

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/16/20**

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 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 10/16/20 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.

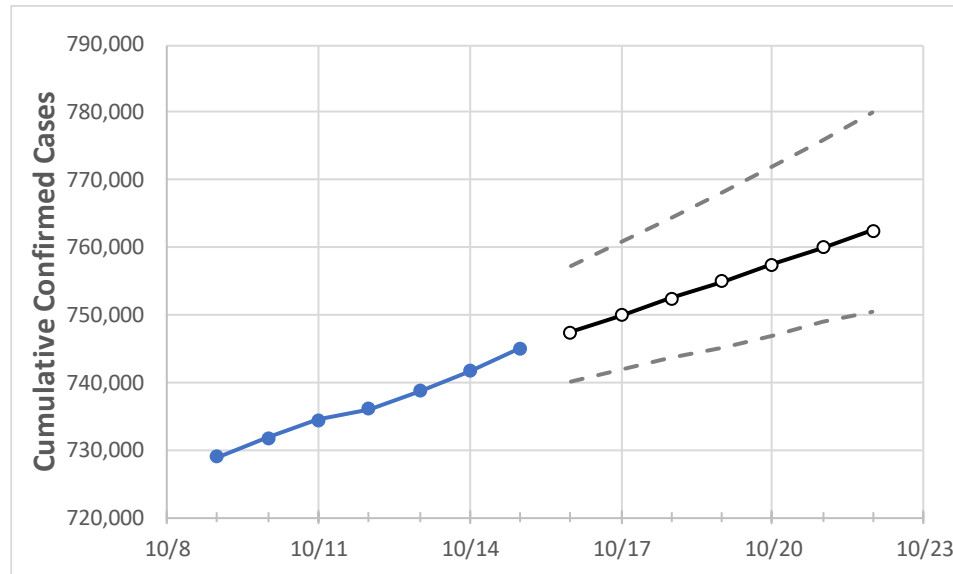
IEM's Modeling Lead

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:						
	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21	10/22
Florida	736,024	738,749	741,632	744,988	747,441	749,908	752,391	754,888	757,401	759,929	762,473

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:						
	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21	10/22
Alachua	8,985	9,055	9,133	9,190	9,233	9,276	9,317	9,358	9,398	9,436	9,474
Broward	79,434	79,611	79,876	80,112	80,306	80,503	80,703	80,907	81,114	81,324	81,538
Charlotte	3,253	3,265	3,287	3,316	3,330	3,345	3,359	3,374	3,389	3,405	3,421
Collier	13,262	13,330	13,382	13,432	13,480	13,529	13,579	13,630	13,684	13,738	13,794
Duval	32,027	32,138	32,311	32,489	32,617	32,747	32,878	33,010	33,143	33,278	33,414
Hillsborough	44,256	44,460	44,652	44,811	44,983	45,157	45,331	45,507	45,684	45,863	46,043
Lake	7,939	7,973	8,012	8,047	8,081	8,114	8,149	8,183	8,218	8,254	8,289
Lee	21,363	21,438	21,489	21,613	21,683	21,755	21,828	21,902	21,977	22,054	22,132
Manatee	12,173	12,228	12,270	12,304	12,352	12,401	12,450	12,500	12,550	12,601	12,653
Miami-Dade	175,397	175,837	176,271	176,809	177,249	177,695	178,148	178,608	179,075	179,549	180,031
Okaloosa	5,411	5,451	5,491	5,645	5,685	5,726	5,768	5,812	5,857	5,904	5,952
Orange	42,219	42,401	42,572	42,778	42,950	43,126	43,304	43,486	43,671	43,859	44,051
Osceola	13,150	13,208	13,250	13,313	13,364	13,416	13,467	13,520	13,572	13,625	13,679
Palm Beach	48,004	48,176	48,337	48,496	48,620	48,745	48,871	48,997	49,125	49,253	49,382
Pasco	9,871	9,919	9,989	10,054	10,104	10,155	10,207	10,260	10,313	10,368	10,423
Pinellas	23,215	23,367	23,510	23,623	23,720	23,820	23,921	24,025	24,130	24,238	24,348
Polk	21,157	21,280	21,354	21,456	21,544	21,632	21,720	21,807	21,895	21,983	22,070
Sarasota	8,684	8,736	8,786	8,841	8,894	8,949	9,005	9,064	9,125	9,188	9,254
Seminole	9,459	9,499	9,524	9,561	9,590	9,618	9,647	9,676	9,705	9,734	9,763
St. Johns	5,726	5,756	5,814	5,862	5,891	5,920	5,950	5,980	6,010	6,040	6,071
Sumter	2,648	2,674	2,700	2,716	2,736	2,756	2,777	2,799	2,821	2,845	2,869
Volusia	11,532	11,582	11,649	11,739	11,802	11,867	11,934	12,002	12,073	12,146	12,220

