

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/29/20**

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 9/29/20 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.

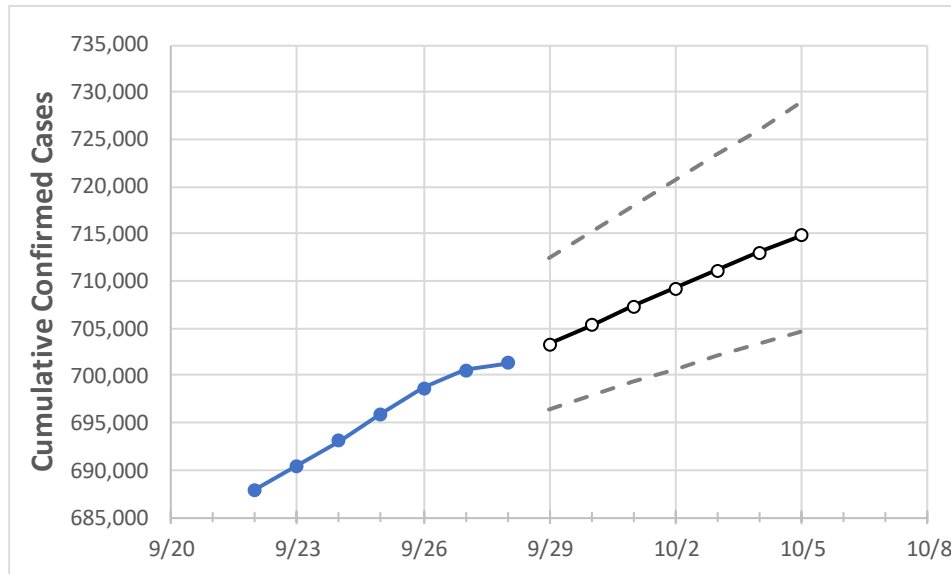
IEM's Modeling Lead

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:						
	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5
Florida	695,887	698,682	700,564	701,302	703,337	705,336	707,300	709,230	711,127	712,991	714,823

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:						
	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5
Alachua	7,960	8,060	8,109	8,164	8,231	8,308	8,390	8,473	8,550	8,637	8,720
Broward	76,520	76,700	76,854	76,874	76,991	77,104	77,215	77,322	77,427	77,529	77,628
Charlotte	3,013	3,030	3,039	3,046	3,055	3,065	3,074	3,083	3,092	3,101	3,110
Collier	12,617	12,656	12,681	12,692	12,718	12,744	12,770	12,795	12,820	12,845	12,869
Duval	29,965	30,114	30,207	30,264	30,371	30,476	30,580	30,684	30,785	30,886	30,986
Hillsborough	41,506	41,722	41,826	41,947	42,096	42,243	42,389	42,535	42,679	42,822	42,964
Lake	7,420	7,444	7,466	7,475	7,495	7,514	7,532	7,550	7,567	7,583	7,599
Lee	20,244	20,326	20,377	20,388	20,434	20,480	20,525	20,570	20,614	20,658	20,701
Manatee	11,393	11,436	11,458	11,486	11,523	11,559	11,596	11,633	11,670	11,707	11,744
Miami-Dade	168,775	169,144	169,426	169,466	169,705	169,935	170,157	170,371	170,577	170,776	170,967
Okaloosa	4,884	4,918	4,953	4,971	4,990	5,009	5,028	5,046	5,065	5,083	5,101
Orange	39,717	39,875	39,973	39,990	40,097	40,203	40,307	40,410	40,512	40,613	40,713
Osceola	12,354	12,395	12,438	12,455	12,496	12,536	12,577	12,617	12,657	12,697	12,737
Palm Beach	46,023	46,183	46,283	46,310	46,433	46,554	46,674	46,792	46,908	47,023	47,136
Pasco	9,101	9,162	9,204	9,233	9,282	9,331	9,381	9,432	9,484	9,537	9,591
Pinellas	21,845	21,964	22,004	22,049	22,116	22,181	22,247	22,311	22,375	22,439	22,502
Polk	19,647	19,765	19,849	19,888	19,973	20,057	20,141	20,223	20,305	20,386	20,466
Sarasota	8,065	8,107	8,142	8,147	8,174	8,201	8,228	8,255	8,282	8,309	8,336
Seminole	8,946	8,972	8,998	9,009	9,035	9,060	9,085	9,109	9,133	9,157	9,180
St. Johns	5,235	5,279	5,308	5,334	5,362	5,390	5,418	5,445	5,473	5,501	5,528
Sumter	2,210	2,217	2,222	2,228	2,233	2,238	2,243	2,248	2,253	2,258	2,262
Volusia	10,738	10,789	10,815	10,834	10,868	10,902	10,935	10,968	11,000	11,032	11,063

