

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 7/23/20**

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 7/23/20 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.

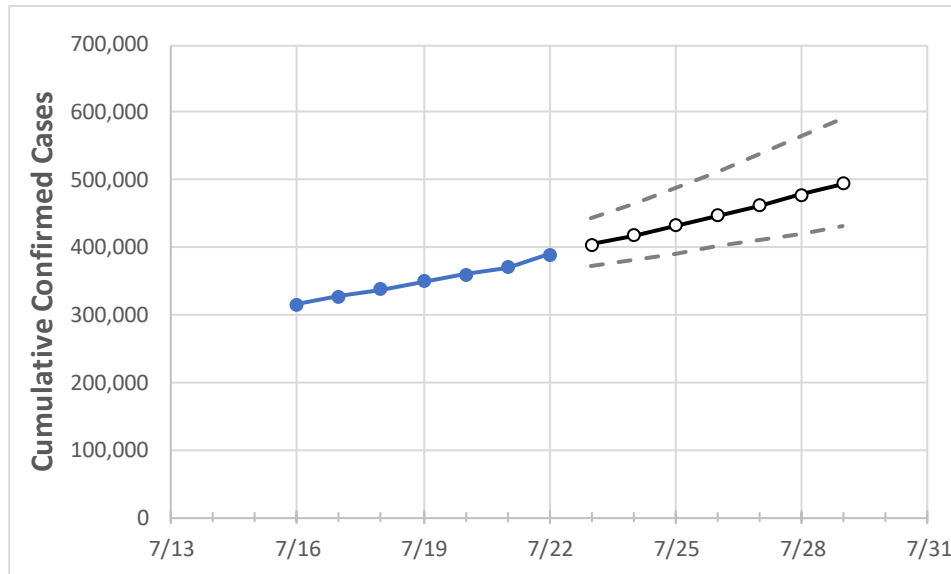
IEM's Modeling Lead

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:						
	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29
Florida	350,047	360,394	369,834	389,868	403,620	417,744	432,251	447,151	462,454	478,171	494,310

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:						
	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29
Alachua	2,619	2,683	2,737	2,890	2,968	3,048	3,129	3,211	3,295	3,381	3,468
Broward	39,281	40,976	42,577	45,010	46,844	48,754	50,743	52,813	54,967	57,206	59,535
Charlotte	1,431	1,470	1,500	1,560	1,609	1,660	1,713	1,769	1,827	1,888	1,952
Collier	7,815	7,934	8,076	8,401	8,637	8,881	9,131	9,390	9,656	9,931	10,214
Duval	16,546	17,245	17,544	18,357	18,895	19,441	19,997	20,562	21,135	21,718	22,311
Hillsborough	23,706	24,135	24,550	25,432	26,010	26,588	27,164	27,740	28,316	28,891	29,466
Lake	3,343	3,391	3,473	3,757	3,883	4,013	4,147	4,285	4,428	4,575	4,727
Lee	12,711	12,906	13,125	13,768	14,134	14,509	14,893	15,285	15,687	16,097	16,516
Manatee	6,569	6,738	6,871	7,252	7,500	7,757	8,024	8,302	8,590	8,890	9,201
Miami-Dade	84,238	87,035	89,557	95,068	98,747	102,595	106,619	110,826	115,223	119,819	124,621
Okaloosa	1,813	1,973	2,062	2,134	2,244	2,361	2,485	2,618	2,759	2,910	3,070
Orange	23,259	23,584	24,011	25,254	25,971	26,704	27,454	28,222	29,009	29,813	30,638
Osceola	6,010	6,268	6,479	6,844	7,158	7,489	7,835	8,199	8,582	8,983	9,406
Palm Beach	25,785	26,426	26,951	28,267	29,129	30,025	30,956	31,924	32,930	33,976	35,062
Pasco	4,943	5,050	5,161	5,363	5,507	5,652	5,798	5,946	6,095	6,246	6,397
Pinellas	13,482	13,705	13,925	14,371	14,678	14,984	15,291	15,597	15,903	16,208	16,514
Polk	9,524	9,877	10,072	10,545	10,887	11,236	11,593	11,959	12,333	12,716	13,107
Sarasota	4,245	4,338	4,432	4,644	4,839	5,044	5,261	5,489	5,729	5,983	6,250
Seminole	5,329	5,411	5,519	5,736	5,876	6,019	6,163	6,309	6,458	6,608	6,760
St. Johns	2,431	2,541	2,612	2,708	2,797	2,890	2,984	3,082	3,183	3,287	3,393
Sumter	827	843	859	902	926	952	979	1,006	1,035	1,065	1,096
Volusia	5,188	5,297	5,530	5,803	6,036	6,280	6,535	6,801	7,080	7,371	7,675

