

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

Date: 4/12/21

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 4/12/21 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.**

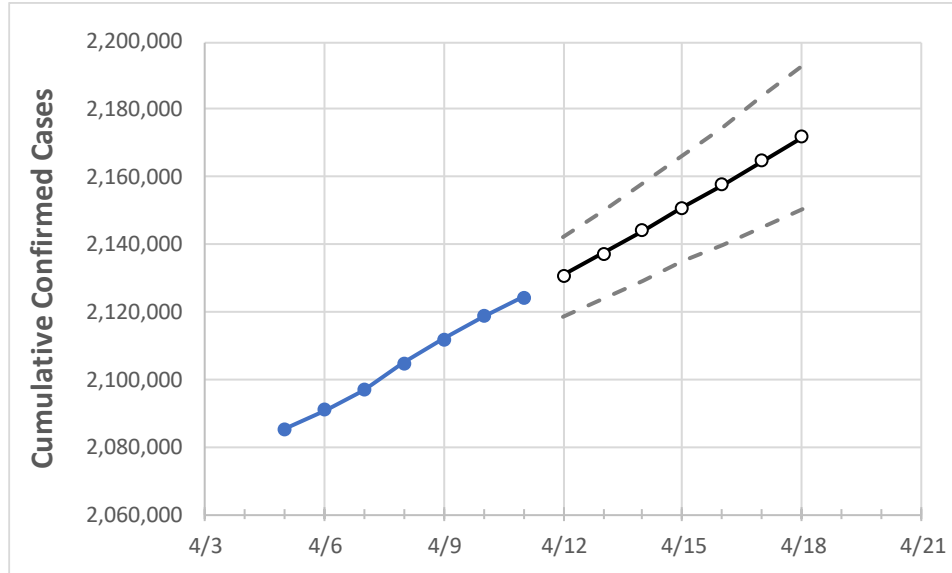
### IEM's Modeling Lead

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:							
	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	

Florida	2,104,686	2,111,807	2,118,713	2,124,233	2,130,769	2,137,314	2,144,025	2,150,771	2,157,642	2,164,678	2,171,752
---------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

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:							
	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	
Alachua	23,734	23,788	23,844	23,879	23,929	23,979	24,031	24,083	24,136	24,191	24,246	
Broward	220,739	221,623	222,445	223,152	223,983	224,832	225,681	226,555	227,432	228,322	229,233	
Charlotte	11,933	11,982	12,034	12,075	12,130	12,186	12,243	12,302	12,361	12,422	12,483	
Collier	33,310	33,404	33,548	33,644	33,761	33,881	34,003	34,128	34,255	34,386	34,519	
Duval	93,616	93,818	93,966	94,128	94,279	94,432	94,590	94,748	94,908	95,072	95,239	
Hillsborough	125,180	125,684	126,165	126,600	127,082	127,578	128,075	128,588	129,115	129,640	130,173	
Lake	27,321	27,447	27,557	27,632	27,728	27,827	27,926	28,031	28,137	28,248	28,361	
Lee	64,206	64,424	64,693	64,915	65,134	65,357	65,585	65,818	66,054	66,293	66,536	
Manatee	35,665	35,788	35,917	36,024	36,138	36,255	36,375	36,496	36,618	36,741	36,868	
Miami-Dade	456,317	457,918	459,493	460,653	462,072	463,522	464,996	466,495	468,037	469,571	471,131	
Okaloosa	19,879	19,904	19,942	19,954	19,970	19,986	20,003	20,018	20,035	20,052	20,068	
Orange	127,153	127,691	128,195	128,564	129,031	129,509	129,999	130,500	131,001	131,514	132,036	
Osceola	40,666	40,844	41,004	41,144	41,308	41,478	41,652	41,833	42,020	42,213	42,412	
Palm Beach	134,854	135,324	135,758	136,108	136,535	136,964	137,388	137,823	138,265	138,706	139,162	
Pasco	37,424	37,618	37,783	37,924	38,088	38,256	38,430	38,611	38,795	38,986	39,184	
Pinellas	74,155	74,455	74,799	75,056	75,341	75,639	75,932	76,233	76,540	76,860	77,179	
Polk	62,606	62,807	63,044	63,240	63,449	63,666	63,896	64,130	64,370	64,611	64,856	
Sarasota	30,231	30,385	30,505	30,608	30,739	30,872	31,009	31,147	31,295	31,446	31,598	
Seminole	30,915	31,066	31,220	31,317	31,437	31,561	31,686	31,810	31,938	32,069	32,199	
St. Johns	21,507	21,550	21,610	21,643	21,698	21,754	21,809	21,866	21,923	21,982	22,041	
Sumter	8,923	8,956	8,971	8,988	9,001	9,015	9,028	9,040	9,051	9,064	9,075	
Volusia	39,538	39,709	39,893	40,065	40,246	40,424	40,606	40,792	40,977	41,164	41,355	