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:											
	10/12	10/13	10/14	10/15	10/17				10/19				10/21			
Alachua	8,985	9,055	9,133	9,190	9,276	(1,855)	[445]	{223}	9,358	(1,872)	[449]	{225}	9,436	(1,887)	[453]	{226}
Broward	79,434	79,611	79,876	80,112	80,503	(16,101)	[3,864]	{1,932}	80,907	(16,181)	[3,884]	{1,942}	81,324	(16,265)	[3,904]	{1,952}
Charlotte	3,253	3,265	3,287	3,316	3,345	(669)	[161]	{80}	3,374	(675)	[162]	{81}	3,405	(681)	[163]	{82}
Collier	13,262	13,330	13,382	13,432	13,529	(2,706)	[649]	{325}	13,630	(2,726)	[654]	{327}	13,738	(2,748)	[659]	{330}
Duval	32,027	32,138	32,311	32,489	32,747	(6,549)	[1,572]	{786}	33,010	(6,602)	[1,584]	{792}	33,278	(6,656)	[1,597]	{799}
Hillsborough	44,256	44,460	44,652	44,811	45,157	(9,031)	[2,168]	{1,084}	45,507	(9,101)	[2,184]	{1,092}	45,863	(9,173)	[2,201]	{1,101}
Lake	7,939	7,973	8,012	8,047	8,114	(1,623)	[389]	{195}	8,183	(1,637)	[393]	{196}	8,254	(1,651)	[396]	{198}
Lee	21,363	21,438	21,489	21,613	21,755	(4,351)	[1,044]	{522}	21,902	(4,380)	[1,051]	{526}	22,054	(4,411)	[1,059]	{529}
Manatee	12,173	12,228	12,270	12,304	12,401	(2,480)	[595]	{298}	12,500	(2,500)	[600]	{300}	12,601	(2,520)	[605]	{302}
Miami-Dade	175,397	175,837	176,271	176,809	177,695	(35,539)	[8,529]	{4,265}	178,608	(35,722)	[8,573]	{4,287}	179,549	(35,910)	[8,618]	{4,309}
Okaloosa	5,411	5,451	5,491	5,645	5,726	(1,145)	[275]	{137}	5,812	(1,162)	[279]	{139}	5,904	(1,181)	[283]	{142}
Orange	42,219	42,401	42,572	42,778	43,126	(8,625)	[2,070]	{1,035}	43,486	(8,697)	[2,087]	{1,044}	43,859	(8,772)	[2,105]	{1,053}
Osceola	13,150	13,208	13,250	13,313	13,416	(2,683)	[644]	{322}	13,520	(2,704)	[649]	{324}	13,625	(2,725)	[654]	{327}
Palm Beach	48,004	48,176	48,337	48,496	48,745	(9,749)	[2,340]	{1,170}	48,997	(9,799)	[2,352]	{1,176}	49,253	(9,851)	[2,364]	{1,182}
Pasco	9,871	9,919	9,989	10,054	10,155	(2,031)	[487]	{244}	10,260	(2,052)	[492]	{246}	10,368	(2,074)	[498]	{249}
Pinellas	23,215	23,367	23,510	23,623	23,820	(4,764)	[1,143]	{572}	24,025	(4,805)	[1,153]	{577}	24,238	(4,848)	[1,163]	{582}
Polk	21,157	21,280	21,354	21,456	21,632	(4,326)	[1,038]	{519}	21,807	(4,361)	[1,047]	{523}	21,983	(4,397)	[1,055]	{528}
Sarasota	8,684	8,736	8,786	8,841	8,949	(1,790)	[430]	{215}	9,064	(1,813)	[435]	{218}	9,188	(1,838)	[441]	{221}
Seminole	9,459	9,499	9,524	9,561	9,618	(1,924)	[462]	{231}	9,676	(1,935)	[464]	{232}	9,734	(1,947)	[467]	{234}
St. Johns	5,726	5,756	5,814	5,862	5,920	(1,184)	[284]	{142}	5,980	(1,196)	[287]	{144}	6,040	(1,208)	[290]	{145}
Sumter	2,648	2,674	2,700	2,716	2,756	(551)	[132]	{66}	2,799	(560)	[134]	{67}	2,845	(569)	[137]	{68}
Volusia	11,532	11,582	11,649	11,739	11,867	(2,373)	[570]	{285}	12,002	(2,400)	[576]	{288}	12,146	(2,429)	[583]	{291}

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.