

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/21/20**

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 10/21/20 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.

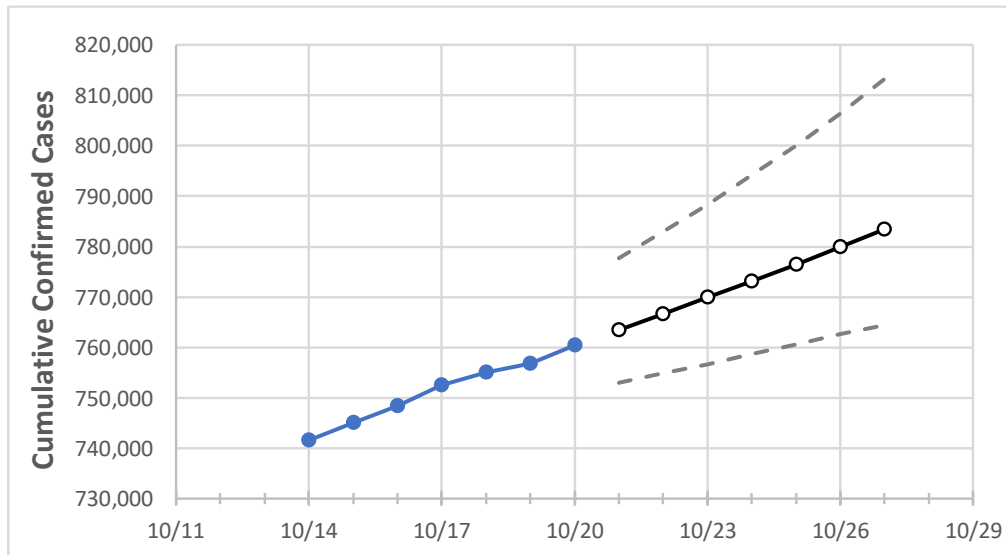
IEM's Modeling Lead

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:						
	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27
Florida	752,481	755,020	756,727	760,389	763,486	766,643	769,861	773,143	776,489	779,900	783,377

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:						
	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27
Alachua	9,412	9,452	9,496	9,575	9,646	9,718	9,791	9,865	9,940	10,016	10,094
Broward	80,820	81,107	81,277	81,537	81,836	82,147	82,470	82,806	83,155	83,517	83,893
Charlotte	3,349	3,363	3,368	3,388	3,403	3,418	3,434	3,449	3,465	3,482	3,498
Collier	13,588	13,621	13,653	13,716	13,777	13,840	13,905	13,972	14,042	14,113	14,188
Duval	32,772	32,887	32,951	33,132	33,265	33,399	33,534	33,670	33,808	33,946	34,086
Hillsborough	45,275	45,455	45,538	45,798	45,988	46,179	46,373	46,570	46,768	46,969	47,172
Lake	8,130	8,168	8,195	8,240	8,279	8,319	8,360	8,401	8,444	8,487	8,531
Lee	21,883	21,962	22,023	22,117	22,215	22,316	22,420	22,527	22,637	22,751	22,868
Manatee	12,488	12,538	12,584	12,648	12,710	12,774	12,839	12,906	12,974	13,045	13,116
Miami-Dade	177,893	178,354	178,726	179,286	179,831	180,391	180,965	181,553	182,157	182,777	183,412
Okaloosa	5,756	5,793	5,820	5,860	5,912	5,966	6,022	6,080	6,141	6,204	6,269
Orange	43,302	43,453	43,621	43,943	44,175	44,414	44,661	44,916	45,179	45,450	45,730
Osceola	13,436	13,474	13,501	13,560	13,609	13,658	13,708	13,757	13,806	13,856	13,905
Palm Beach	48,870	49,011	49,068	49,298	49,438	49,581	49,726	49,873	50,022	50,174	50,328
Pasco	10,169	10,216	10,238	10,294	10,348	10,403	10,458	10,514	10,572	10,630	10,689
Pinellas	23,982	24,099	24,169	24,327	24,482	24,643	24,811	24,987	25,170	25,361	25,561
Polk	21,713	21,780	21,837	21,981	22,076	22,171	22,267	22,363	22,460	22,557	22,655
Sarasota	8,969	9,020	9,057	9,115	9,175	9,236	9,299	9,363	9,430	9,499	9,569
Seminole	9,674	9,711	9,737	9,802	9,845	9,889	9,935	9,982	10,030	10,080	10,131
St. Johns	5,944	5,979	5,990	6,038	6,074	6,111	6,148	6,186	6,225	6,265	6,306
Sumter	2,742	2,756	2,754	2,771	2,785	2,800	2,815	2,829	2,844	2,859	2,874
Volusia	11,903	11,943	11,976	12,038	12,103	12,169	12,237	12,306	12,377	12,449	12,523

