

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/7/20**

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

The projections shown in this document are based on data pulled in as of 10/7/20 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.

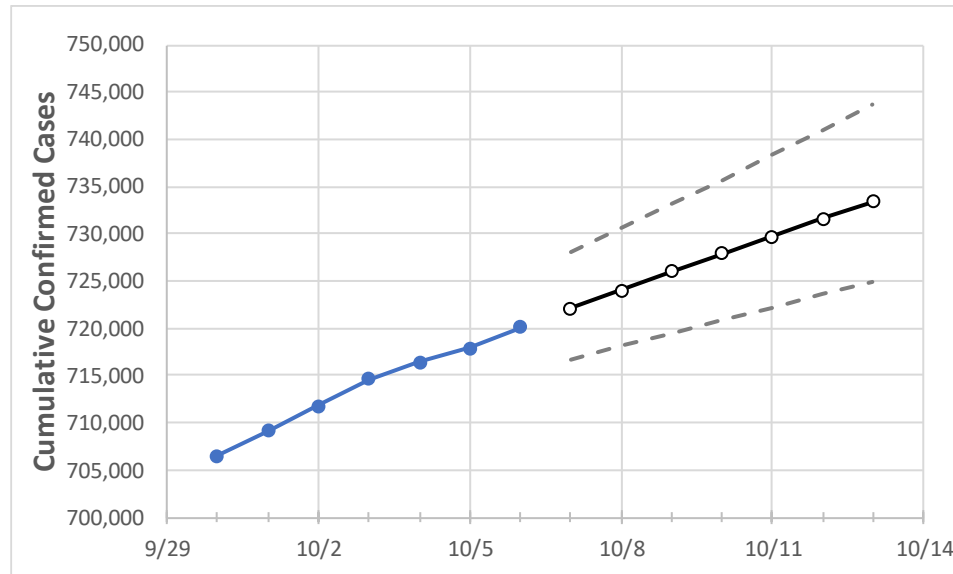
IEM's Modeling Lead

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:						
	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13
Florida	714,591	716,459	717,874	720,125	722,098	724,047	725,972	727,874	729,752	731,607	733,439

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:						
	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13
Alachua	8,494	8,548	8,570	8,619	8,662	8,702	8,741	8,778	8,814	8,848	8,880
Broward	77,762	77,934	78,012	78,136	78,258	78,378	78,496	78,613	78,728	78,842	78,954
Charlotte	3,136	3,149	3,152	3,159	3,169	3,180	3,190	3,200	3,210	3,220	3,230
Collier	12,862	12,909	12,920	12,961	12,988	13,015	13,043	13,070	13,096	13,123	13,150
Duval	30,914	30,985	31,056	31,195	31,299	31,402	31,505	31,607	31,708	31,809	31,909
Hillsborough	42,765	42,891	43,027	43,166	43,310	43,454	43,597	43,739	43,881	44,021	44,161
Lake	7,650	7,693	7,712	7,729	7,753	7,777	7,800	7,824	7,847	7,870	7,892
Lee	20,743	20,780	20,824	20,862	20,911	20,961	21,009	21,058	21,107	21,155	21,203
Manatee	11,732	11,766	11,785	11,848	11,888	11,929	11,970	12,012	12,054	12,096	12,139
Miami-Dade	171,876	172,205	172,398	172,849	173,155	173,458	173,760	174,059	174,356	174,651	174,944
Okaloosa	5,144	5,176	5,181	5,206	5,232	5,258	5,284	5,311	5,337	5,364	5,391
Orange	40,841	40,940	41,055	41,218	41,344	41,469	41,595	41,721	41,847	41,973	42,099
Osceola	12,727	12,760	12,798	12,846	12,890	12,934	12,978	13,023	13,067	13,112	13,156
Palm Beach	46,962	47,079	47,153	47,244	47,336	47,426	47,514	47,600	47,684	47,767	47,848
Pasco	9,444	9,476	9,499	9,538	9,576	9,614	9,652	9,689	9,726	9,762	9,798
Pinellas	22,441	22,509	22,548	22,603	22,664	22,725	22,785	22,844	22,903	22,961	23,019
Polk	20,354	20,425	20,500	20,587	20,669	20,751	20,832	20,913	20,994	21,074	21,153
Sarasota	8,329	8,343	8,376	8,407	8,432	8,457	8,482	8,507	8,532	8,557	8,582
Seminole	9,200	9,213	9,250	9,278	9,302	9,326	9,350	9,374	9,398	9,422	9,445
St. Johns	5,497	5,518	5,526	5,565	5,589	5,614	5,638	5,662	5,686	5,710	5,734
Sumter	2,438	2,446	2,458	2,481	2,499	2,518	2,537	2,557	2,579	2,601	2,624
Volusia	11,077	11,110	11,150	11,190	11,227	11,265	11,302	11,339	11,376	11,413	11,449