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:											
	4/8	4/9	4/10	4/11	4/13		4/15		4/17							
Alachua	23,734	23,788	23,844	23,879	23,979	(4,796)	[1,151]	{576}	24,083	(4,817)	[1,156]	{578}	24,191	(4,838)	[1,161]	{581}
Broward	220,739	221,623	222,445	223,152	224,832	(44,966)	[10,792]	{5,396}	226,555	(45,311)	[10,875]	{5,437}	228,322	(45,664)	[10,959]	{5,480}
Charlotte	11,933	11,982	12,034	12,075	12,186	(2,437)	[585]	{292}	12,302	(2,460)	[591]	{295}	12,422	(2,484)	[596]	{298}
Collier	33,310	33,404	33,548	33,644	33,881	(6,776)	[1,626]	{813}	34,128	(6,826)	[1,638]	{819}	34,386	(6,877)	[1,651]	{825}
Duval	93,616	93,818	93,966	94,128	94,432	(18,886)	[4,533]	{2,266}	94,748	(18,950)	[4,548]	{2,274}	95,072	(19,014)	[4,563]	{2,282}
Hillsborough	125,180	125,684	126,165	126,600	127,578	(25,516)	[6,124]	{3,062}	128,588	(25,718)	[6,172]	{3,086}	129,640	(25,928)	[6,223]	{3,111}
Lake	27,321	27,447	27,557	27,632	27,827	(5,565)	[1,336]	{668}	28,031	(5,606)	[1,345]	{673}	28,248	(5,650)	[1,356]	{678}
Lee	64,206	64,424	64,693	64,915	65,357	(13,071)	[3,137]	{1,569}	65,818	(13,164)	[3,159]	{1,580}	66,293	(13,259)	[3,182]	{1,591}
Manatee	35,665	35,788	35,917	36,024	36,255	(7,251)	[1,740]	{870}	36,496	(7,299)	[1,752]	{876}	36,741	(7,348)	[1,764]	{882}
Miami-Dade	456,317	457,918	459,493	460,653	463,522	(92,704)	[22,249]	{11,125}	466,495	(93,299)	[22,392]	{11,196}	469,571	(93,914)	[22,539]	{11,270}
Okaloosa	19,879	19,904	19,942	19,954	19,986	(3,997)	[959]	{480}	20,018	(4,004)	[961]	{480}	20,052	(4,010)	[962]	{481}
Orange	127,153	127,691	128,195	128,564	129,509	(25,902)	[6,216]	{3,108}	130,500	(26,100)	[6,264]	{3,132}	131,514	(26,303)	[6,313]	{3,156}
Osceola	40,666	40,844	41,004	41,144	41,478	(8,296)	[1,991]	{995}	41,833	(8,367)	[2,008]	{1,004}	42,213	(8,443)	[2,026]	{1,013}
Palm Beach	134,854	135,324	135,758	136,108	136,964	(27,393)	[6,574]	{3,287}	137,823	(27,565)	[6,615]	{3,308}	138,706	(27,741)	[6,658]	{3,329}
Pasco	37,424	37,618	37,783	37,924	38,256	(7,651)	[1,836]	{918}	38,611	(7,722)	[1,853]	{927}	38,986	(7,797)	[1,871]	{936}
Pinellas	74,155	74,455	74,799	75,056	75,639	(15,128)	[3,631]	{1,815}	76,233	(15,247)	[3,659]	{1,830}	76,860	(15,372)	[3,689]	{1,845}
Polk	62,606	62,807	63,044	63,240	63,666	(12,733)	[3,056]	{1,528}	64,130	(12,826)	[3,078]	{1,539}	64,611	(12,922)	[3,101]	{1,551}
Sarasota	30,231	30,385	30,505	30,608	30,872	(6,174)	[1,482]	{741}	31,147	(6,229)	[1,495]	{748}	31,446	(6,289)	[1,509]	{755}
Seminole	30,915	31,066	31,220	31,317	31,561	(6,312)	[1,515]	{757}	31,810	(6,362)	[1,527]	{763}	32,069	(6,414)	[1,539]	{770}
St. Johns	21,507	21,550	21,610	21,643	21,754	(4,351)	[1,044]	{522}	21,866	(4,373)	[1,050]	{525}	21,982	(4,396)	[1,055]	{528}
Sumter	8,923	8,956	8,971	8,988	9,015	(1,803)	[433]	{216}	9,040	(1,808)	[434]	{217}	9,064	(1,813)	[435]	{218}
Volusia	39,538	39,709	39,893	40,065	40,424	(8,085)	[1,940]	{970}	40,792	(8,158)	[1,958]	{979}	41,164	(8,233)	[1,976]	{988}

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.