	14,480	14,480	14,480	14,502	(2,900)	[696]	{348}	14,523	(2,905)	[697]	{349}	14,543	(2,909)	[698]	{349}
Volusia	75,476	75,476	75,476	75,476	75,587	(15,117)	[3,628]	{1,814}	75,691	(15,138)	[3,633]	{1,817}	75,790	(15,158)	[3,638]	{1,819}

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.