

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

Date: 2/25/22

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 2/25/22 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.**

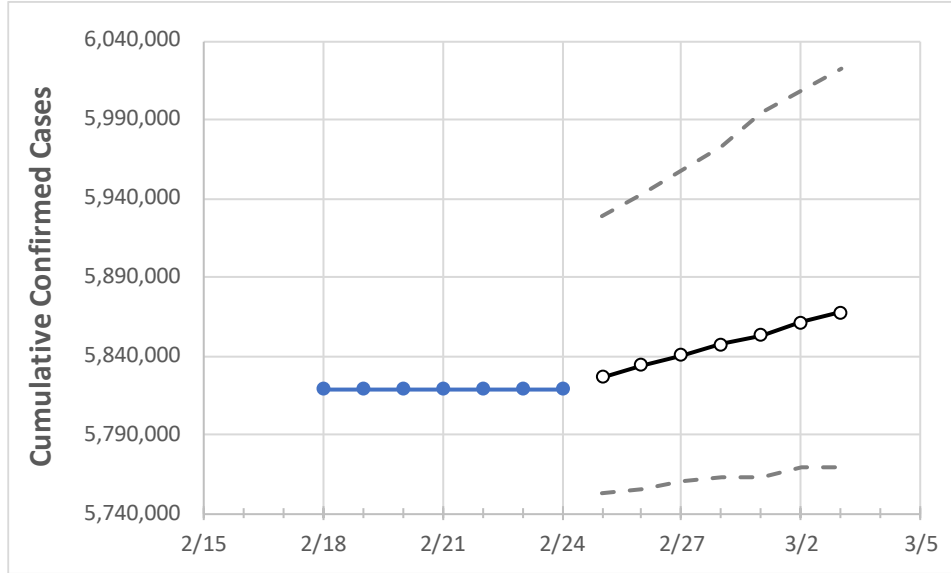
### IEM's Modeling Lead

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.

Florida State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Florida	5,818,706	5,818,706	5,818,706	5,818,706	5,826,473	5,833,877	5,840,562	5,847,614	5,852,807	5,861,092	5,867,651

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Alachua	66,948	66,948	66,948	66,948	67,008	67,066	67,118	67,171	67,218	67,262	67,311
Broward	597,048	597,048	597,048	597,048	597,358	597,670	597,924	598,208	598,431	598,701	598,922
Charlotte	35,010	35,010	35,010	35,010	35,060	35,107	35,151	35,191	35,235	35,275	35,311
Collier	83,659	83,659	83,659	83,659	83,723	83,785	83,842	83,895	83,952	84,003	84,052
Duval	251,211	251,211	251,211	251,211	251,392	251,557	251,722	251,854	252,005	252,165	252,282
Hillsborough	369,320	369,320	369,320	369,320	369,794	370,255	370,690	371,119	371,501	371,896	372,292
Lake	83,879	83,879	83,879	83,879	83,959	84,037	84,110	84,178	84,246	84,316	84,372
Lee	188,238	188,238	188,238	188,238	188,398	188,554	188,704	188,849	188,973	189,115	189,237
Manatee	94,765	94,765	94,765	94,765	94,846	94,922	94,989	95,060	95,123	95,193	95,248
Miami-Dade	1,173,497	1,173,497	1,173,497	1,173,497	1,174,054	1,174,616	1,175,090	1,175,532	1,176,021	1,176,464	1,176,825
Okaloosa	51,097	51,097	51,097	51,097	51,141	51,183	51,220	51,257	51,291	51,321	51,354
Orange	371,993	371,993	371,993	371,993	372,319	372,609	372,914	373,183	373,440	373,720	373,955
Osceola	112,450	112,450	112,450	112,450	112,543	112,635	112,724	112,804	112,882	112,962	113,037
Palm Beach	363,950	363,950	363,950	363,950	364,135	364,324	364,510	364,671	364,832	364,989	365,144
Pasco	120,471	120,471	120,471	120,471	120,584	120,691	120,791	120,886	120,981	121,072	121,153
Pinellas	206,855	206,855	206,855	206,855	207,071	207,270	207,475	207,656	207,844	208,017	208,169
Polk	197,889	197,889	197,889	197,889	198,048	198,174	198,306	198,445	198,557	198,680	198,792
Sarasota	89,232	89,232	89,232	89,232	89,360	89,480	89,593	89,700	89,811	89,914	90,012
Seminole	102,371	102,371	102,371	102,371	102,455	102,529	102,607	102,676	102,742	102,809	102,867
St. Johns	62,444	62,444	62,444	62,444	62,499	62,547	62,590	62,635	62,676	62,721	62,752
Sumter	21,255	21,255	21,255	21,255	21,292	21,328	21,363	21,397	21,430	21,462	21,492
Volusia	115,611	115,611	115,611	115,611	115,714	115,811	115,904	115,994	116,080	116,168	116,246

