

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/27/21**

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 12/27/21 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.

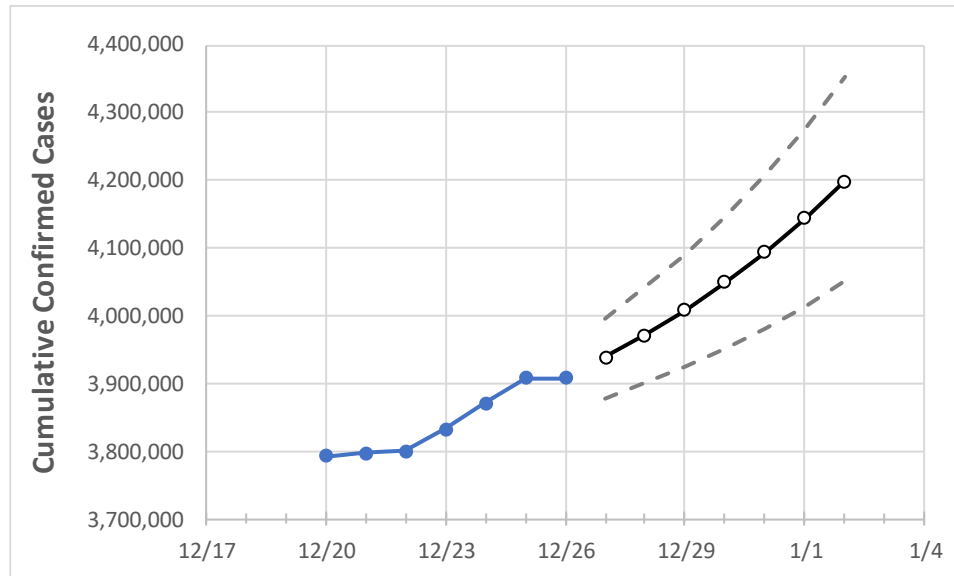
IEM's Modeling Lead

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:						
	12/23	12/24	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2
Florida	3,832,530	3,870,139	3,907,748	3,907,748	3,938,848	3,971,820	4,008,732	4,050,125	4,093,824	4,143,687	4,198,615

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:						
	12/23	12/24	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2
Alachua	41,349	41,436	41,522	41,522	41,633	41,753	41,879	42,014	42,158	42,311	42,475
Broward	388,357	391,299	394,240	394,240	398,694	403,556	408,804	414,640	421,087	427,973	435,684
Charlotte	24,293	24,321	24,350	24,350	24,382	24,415	24,449	24,483	24,519	24,555	24,593
Collier	60,371	60,512	60,653	60,653	60,838	61,036	61,246	61,474	61,714	61,975	62,251
Duval	169,703	169,927	170,151	170,151	170,442	170,751	171,084	171,440	171,810	172,214	172,640
Hillsborough	253,201	253,845	254,488	254,488	255,330	256,243	257,223	258,264	259,383	260,595	261,894
Lake	57,120	57,207	57,294	57,294	57,398	57,507	57,618	57,737	57,860	57,992	58,127
Lee	131,226	131,453	131,680	131,680	131,972	132,272	132,595	132,935	133,301	133,696	134,109
Manatee	67,545	67,648	67,750	67,750	67,877	68,016	68,159	68,310	68,476	68,650	68,835
Miami-Dade	741,635	748,190	754,744	754,744	764,818	775,674	787,422	800,195	814,255	829,462	846,112
Okaloosa	35,481	35,508	35,535	35,535	35,565	35,596	35,628	35,661	35,695	35,729	35,765
Orange	240,678	241,506	242,335	242,335	243,488	244,736	246,065	247,548	249,131	250,864	252,701
Osceola	75,644	75,877	76,109	76,109	76,426	76,770	77,141	77,542	77,975	78,442	78,954
Palm Beach	243,170	244,647	246,123	246,123	248,306	250,703	253,285	256,137	259,223	262,648	266,391
Pasco	81,950	82,071	82,193	82,193	82,341	82,497	82,660	82,832	83,012	83,206	83,406
Pinellas	140,688	140,929	141,171	141,171	141,471	141,792	142,118	142,476	142,852	143,257	143,687
Polk	132,861	133,084	133,308	133,308	133,595	133,897	134,225	134,566	134,935	135,328	135,750
Sarasota	59,022	59,137	59,253	59,253	59,394	59,542	59,699	59,864	60,040	60,224	60,420
Seminole	65,532	65,731	65,930	65,930	66,197	66,479	66,783	67,108	67,457	67,842	68,243
St. Johns	42,404	42,468	42,533	42,533	42,609	42,689	42,774	42,864	42,959	43,059	43,166
Sumter	15,104	15,116	15,128	15,128	15,142	15,156	15,170	15,185	15,200	15,215	15,231
Volusia	79,514	79,635	79,757	79,757	79,896	80,042	80,191	80,350	80,515	80,693	80,874