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:											
	10/3	10/4	10/5	10/6	10/8				10/10				10/12			
Alachua	8,494	8,548	8,570	8,619	8,702	(1,740)	[418]	{209}	8,778	(1,756)	[421]	{211}	8,848	(1,770)	[425]	{212}
Broward	77,762	77,934	78,012	78,136	78,378	(15,676)	[3,762]	{1,881}	78,613	(15,723)	[3,773]	{1,887}	78,842	(15,768)	[3,784]	{1,892}
Charlotte	3,136	3,149	3,152	3,159	3,180	(636)	[153]	{76}	3,200	(640)	[154]	{77}	3,220	(644)	[155]	{77}
Collier	12,862	12,909	12,920	12,961	13,015	(2,603)	[625]	{312}	13,070	(2,614)	[627]	{314}	13,123	(2,625)	[630]	{315}
Duval	30,914	30,985	31,056	31,195	31,402	(6,280)	[1,507]	{754}	31,607	(6,321)	[1,517]	{759}	31,809	(6,362)	[1,527]	{763}
Hillsborough	42,765	42,891	43,027	43,166	43,454	(8,691)	[2,086]	{1,043}	43,739	(8,748)	[2,099]	{1,050}	44,021	(8,804)	[2,113]	{1,057}
Lake	7,650	7,693	7,712	7,729	7,777	(1,555)	[373]	{187}	7,824	(1,565)	[376]	{188}	7,870	(1,574)	[378]	{189}
Lee	20,743	20,780	20,824	20,862	20,961	(4,192)	[1,006]	{503}	21,058	(4,212)	[1,011]	{505}	21,155	(4,231)	[1,015]	{508}
Manatee	11,732	11,766	11,785	11,848	11,929	(2,386)	[573]	{286}	12,012	(2,402)	[577]	{288}	12,096	(2,419)	[581]	{290}
Miami-Dade	171,876	172,205	172,398	172,849	173,458	(34,692)	[8,326]	{4,163}	174,059	(34,812)	[8,355]	{4,177}	174,651	(34,930)	[8,383]	{4,192}
Okaloosa	5,144	5,176	5,181	5,206	5,258	(1,052)	[252]	{126}	5,311	(1,062)	[255]	{127}	5,364	(1,073)	[257]	{129}
Orange	40,841	40,940	41,055	41,218	41,469	(8,294)	[1,991]	{995}	41,721	(8,344)	[2,003]	{1,001}	41,973	(8,395)	[2,015]	{1,007}
Osceola	12,727	12,760	12,798	12,846	12,934	(2,587)	[621]	{310}	13,023	(2,605)	[625]	{313}	13,112	(2,622)	[629]	{315}
Palm Beach	46,962	47,079	47,153	47,244	47,426	(9,485)	[2,276]	{1,138}	47,600	(9,520)	[2,285]	{1,142}	47,767	(9,553)	[2,293]	{1,146}
Pasco	9,444	9,476	9,499	9,538	9,614	(1,923)	[461]	{231}	9,689	(1,938)	[465]	{233}	9,762	(1,952)	[469]	{234}
Pinellas	22,441	22,509	22,548	22,603	22,725	(4,545)	[1,091]	{545}	22,844	(4,569)	[1,097]	{548}	22,961	(4,592)	[1,102]	{551}
Polk	20,354	20,425	20,500	20,587	20,751	(4,150)	[996]	{498}	20,913	(4,183)	[1,004]	{502}	21,074	(4,215)	[1,012]	{506}
Sarasota	8,329	8,343	8,376	8,407	8,457	(1,691)	[406]	{203}	8,507	(1,701)	[408]	{204}	8,557	(1,711)	[411]	{205}
Seminole	9,200	9,213	9,250	9,278	9,326	(1,865)	[448]	{224}	9,374	(1,875)	[450]	{225}	9,422	(1,884)	[452]	{226}
St. Johns	5,497	5,518	5,526	5,565	5,614	(1,123)	[269]	{135}	5,662	(1,132)	[272]	{136}	5,710	(1,142)	[274]	{137}
Sumter	2,438	2,446	2,458	2,481	2,518	(504)	[121]	{60}	2,557	(511)	[123]	{61}	2,601	(520)	[125]	{62}
Volusia	11,077	11,110	11,150	11,190	11,265	(2,253)	[541]	{270}	11,339	(2,268)	[544]	{272}	11,413	(2,283)	[548]	{274}

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.