

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

Date: 8/3/20

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 8/3/20 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.

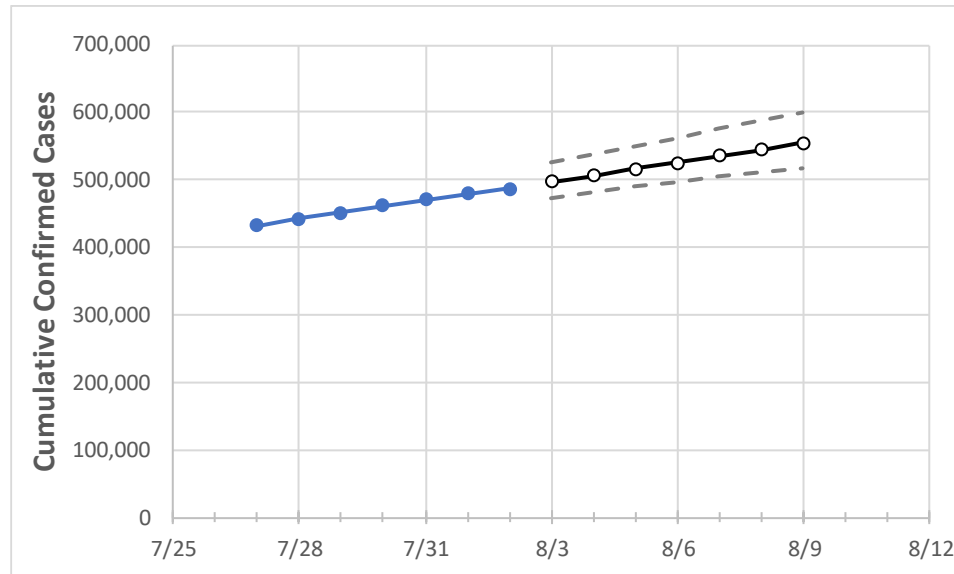
IEM's Modeling Lead

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:						
	7/30	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9
Florida	461,379	470,386	480,027	487,132	496,760	506,377	515,985	525,583	535,171	544,749	554,316

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:						
	7/30	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9
Alachua	3,448	3,526	3,590	3,662	3,736	3,811	3,888	3,965	4,043	4,123	4,204
Broward	54,312	55,411	56,797	57,975	59,368	60,777	62,201	63,641	65,096	66,568	68,055
Charlotte	1,889	1,946	1,984	2,024	2,070	2,117	2,166	2,216	2,268	2,322	2,377
Collier	9,355	9,581	9,662	9,734	9,853	9,972	10,090	10,207	10,323	10,439	10,554
Duval	20,816	21,038	21,322	21,665	21,952	22,235	22,515	22,793	23,066	23,337	23,605
Hillsborough	28,742	29,116	29,589	30,118	30,524	30,925	31,323	31,716	32,106	32,492	32,873
Lake	4,408	4,516	4,612	4,661	4,747	4,833	4,919	5,006	5,094	5,182	5,270
Lee	15,137	15,416	15,551	15,674	15,844	16,011	16,176	16,339	16,500	16,658	16,813
Manatee	8,337	8,517	8,655	8,733	8,873	9,013	9,153	9,294	9,434	9,575	9,715
Miami-Dade	115,916	118,462	121,207	122,690	125,481	128,314	131,191	134,110	137,071	140,075	143,122
Okaloosa	2,704	2,765	2,850	2,931	3,018	3,109	3,202	3,298	3,398	3,500	3,606
Orange	28,591	29,011	29,466	29,699	30,096	30,492	30,886	31,278	31,669	32,057	32,444
Osceola	8,281	8,470	8,649	8,782	8,978	9,177	9,379	9,583	9,790	10,000	10,212
Palm Beach	32,696	33,274	33,854	34,226	34,827	35,435	36,049	36,670	37,297	37,930	38,570
Pasco	6,201	6,299	6,394	6,479	6,578	6,675	6,773	6,869	6,965	7,060	7,155
Pinellas	16,114	16,356	16,604	16,774	16,981	17,187	17,391	17,593	17,793	17,991	18,187
Polk	12,281	12,488	12,735	12,991	13,224	13,457	13,692	13,927	14,163	14,400	14,638
Sarasota	5,443	5,588	5,672	5,724	5,822	5,920	6,018	6,117	6,217	6,317	6,418
Seminole	6,419	6,487	6,566	6,639	6,718	6,796	6,874	6,950	7,026	7,100	7,174
St. Johns	3,168	3,216	3,264	3,323	3,380	3,437	3,495	3,553	3,611	3,669	3,728
Sumter	1,058	1,077	1,091	1,131	1,152	1,173	1,194	1,216	1,238	1,261	1,284
Volusia	6,707	6,834	6,959	7,097	7,224	7,352	7,480	7,609	7,738	7,868	7,998

