

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

**Date: 7/27/20**

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 7/27/20 11 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.**

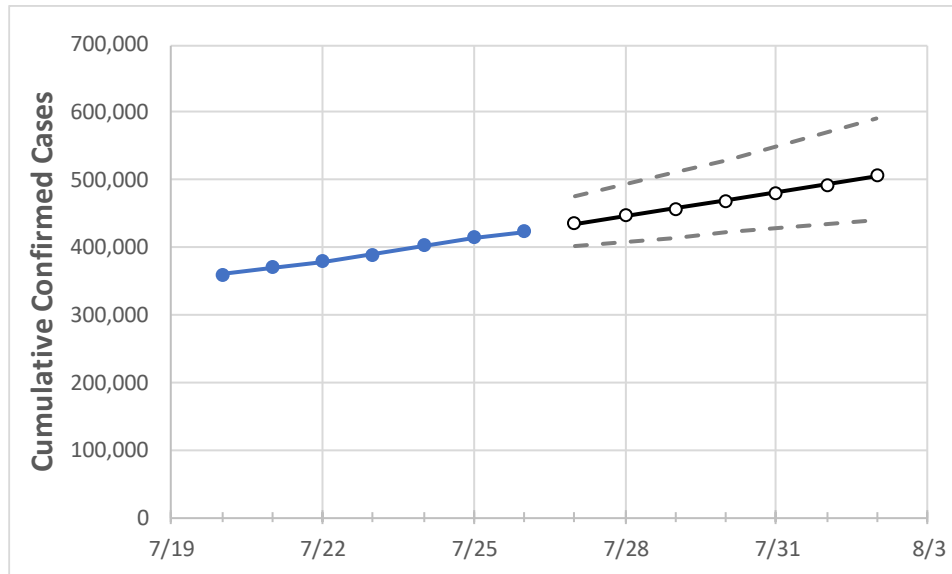
### **IEM's Modeling Lead**

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:						
	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2
Florida	389,868	402,312	414,510	423,855	435,153	446,565	458,093	469,738	481,502	493,383	505,385

*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 20%, and are often within 10%, of actual confirmed cases.*

## Florida Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2
Alachua	2,890	2,984	3,050	3,144	3,221	3,298	3,378	3,458	3,540	3,623	3,708
Broward	45,010	46,576	48,187	49,350	50,818	52,318	53,851	55,417	57,016	58,649	60,315
Charlotte	1,560	1,606	1,660	1,683	1,721	1,759	1,798	1,837	1,878	1,918	1,960
Collier	8,401	8,601	8,725	8,795	8,925	9,053	9,179	9,303	9,425	9,545	9,663
Duval	18,357	18,781	19,288	19,753	20,194	20,635	21,078	21,522	21,967	22,413	22,861
Hillsborough	25,432	26,037	26,626	27,077	27,530	27,976	28,415	28,849	29,276	29,697	30,112
Lake	3,757	3,890	3,988	4,090	4,193	4,297	4,402	4,508	4,616	4,725	4,835
Lee	13,768	14,046	14,292	14,415	14,644	14,872	15,097	15,319	15,540	15,758	15,975
Manatee	7,252	7,520	7,709	7,859	8,069	8,284	8,504	8,729	8,960	9,195	9,437
Miami-Dade	95,068	98,430	101,854	104,755	107,842	111,004	114,239	117,552	120,941	124,410	127,959
Okaloosa	2,134	2,202	2,275	2,368	2,443	2,520	2,600	2,681	2,765	2,852	2,940
Orange	25,254	25,952	26,559	26,980	27,523	28,067	28,611	29,155	29,701	30,247	30,794
Osceola	6,844	7,150	7,407	7,614	7,874	8,142	8,419	8,705	9,000	9,306	9,622
Palm Beach	28,267	29,004	29,707	30,325	30,993	31,672	32,362	33,063	33,776	34,500	35,235
Pasco	5,363	5,526	5,674	5,803	5,918	6,032	6,146	6,259	6,371	6,482	6,593
Pinellas	14,371	14,726	14,985	15,147	15,364	15,576	15,784	15,988	16,188	16,384	16,576
Polk	10,545	10,909	11,197	11,423	11,690	11,959	12,229	12,501	12,775	13,050	13,327
Sarasota	4,644	4,837	5,006	5,103	5,238	5,375	5,515	5,658	5,804	5,952	6,103
Seminole	5,736	5,852	5,969	6,034	6,130	6,225	6,319	6,411	6,502	6,592	6,681
St. Johns	2,708	2,796	2,871	2,929	2,999	3,070	3,141	3,213	3,286	3,359	3,434
Sumter	902	941	968	992	1,016	1,040	1,065	1,091	1,117	1,145	1,173
Volusia	5,803	5,969	6,133	6,240	6,403	6,568	6,736	6,906	7,079	7,254	7,432