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:											
	7/19	7/20	7/21	7/22	7/24				7/26				7/28			
Alachua	2,619	2,683	2,737	2,890	3,048	(610)	[146]	{73}	3,211	(642)	[154]	{77}	3,381	(676)	[162]	{81}
Broward	39,281	40,976	42,577	45,010	48,754	(9,751)	[2,340]	{1,170}	52,813	(10,563)	[2,535]	{1,268}	57,206	(11,441)	[2,746]	{1,373}
Charlotte	1,431	1,470	1,500	1,560	1,660	(332)	[80]	{40}	1,769	(354)	[85]	{42}	1,888	(378)	[91]	{45}
Collier	7,815	7,934	8,076	8,401	8,881	(1,776)	[426]	{213}	9,390	(1,878)	[451]	{225}	9,931	(1,986)	[477]	{238}
Duval	16,546	17,245	17,544	18,357	19,441	(3,888)	[933]	{467}	20,562	(4,112)	[987]	{493}	21,718	(4,344)	[1,042]	{521}
Hillsborough	23,706	24,135	24,550	25,432	26,588	(5,318)	[1,276]	{638}	27,740	(5,548)	[1,332]	{666}	28,891	(5,778)	[1,387]	{693}
Lake	3,343	3,391	3,473	3,757	4,013	(803)	[193]	{96}	4,285	(857)	[206]	{103}	4,575	(915)	[220]	{110}
Lee	12,711	12,906	13,125	13,768	14,509	(2,902)	[696]	{348}	15,285	(3,057)	[734]	{367}	16,097	(3,219)	[773]	{386}
Manatee	6,569	6,738	6,871	7,252	7,757	(1,551)	[372]	{186}	8,302	(1,660)	[398]	{199}	8,890	(1,778)	[427]	{213}
Miami-Dade	84,238	87,035	89,557	95,068	102,595	(20,519)	[4,925]	{2,462}	110,826	(22,165)	[5,320]	{2,660}	119,819	(23,964)	[5,751]	{2,876}
Okaloosa	1,813	1,973	2,062	2,134	2,361	(472)	[113]	{57}	2,618	(524)	[126]	{63}	2,910	(582)	[140]	{70}
Orange	23,259	23,584	24,011	25,254	26,704	(5,341)	[1,282]	{641}	28,222	(5,644)	[1,355]	{677}	29,813	(5,963)	[1,431]	{716}
Osceola	6,010	6,268	6,479	6,844	7,489	(1,498)	[359]	{180}	8,199	(1,640)	[394]	{197}	8,983	(1,797)	[431]	{216}
Palm Beach	25,785	26,426	26,951	28,267	30,025	(6,005)	[1,441]	{721}	31,924	(6,385)	[1,532]	{766}	33,976	(6,795)	[1,631]	{815}
Pasco	4,943	5,050	5,161	5,363	5,652	(1,130)	[271]	{136}	5,946	(1,189)	[285]	{143}	6,246	(1,249)	[300]	{150}
Pinellas	13,482	13,705	13,925	14,371	14,984	(2,997)	[719]	{360}	15,597	(3,119)	[749]	{374}	16,208	(3,242)	[778]	{389}
Polk	9,524	9,877	10,072	10,545	11,236	(2,247)	[539]	{270}	11,959	(2,392)	[574]	{287}	12,716	(2,543)	[610]	{305}
Sarasota	4,245	4,338	4,432	4,644	5,044	(1,009)	[242]	{121}	5,489	(1,098)	[263]	{132}	5,983	(1,197)	[287]	{144}
Seminole	5,329	5,411	5,519	5,736	6,019	(1,204)	[289]	{144}	6,309	(1,262)	[303]	{151}	6,608	(1,322)	[317]	{159}
St. Johns	2,431	2,541	2,612	2,708	2,890	(578)	[139]	{69}	3,082	(616)	[148]	{74}	3,287	(657)	[158]	{79}
Sumter	827	843	859	902	952	(190)	[46]	{23}	1,006	(201)	[48]	{24}	1,065	(213)	[51]	{26}
Volusia	5,188	5,297	5,530	5,803	6,280	(1,256)	[301]	{151}	6,801	(1,360)	[326]	{163}	7,371	(1,474)	[354]	{177}

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.