

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

Date: 8/7/20

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 8/7/20 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.**

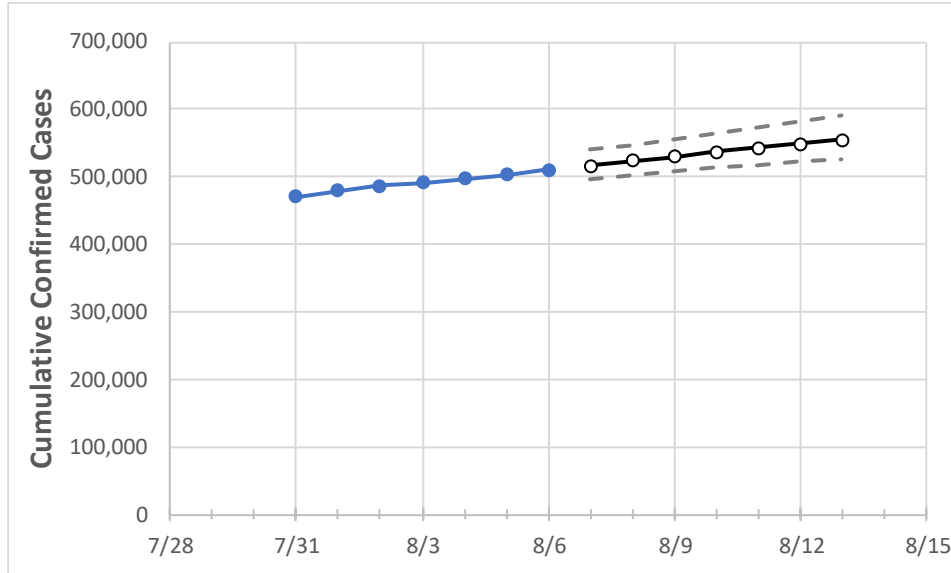
### IEM's Modeling Lead

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:						
	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13
Florida	491,855	497,292	502,715	510,389	517,141	523,742	530,195	536,506	542,675	548,708	554,605

*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:						
	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13
Alachua	3,749	3,808	3,862	3,952	4,020	4,089	4,158	4,228	4,298	4,369	4,441
Broward	58,531	58,953	59,354	60,058	60,778	61,477	62,156	62,816	63,457	64,080	64,685
Charlotte	2,062	2,076	2,104	2,144	2,179	2,215	2,250	2,286	2,323	2,359	2,396
Collier	9,811	9,897	10,050	10,118	10,202	10,283	10,362	10,440	10,515	10,588	10,660
Duval	21,830	22,034	22,215	22,568	22,768	22,962	23,150	23,332	23,509	23,681	23,847
Hillsborough	30,450	30,798	31,197	31,563	31,904	32,240	32,569	32,893	33,210	33,522	33,828
Lake	4,708	4,769	4,794	4,840	4,892	4,943	4,992	5,041	5,089	5,135	5,181
Lee	15,799	15,874	15,961	16,090	16,194	16,293	16,389	16,481	16,569	16,654	16,735
Manatee	8,825	8,887	8,938	9,050	9,130	9,208	9,284	9,356	9,427	9,495	9,560
Miami-Dade	123,644	124,759	125,949	127,677	129,313	130,920	132,501	134,054	135,581	137,081	138,556
Okaloosa	3,031	3,106	3,160	3,292	3,376	3,462	3,550	3,640	3,732	3,827	3,924
Orange	29,927	30,140	30,425	30,776	31,040	31,296	31,545	31,787	32,023	32,251	32,473
Osceola	8,894	9,018	9,156	9,286	9,414	9,539	9,663	9,785	9,906	10,025	10,142
Palm Beach	34,550	34,929	35,283	35,737	36,159	36,577	36,991	37,401	37,807	38,208	38,606
Pasco	6,548	6,636	6,708	6,802	6,874	6,945	7,014	7,081	7,147	7,212	7,275
Pinellas	16,886	17,047	17,202	17,358	17,512	17,662	17,809	17,952	18,092	18,228	18,362
Polk	13,137	13,231	13,419	13,654	13,816	13,975	14,131	14,285	14,436	14,584	14,730
Sarasota	5,814	5,854	5,940	6,025	6,092	6,157	6,221	6,283	6,344	6,404	6,462
Seminole	6,687	6,760	6,826	6,932	6,993	7,053	7,111	7,168	7,224	7,278	7,331
St. Johns	3,362	3,422	3,450	3,512	3,554	3,595	3,636	3,676	3,716	3,755	3,794
Sumter	1,142	1,163	1,180	1,208	1,225	1,243	1,261	1,278	1,296	1,314	1,332
Volusia	7,194	7,288	7,372	7,488	7,581	7,673	7,763	7,852	7,940	8,026	8,111