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:											
		7/23	7/24	7/25	7/26	7/28				7/30				8/1			
	Alachua	2,890	2,984	3,050	3,144	3,298	(660)	[158]	{79}	3,458	(692)	[166]	{83}	3,623	(725)	[174]	{87}
	Broward	45,010	46,576	48,187	49,350	52,318	(10,464)	[2,511]	{1,256}	55,417	(11,083)	[2,660]	{1,330}	58,649	(11,730)	[2,815]	{1,408}
	Charlotte	1,560	1,606	1,660	1,683	1,759	(352)	[84]	{42}	1,837	(367)	[88]	{44}	1,918	(384)	[92]	{46}
	Collier	8,401	8,601	8,725	8,795	9,053	(1,811)	[435]	{217}	9,303	(1,861)	[447]	{223}	9,545	(1,909)	[458]	{229}
	Duval	18,357	18,781	19,288	19,753	20,635	(4,127)	[991]	{495}	21,522	(4,304)	[1,033]	{517}	22,413	(4,483)	[1,076]	{538}
	Hillsborough	25,432	26,037	26,626	27,077	27,976	(5,595)	[1,343]	{671}	28,849	(5,770)	[1,385]	{692}	29,697	(5,939)	[1,425]	{713}
	Lake	3,757	3,890	3,988	4,090	4,297	(859)	[206]	{103}	4,508	(902)	[216]	{108}	4,725	(945)	[227]	{113}
	Lee	13,768	14,046	14,292	14,415	14,872	(2,974)	[714]	{357}	15,319	(3,064)	[735]	{368}	15,758	(3,152)	[756]	{378}
	Manatee	7,252	7,520	7,709	7,859	8,284	(1,657)	[398]	{199}	8,729	(1,746)	[419]	{210}	9,195	(1,839)	[441]	{221}
	Miami-Dade	95,068	98,430	101,854	104,755	111,004	(22,201)	[5,328]	{2,664}	117,552	(23,510)	[5,642]	{2,821}	124,410	(24,882)	[5,972]	{2,986}
	Okaloosa	2,134	2,202	2,275	2,368	2,520	(504)	[121]	{60}	2,681	(536)	[129]	{64}	2,852	(570)	[137]	{68}
	Orange	25,254	25,952	26,559	26,980	28,067	(5,613)	[1,347]	{674}	29,155	(5,831)	[1,399]	{700}	30,247	(6,049)	[1,452]	{726}
	Osceola	6,844	7,150	7,407	7,614	8,142	(1,628)	[391]	{195}	8,705	(1,741)	[418]	{209}	9,306	(1,861)	[447]	{223}
	Palm Beach	28,267	29,004	29,707	30,325	31,672	(6,334)	[1,520]	{760}	33,063	(6,613)	[1,587]	{794}	34,500	(6,900)	[1,656]	{828}
	Pasco	5,363	5,526	5,674	5,803	6,032	(1,206)	[290]	{145}	6,259	(1,252)	[300]	{150}	6,482	(1,296)	[311]	{156}
	Pinellas	14,371	14,726	14,985	15,147	15,576	(3,115)	[748]	{374}	15,988	(3,198)	[767]	{384}	16,384	(3,277)	[786]	{393}
	Polk	10,545	10,909	11,197	11,423	11,959	(2,392)	[574]	{287}	12,501	(2,500)	[600]	{300}	13,050	(2,610)	[626]	{313}
	Sarasota	4,644	4,837	5,006	5,103	5,375	(1,075)	[258]	{129}	5,658	(1,132)	[272]	{136}	5,952	(1,190)	[286]	{143}
	Seminole	5,736	5,852	5,969	6,034	6,225	(1,245)	[299]	{149}	6,411	(1,282)	[308]	{154}	6,592	(1,318)	[316]	{158}
	St. Johns	2,708	2,796	2,871	2,929	3,070	(614)	[147]	{74}	3,213	(643)	[154]	{77}	3,359	(672)	[161]	{81}
	Sumter	902	941	968	992	1,040	(208)	[50]	{25}	1,091	(218)	[52]	{26}	1,145	(229)	[55]	{27}
	Volusia	5,803	5,969	6,133	6,240	6,568	(1,314)	[315]	{158}	6,906	(1,381)	[332]	{166}	7,254	(1,451)	[348]	{174}

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.