

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

Date: 4/20/21

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 4/20/21 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.**

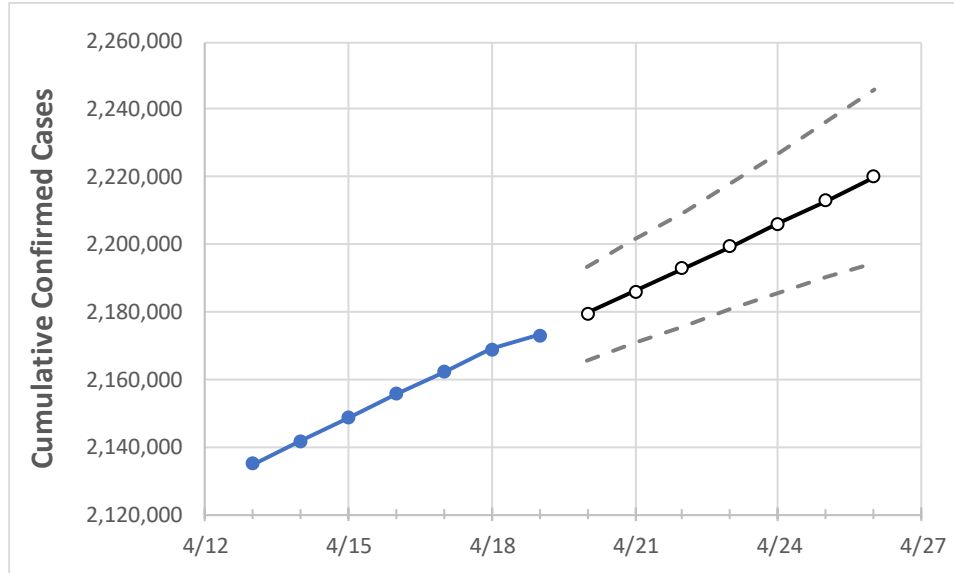
### IEM's Modeling Lead

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:					
	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	

Florida	2,155,744	2,162,067	2,168,901	2,173,138	2,179,672	2,186,161	2,192,737	2,199,466	2,206,179	2,212,922	2,219,934
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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:						
	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26
Alachua	24,072	24,110	24,151	24,184	24,224	24,265	24,304	24,345	24,384	24,425	24,466
Broward	226,990	227,738	228,502	229,073	229,850	230,616	231,383	232,149	232,905	233,672	234,447
Charlotte	12,272	12,297	12,331	12,358	12,393	12,427	12,461	12,493	12,525	12,557	12,588
Collier	34,138	34,223	34,321	34,370	34,466	34,561	34,656	34,753	34,848	34,944	35,042
Duval	94,984	95,143	95,314	95,425	95,604	95,783	95,963	96,148	96,337	96,530	96,725
Hillsborough	129,041	129,549	130,034	130,329	130,834	131,337	131,841	132,350	132,868	133,383	133,903
Lake	28,118	28,213	28,317	28,379	28,484	28,590	28,699	28,809	28,922	29,037	29,152
Lee	66,058	66,301	66,554	66,760	67,011	67,266	67,526	67,784	68,049	68,323	68,607
Manatee	36,646	36,768	36,883	36,938	37,060	37,181	37,305	37,427	37,552	37,679	37,804
Miami-Dade	467,464	468,908	470,668	471,595	473,034	474,511	475,944	477,417	478,878	480,355	481,800
Okaloosa	20,103	20,114	20,151	20,168	20,199	20,230	20,263	20,298	20,333	20,370	20,408
Orange	130,889	131,312	131,738	132,053	132,535	133,016	133,498	133,975	134,476	134,973	135,467
Osceola	41,984	42,145	42,317	42,430	42,610	42,791	42,979	43,172	43,367	43,566	43,767
Palm Beach	138,063	138,476	138,967	139,199	139,598	139,997	140,405	140,807	141,214	141,622	142,023
Pasco	38,721	38,883	39,036	39,145	39,312	39,482	39,654	39,827	40,006	40,188	40,371
Pinellas	76,172	76,425	76,637	76,792	77,032	77,274	77,516	77,758	77,992	78,229	78,467
Polk	64,447	64,706	64,922	65,084	65,338	65,596	65,860	66,131	66,409	66,689	66,976
Sarasota	31,104	31,236	31,387	31,472	31,597	31,724	31,850	31,977	32,107	32,237	32,373
Seminole	32,006	32,131	32,284	32,403	32,552	32,700	32,855	33,010	33,172	33,333	33,504
St. Johns	21,848	21,893	21,947	21,976	22,018	22,059	22,102	22,143	22,184	22,224	22,265
Sumter	9,070	9,084	9,093	9,101	9,114	9,126	9,138	9,150	9,162	9,174	9,185
Volusia	40,929	41,080	41,255	41,346	41,515	41,687	41,856	42,029	42,199	42,371	42,546