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:											
	7/30	7/31	8/1	8/2	8/4				8/6				8/8			
Alachua	3,448	3,526	3,590	3,662	3,811	(762)	[183]	{91}	3,965	(793)	[190]	{95}	4,123	(825)	[198]	{99}
Broward	54,312	55,411	56,797	57,975	60,777	(12,155)	[2,917]	{1,459}	63,641	(12,728)	[3,055]	{1,527}	66,568	(13,314)	[3,195]	{1,598}
Charlotte	1,889	1,946	1,984	2,024	2,117	(423)	[102]	{51}	2,216	(443)	[106]	{53}	2,322	(464)	[111]	{56}
Collier	9,355	9,581	9,662	9,734	9,972	(1,994)	[479]	{239}	10,207	(2,041)	[490]	{245}	10,439	(2,088)	[501]	{251}
Duval	20,816	21,038	21,322	21,665	22,235	(4,447)	[1,067]	{534}	22,793	(4,559)	[1,094]	{547}	23,337	(4,667)	[1,120]	{560}
Hillsborough	28,742	29,116	29,589	30,118	30,925	(6,185)	[1,484]	{742}	31,716	(6,343)	[1,522]	{761}	32,492	(6,498)	[1,560]	{780}
Lake	4,408	4,516	4,612	4,661	4,833	(967)	[232]	{116}	5,006	(1,001)	[240]	{120}	5,182	(1,036)	[249]	{124}
Lee	15,137	15,416	15,551	15,674	16,011	(3,202)	[769]	{384}	16,339	(3,268)	[784]	{392}	16,658	(3,332)	[800]	{400}
Manatee	8,337	8,517	8,655	8,733	9,013	(1,803)	[433]	{216}	9,294	(1,859)	[446]	{223}	9,575	(1,915)	[460]	{230}
Miami-Dade	115,916	118,462	121,207	122,690	128,314	(25,663)	[6,159]	{3,080}	134,110	(26,822)	[6,437]	{3,219}	140,075	(28,015)	[6,724]	{3,362}
Okaloosa	2,704	2,765	2,850	2,931	3,109	(622)	[149]	{75}	3,298	(660)	[158]	{79}	3,500	(700)	[168]	{84}
Orange	28,591	29,011	29,466	29,699	30,492	(6,098)	[1,464]	{732}	31,278	(6,256)	[1,501]	{751}	32,057	(6,411)	[1,539]	{769}
Osceola	8,281	8,470	8,649	8,782	9,177	(1,835)	[441]	{220}	9,583	(1,917)	[460]	{230}	10,000	(2,000)	[480]	{240}
Palm Beach	32,696	33,274	33,854	34,226	35,435	(7,087)	[1,701]	{850}	36,670	(7,334)	[1,760]	{880}	37,930	(7,586)	[1,821]	{910}
Pasco	6,201	6,299	6,394	6,479	6,675	(1,335)	[320]	{160}	6,869	(1,374)	[330]	{165}	7,060	(1,412)	[339]	{169}
Pinellas	16,114	16,356	16,604	16,774	17,187	(3,437)	[825]	{412}	17,593	(3,519)	[844]	{422}	17,991	(3,598)	[864]	{432}
Polk	12,281	12,488	12,735	12,991	13,457	(2,691)	[646]	{323}	13,927	(2,785)	[668]	{334}	14,400	(2,880)	[691]	{346}
Sarasota	5,443	5,588	5,672	5,724	5,920	(1,184)	[284]	{142}	6,117	(1,223)	[294]	{147}	6,317	(1,263)	[303]	{152}
Seminole	6,419	6,487	6,566	6,639	6,796	(1,359)	[326]	{163}	6,950	(1,390)	[334]	{167}	7,100	(1,420)	[341]	{170}
St. Johns	3,168	3,216	3,264	3,323	3,437	(687)	[165]	{82}	3,553	(711)	[171]	{85}	3,669	(734)	[176]	{88}
Sumter	1,058	1,077	1,091	1,131	1,173	(235)	[56]	{28}	1,216	(243)	[58]	{29}	1,261	(252)	[61]	{30}
Volusia	6,707	6,834	6,959	7,097	7,352	(1,470)	[353]	{176}	7,609	(1,522)	[365]	{183}	7,868	(1,574)	[378]	{189}

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.