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:											
	8/3	8/4	8/5	8/6	8/8		8/10		8/12							
Alachua	3,749	3,808	3,862	3,952	4,089	(818)	[196]	{98}	4,228	(846)	[203]	{101}	4,369	(874)	[210]	{105}
Broward	58,531	58,953	59,354	60,058	61,477	(12,295)	[2,951]	{1,475}	62,816	(12,563)	[3,015]	{1,508}	64,080	(12,816)	[3,076]	{1,538}
Charlotte	2,062	2,076	2,104	2,144	2,215	(443)	[106]	{53}	2,286	(457)	[110]	{55}	2,359	(472)	[113]	{57}
Collier	9,811	9,897	10,050	10,118	10,283	(2,057)	[494]	{247}	10,440	(2,088)	[501]	{251}	10,588	(2,118)	[508]	{254}
Duval	21,830	22,034	22,215	22,568	22,962	(4,592)	[1,102]	{551}	23,332	(4,666)	[1,120]	{560}	23,681	(4,736)	[1,137]	{568}
Hillsborough	30,450	30,798	31,197	31,563	32,240	(6,448)	[1,548]	{774}	32,893	(6,579)	[1,579]	{789}	33,522	(6,704)	[1,609]	{805}
Lake	4,708	4,769	4,794	4,840	4,943	(989)	[237]	{119}	5,041	(1,008)	[242]	{121}	5,135	(1,027)	[246]	{123}
Lee	15,799	15,874	15,961	16,090	16,293	(3,259)	[782]	{391}	16,481	(3,296)	[791]	{396}	16,654	(3,331)	[799]	{400}
Manatee	8,825	8,887	8,938	9,050	9,208	(1,842)	[442]	{221}	9,356	(1,871)	[449]	{225}	9,495	(1,899)	[456]	{228}
Miami-Dade	123,644	124,759	125,949	127,677	130,920	(26,184)	[6,284]	{3,142}	134,054	(26,811)	[6,435]	{3,217}	137,081	(27,416)	[6,580]	{3,290}
Okaloosa	3,031	3,106	3,160	3,292	3,462	(692)	[166]	{83}	3,640	(728)	[175]	{87}	3,827	(765)	[184]	{92}
Orange	29,927	30,140	30,425	30,776	31,296	(6,259)	[1,502]	{751}	31,787	(6,357)	[1,526]	{763}	32,251	(6,450)	[1,548]	{774}
Osceola	8,894	9,018	9,156	9,286	9,539	(1,908)	[458]	{229}	9,785	(1,957)	[470]	{235}	10,025	(2,005)	[481]	{241}
Palm Beach	34,550	34,929	35,283	35,737	36,577	(7,315)	[1,756]	{878}	37,401	(7,480)	[1,795]	{898}	38,208	(7,642)	[1,834]	{917}
Pasco	6,548	6,636	6,708	6,802	6,945	(1,389)	[333]	{167}	7,081	(1,416)	[340]	{170}	7,212	(1,442)	[346]	{173}
Pinellas	16,886	17,047	17,202	17,358	17,662	(3,532)	[848]	{424}	17,952	(3,590)	[862]	{431}	18,228	(3,646)	[875]	{437}
Polk	13,137	13,231	13,419	13,654	13,975	(2,795)	[671]	{335}	14,285	(2,857)	[686]	{343}	14,584	(2,917)	[700]	{350}
Sarasota	5,814	5,854	5,940	6,025	6,157	(1,231)	[296]	{148}	6,283	(1,257)	[302]	{151}	6,404	(1,281)	[307]	{154}
Seminole	6,687	6,760	6,826	6,932	7,053	(1,411)	[339]	{169}	7,168	(1,434)	[344]	{172}	7,278	(1,456)	[349]	{175}
St. Johns	3,362	3,422	3,450	3,512	3,595	(719)	[173]	{86}	3,676	(735)	[176]	{88}	3,755	(751)	[180]	{90}
Sumter	1,142	1,163	1,180	1,208	1,243	(249)	[60]	{30}	1,278	(256)	[61]	{31}	1,314	(263)	[63]	{32}
Volusia	7,194	7,288	7,372	7,488	7,673	(1,535)	[368]	{184}	7,852	(1,570)	[377]	{188}	8,026	(1,605)	[385]	{193}

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.