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:											
	4/16	4/17	4/18	4/19	4/21				4/23				4/25			
Alachua	24,072	24,110	24,151	24,184	24,265	(4,853)	[1,165]	{582}	24,345	(4,869)	[1,169]	{584}	24,425	(4,885)	[1,172]	{586}
Broward	226,990	227,738	228,502	229,073	230,616	(46,123)	[11,070]	{5,535}	232,149	(46,430)	[11,143]	{5,572}	233,672	(46,734)	[11,216]	{5,608}
Charlotte	12,272	12,297	12,331	12,358	12,427	(2,485)	[596]	{298}	12,493	(2,499)	[600]	{300}	12,557	(2,511)	[603]	{301}
Collier	34,138	34,223	34,321	34,370	34,561	(6,912)	[1,659]	{829}	34,753	(6,951)	[1,668]	{834}	34,944	(6,989)	[1,677]	{839}
Duval	94,984	95,143	95,314	95,425	95,783	(19,157)	[4,598]	{2,299}	96,148	(19,230)	[4,615]	{2,308}	96,530	(19,306)	[4,633]	{2,317}
Hillsborough	129,041	129,549	130,034	130,329	131,337	(26,267)	[6,304]	{3,152}	132,350	(26,470)	[6,353]	{3,176}	133,383	(26,677)	[6,402]	{3,201}
Lake	28,118	28,213	28,317	28,379	28,590	(5,718)	[1,372]	{686}	28,809	(5,762)	[1,383]	{691}	29,037	(5,807)	[1,394]	{697}
Lee	66,058	66,301	66,554	66,760	67,266	(13,453)	[3,229]	{1,614}	67,784	(13,557)	[3,254]	{1,627}	68,323	(13,665)	[3,280]	{1,640}
Manatee	36,646	36,768	36,883	36,938	37,181	(7,436)	[1,785]	{892}	37,427	(7,485)	[1,796]	{898}	37,679	(7,536)	[1,809]	{904}
Miami-Dade	467,464	468,908	470,668	471,595	474,511	(94,902)	[22,777]	{11,388}	477,417	(95,483)	[22,916]	{11,458}	480,355	(96,071)	[23,057]	{11,529}
Okaloosa	20,103	20,114	20,151	20,168	20,230	(4,046)	[971]	{486}	20,298	(4,060)	[974]	{487}	20,370	(4,074)	[978]	{489}
Orange	130,889	131,312	131,738	132,053	133,016	(26,603)	[6,385]	{3,192}	133,975	(26,795)	[6,431]	{3,215}	134,973	(26,995)	[6,479]	{3,239}
Osceola	41,984	42,145	42,317	42,430	42,791	(8,558)	[2,054]	{1,027}	43,172	(8,634)	[2,072]	{1,036}	43,566	(8,713)	[2,091]	{1,046}
Palm Beach	138,063	138,476	138,967	139,199	139,997	(27,999)	[6,720]	{3,360}	140,807	(28,161)	[6,759]	{3,379}	141,622	(28,324)	[6,798]	{3,399}
Pasco	38,721	38,883	39,036	39,145	39,482	(7,896)	[1,895]	{948}	39,827	(7,965)	[1,912]	{956}	40,188	(8,038)	[1,929]	{965}
Pinellas	76,172	76,425	76,637	76,792	77,274	(15,455)	[3,709]	{1,855}	77,758	(15,552)	[3,732]	{1,866}	78,229	(15,646)	[3,755]	{1,878}
Polk	64,447	64,706	64,922	65,084	65,596	(13,119)	[3,149]	{1,574}	66,131	(13,226)	[3,174]	{1,587}	66,689	(13,338)	[3,201]	{1,601}
Sarasota	31,104	31,236	31,387	31,472	31,724	(6,345)	[1,523]	{761}	31,977	(6,395)	[1,535]	{767}	32,237	(6,447)	[1,547]	{774}
Seminole	32,006	32,131	32,284	32,403	32,700	(6,540)	[1,570]	{785}	33,010	(6,602)	[1,584]	{792}	33,333	(6,667)	[1,600]	{800}
St. Johns	21,848	21,893	21,947	21,976	22,059	(4,412)	[1,059]	{529}	22,143	(4,429)	[1,063]	{531}	22,224	(4,445)	[1,067]	{533}
Sumter	9,070	9,084	9,093	9,101	9,126	(1,825)	[438]	{219}	9,150	(1,830)	[439]	{220}	9,174	(1,835)	[440]	{220}
Volusia	40,929	41,080	41,255	41,346	41,687	(8,337)	[2,001]	{1,000}	42,029	(8,406)	[2,017]	{1,009}	42,371	(8,474)	[2,034]	{1,017}

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.