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:											
	2/21	2/22	2/23	2/24	2/26				2/28				3/2			
Alachua	66,948	66,948	66,948	66,948	67,066	(13,413)	[3,219]	{1,610}	67,171	(13,434)	[3,224]	{1,612}	67,262	(13,452)	[3,229]	{1,614}
Broward	597,048	597,048	597,048	597,048	597,670	(119,534)	[28,688]	{14,344}	598,208	(119,642)	[28,714]	{14,357}	598,701	(119,740)	[28,738]	{14,369}
Charlotte	35,010	35,010	35,010	35,010	35,107	(7,021)	[1,685]	{843}	35,191	(7,038)	[1,689]	{845}	35,275	(7,055)	[1,693]	{847}
Collier	83,659	83,659	83,659	83,659	83,785	(16,757)	[4,022]	{2,011}	83,895	(16,779)	[4,027]	{2,013}	84,003	(16,801)	[4,032]	{2,016}
Duval	251,211	251,211	251,211	251,211	251,557	(50,311)	[12,075]	{6,037}	251,854	(50,371)	[12,089]	{6,044}	252,165	(50,433)	[12,104]	{6,052}
Hillsborough	369,320	369,320	369,320	369,320	370,255	(74,051)	[17,772]	{8,886}	371,119	(74,224)	[17,814]	{8,907}	371,896	(74,379)	[17,851]	{8,926}
Lake	83,879	83,879	83,879	83,879	84,037	(16,807)	[4,034]	{2,017}	84,178	(16,836)	[4,041]	{2,020}	84,316	(16,863)	[4,047]	{2,024}
Lee	188,238	188,238	188,238	188,238	188,554	(37,711)	[9,051]	{4,525}	188,849	(37,770)	[9,065]	{4,532}	189,115	(37,823)	[9,078]	{4,539}
Manatee	94,765	94,765	94,765	94,765	94,922	(18,984)	[4,556]	{2,278}	95,060	(19,012)	[4,563]	{2,281}	95,193	(19,039)	[4,569]	{2,285}
Miami-Dade	1,173,497	1,173,497	1,173,497	1,173,497	1,174,616	(234,923)	[56,382]	{28,191}	1,175,532	(235,106)	[56,426]	{28,213}	1,176,464	(235,293)	[56,470]	{28,235}
Okaloosa	51,097	51,097	51,097	51,097	51,183	(10,237)	[2,457]	{1,228}	51,257	(10,251)	[2,460]	{1,230}	51,321	(10,264)	[2,463]	{1,232}
Orange	371,993	371,993	371,993	371,993	372,609	(74,522)	[17,885]	{8,943}	373,183	(74,637)	[17,913]	{8,956}	373,720	(74,744)	[17,939]	{8,969}
Osceola	112,450	112,450	112,450	112,450	112,635	(22,527)	[5,406]	{2,703}	112,804	(22,561)	[5,415]	{2,707}	112,962	(22,592)	[5,422]	{2,711}
Palm Beach	363,950	363,950	363,950	363,950	364,324	(72,865)	[17,488]	{8,744}	364,671	(72,934)	[17,504]	{8,752}	364,989	(72,998)	[17,519]	{8,760}
Pasco	120,471	120,471	120,471	120,471	120,691	(24,138)	[5,793]	{2,897}	120,886	(24,177)	[5,803]	{2,901}	121,072	(24,214)	[5,811]	{2,906}
Pinellas	206,855	206,855	206,855	206,855	207,270	(41,454)	[9,949]	{4,974}	207,656	(41,531)	[9,967]	{4,984}	208,017	(41,603)	[9,985]	{4,992}
Polk	197,889	197,889	197,889	197,889	198,174	(39,635)	[9,512]	{4,756}	198,445	(39,689)	[9,525]	{4,763}	198,680	(39,736)	[9,537]	{4,768}
Sarasota	89,232	89,232	89,232	89,232	89,480	(17,896)	[4,295]	{2,148}	89,700	(17,940)	[4,306]	{2,153}	89,914	(17,983)	[4,316]	{2,158}
Seminole	102,371	102,371	102,371	102,371	102,529	(20,506)	[4,921]	{2,461}	102,676	(20,535)	[4,928]	{2,464}	102,809	(20,562)	[4,935]	{2,467}
St. Johns	62,444	62,444	62,444	62,444	62,547	(12,509)	[3,002]	{1,501}	62,635	(12,527)	[3,006]	{1,503}	62,721	(12,544)	[3,011]	{1,505}
Sumter	21,255	21,255	21,255	21,255	21,328	(4,266)	[1,024]	{512}	21,397	(4,279)	[1,027]	{514}	21,462	(4,292)	[1,030]	{515}
Volusia	115,611	115,611	115,611	115,611	115,811	(23,162)	[5,559]	{2,779}	115,994	(23,199)	[5,568]	{2,784}	116,168	(23,234)	[5,576]	{2,788}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.