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:											
	10/17	10/18	10/19	10/20	10/22				10/24				10/26			
Alachua	9,412	9,452	9,496	9,575	9,718	(1,944)	[466]	{233}	9,865	(1,973)	[474]	{237}	10,016	(2,003)	[481]	{240}
Broward	80,820	81,107	81,277	81,537	82,147	(16,429)	[3,943]	{1,972}	82,806	(16,561)	[3,975]	{1,987}	83,517	(16,703)	[4,009]	{2,004}
Charlotte	3,349	3,363	3,368	3,388	3,418	(684)	[164]	{82}	3,449	(690)	[166]	{83}	3,482	(696)	[167]	{84}
Collier	13,588	13,621	13,653	13,716	13,840	(2,768)	[664]	{332}	13,972	(2,794)	[671]	{335}	14,113	(2,823)	[677]	{339}
Duval	32,772	32,887	32,951	33,132	33,399	(6,680)	[1,603]	{802}	33,670	(6,734)	[1,616]	{808}	33,946	(6,789)	[1,629]	{815}
Hillsborough	45,275	45,455	45,538	45,798	46,179	(9,236)	[2,217]	{1,108}	46,570	(9,314)	[2,235]	{1,118}	46,969	(9,394)	[2,255]	{1,127}
Lake	8,130	8,168	8,195	8,240	8,319	(1,664)	[399]	{200}	8,401	(1,680)	[403]	{202}	8,487	(1,697)	[407]	{204}
Lee	21,883	21,962	22,023	22,117	22,316	(4,463)	[1,071]	{536}	22,527	(4,505)	[1,081]	{541}	22,751	(4,550)	[1,092]	{546}
Manatee	12,488	12,538	12,584	12,648	12,774	(2,555)	[613]	{307}	12,906	(2,581)	[619]	{310}	13,045	(2,609)	[626]	{313}
Miami-Dade	177,893	178,354	178,726	179,286	180,391	(36,078)	[8,659]	{4,329}	181,553	(36,311)	[8,715]	{4,357}	182,777	(36,555)	[8,773]	{4,387}
Okaloosa	5,756	5,793	5,820	5,860	5,966	(1,193)	[286]	{143}	6,080	(1,216)	[292]	{146}	6,204	(1,241)	[298]	{149}
Orange	43,302	43,453	43,621	43,943	44,414	(8,883)	[2,132]	{1,066}	44,916	(8,983)	[2,156]	{1,078}	45,450	(9,090)	[2,182]	{1,091}
Osceola	13,436	13,474	13,501	13,560	13,658	(2,732)	[656]	{328}	13,757	(2,751)	[660]	{330}	13,856	(2,771)	[665]	{333}
Palm Beach	48,870	49,011	49,068	49,298	49,581	(9,916)	[2,380]	{1,190}	49,873	(9,975)	[2,394]	{1,197}	50,174	(10,035)	[2,408]	{1,204}
Pasco	10,169	10,216	10,238	10,294	10,403	(2,081)	[499]	{250}	10,514	(2,103)	[505]	{252}	10,630	(2,126)	[510]	{255}
Pinellas	23,982	24,099	24,169	24,327	24,643	(4,929)	[1,183]	{591}	24,987	(4,997)	[1,199]	{600}	25,361	(5,072)	[1,217]	{609}
Polk	21,713	21,780	21,837	21,981	22,171	(4,434)	[1,064]	{532}	22,363	(4,473)	[1,073]	{537}	22,557	(4,511)	[1,083]	{541}
Sarasota	8,969	9,020	9,057	9,115	9,236	(1,847)	[443]	{222}	9,363	(1,873)	[449]	{225}	9,499	(1,900)	[456]	{228}
Seminole	9,674	9,711	9,737	9,802	9,889	(1,978)	[475]	{237}	9,982	(1,996)	[479]	{240}	10,080	(2,016)	[484]	{242}
St. Johns	5,944	5,979	5,990	6,038	6,111	(1,222)	[293]	{147}	6,186	(1,237)	[297]	{148}	6,265	(1,253)	[301]	{150}
Sumter	2,742	2,756	2,754	2,771	2,800	(560)	[134]	{67}	2,829	(566)	[136]	{68}	2,859	(572)	[137]	{69}
Volusia	11,903	11,943	11,976	12,038	12,169	(2,434)	[584]	{292}	12,306	(2,461)	[591]	{295}	12,449	(2,490)	[598]	{299}

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.