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:											
	12/23	12/24	12/25	12/26	12/28				12/30				1/1			
Alachua	41,349	41,436	41,522	41,522	41,753	(8,351)	[2,004]	{1,002}	42,014	(8,403)	[2,017]	{1,008}	42,311	(8,462)	[2,031]	{1,015}
Broward	388,357	391,299	394,240	394,240	403,556	(80,711)	[19,371]	{9,685}	414,640	(82,928)	[19,903]	{9,951}	427,973	(85,595)	[20,543]	{10,271}
Charlotte	24,293	24,321	24,350	24,350	24,415	(4,883)	[1,172]	{586}	24,483	(4,897)	[1,175]	{588}	24,555	(4,911)	[1,179]	{589}
Collier	60,371	60,512	60,653	60,653	61,036	(12,207)	[2,930]	{1,465}	61,474	(12,295)	[2,951]	{1,475}	61,975	(12,395)	[2,975]	{1,487}
Duval	169,703	169,927	170,151	170,151	170,751	(34,150)	[8,196]	{4,098}	171,440	(34,288)	[8,229]	{4,115}	172,214	(34,443)	[8,266]	{4,133}
Hillsborough	253,201	253,845	254,488	254,488	256,243	(51,249)	[12,300]	{6,150}	258,264	(51,653)	[12,397]	{6,198}	260,595	(52,119)	[12,509]	{6,254}
Lake	57,120	57,207	57,294	57,294	57,507	(11,501)	[2,760]	{1,380}	57,737	(11,547)	[2,771]	{1,386}	57,992	(11,598)	[2,784]	{1,392}
Lee	131,226	131,453	131,680	131,680	132,272	(26,454)	[6,349]	{3,175}	132,935	(26,587)	[6,381]	{3,190}	133,696	(26,739)	[6,417]	{3,209}
Manatee	67,545	67,648	67,750	67,750	68,016	(13,603)	[3,265]	{1,632}	68,310	(13,662)	[3,279]	{1,639}	68,650	(13,730)	[3,295]	{1,648}
Miami-Dade	741,635	748,190	754,744	754,744	775,674	(155,135)	[37,232]	{18,616}	800,195	(160,039)	[38,409]	{19,205}	829,462	(165,892)	[39,814]	{19,907}
Okaloosa	35,481	35,508	35,535	35,535	35,596	(7,119)	[1,709]	{854}	35,661	(7,132)	[1,712]	{856}	35,729	(7,146)	[1,715]	{858}
Orange	240,678	241,506	242,335	242,335	244,736	(48,947)	[11,747]	{5,874}	247,548	(49,510)	[11,882]	{5,941}	250,864	(50,173)	[12,041]	{6,021}
Osceola	75,644	75,877	76,109	76,109	76,770	(15,354)	[3,685]	{1,842}	77,542	(15,508)	[3,722]	{1,861}	78,442	(15,688)	[3,765]	{1,883}
Palm Beach	243,170	244,647	246,123	246,123	250,703	(50,141)	[12,034]	{6,017}	256,137	(51,227)	[12,295]	{6,147}	262,648	(52,530)	[12,607]	{6,304}
Pasco	81,950	82,071	82,193	82,193	82,497	(16,499)	[3,960]	{1,980}	82,832	(16,566)	[3,976]	{1,988}	83,206	(16,641)	[3,994]	{1,997}
Pinellas	140,688	140,929	141,171	141,171	141,792	(28,358)	[6,806]	{3,403}	142,476	(28,495)	[6,839]	{3,419}	143,257	(28,651)	[6,876]	{3,438}
Polk	132,861	133,084	133,308	133,308	133,897	(26,779)	[6,427]	{3,214}	134,566	(26,913)	[6,459]	{3,230}	135,328	(27,066)	[6,496]	{3,248}
Sarasota	59,022	59,137	59,253	59,253	59,542	(11,908)	[2,858]	{1,429}	59,864	(11,973)	[2,873]	{1,437}	60,224	(12,045)	[2,891]	{1,445}
Seminole	65,532	65,731	65,930	65,930	66,479	(13,296)	[3,191]	{1,595}	67,108	(13,422)	[3,221]	{1,611}	67,842	(13,568)	[3,256]	{1,628}
St. Johns	42,404	42,468	42,533	42,533	42,689	(8,538)	[2,049]	{1,025}	42,864	(8,573)	[2,057]	{1,029}	43,059	(8,612)	[2,067]	{1,033}
Sumter	15,104	15,116	15,128	15,128	15,156	(3,031)	[727]	{364}	15,185	(3,037)	[729]	{364}	15,215	(3,043)	[730]	{365}
Volusia	79,514	79,635	79,757	79,757	80,042	(16,008)	[3,842]	{1,921}	80,350	(16,070)	[3,857]	{1,928}	80,693	(16,139)	[3,873]	{1,937}

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.