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:											
	9/25	9/26	9/27	9/28	9/30				10/2				10/4			
Alachua	7,960	8,060	8,109	8,164	8,308	(1,662)	[399]	{199}	8,473	(1,695)	[407]	{203}	8,637	(1,727)	[415]	{207}
Broward	76,520	76,700	76,854	76,874	77,104	(15,421)	[3,701]	{1,851}	77,322	(15,464)	[3,711]	{1,856}	77,529	(15,506)	[3,721]	{1,861}
Charlotte	3,013	3,030	3,039	3,046	3,065	(613)	[147]	{74}	3,083	(617)	[148]	{74}	3,101	(620)	[149]	{74}
Collier	12,617	12,656	12,681	12,692	12,744	(2,549)	[612]	{306}	12,795	(2,559)	[614]	{307}	12,845	(2,569)	[617]	{308}
Duval	29,965	30,114	30,207	30,264	30,476	(6,095)	[1,463]	{731}	30,684	(6,137)	[1,473]	{736}	30,886	(6,177)	[1,483]	{741}
Hillsborough	41,506	41,722	41,826	41,947	42,243	(8,449)	[2,028]	{1,014}	42,535	(8,507)	[2,042]	{1,021}	42,822	(8,564)	[2,055]	{1,028}
Lake	7,420	7,444	7,466	7,475	7,514	(1,503)	[361]	{180}	7,550	(1,510)	[362]	{181}	7,583	(1,517)	[364]	{182}
Lee	20,244	20,326	20,377	20,388	20,480	(4,096)	[983]	{492}	20,570	(4,114)	[987]	{494}	20,658	(4,132)	[992]	{496}
Manatee	11,393	11,436	11,458	11,486	11,559	(2,312)	[555]	{277}	11,633	(2,327)	[558]	{279}	11,707	(2,341)	[562]	{281}
Miami-Dade	168,775	169,144	169,426	169,466	169,935	(33,987)	[8,157]	{4,078}	170,371	(34,074)	[8,178]	{4,089}	170,776	(34,155)	[8,197]	{4,099}
Okaloosa	4,884	4,918	4,953	4,971	5,009	(1,002)	[240]	{120}	5,046	(1,009)	[242]	{121}	5,083	(1,017)	[244]	{122}
Orange	39,717	39,875	39,973	39,990	40,203	(8,041)	[1,930]	{965}	40,410	(8,082)	[1,940]	{970}	40,613	(8,123)	[1,949]	{975}
Osceola	12,354	12,395	12,438	12,455	12,536	(2,507)	[602]	{301}	12,617	(2,523)	[606]	{303}	12,697	(2,539)	[609]	{305}
Palm Beach	46,023	46,183	46,283	46,310	46,554	(9,311)	[2,235]	{1,117}	46,792	(9,358)	[2,246]	{1,123}	47,023	(9,405)	[2,257]	{1,129}
Pasco	9,101	9,162	9,204	9,233	9,331	(1,866)	[448]	{224}	9,432	(1,886)	[453]	{226}	9,537	(1,907)	[458]	{229}
Pinellas	21,845	21,964	22,004	22,049	22,181	(4,436)	[1,065]	{532}	22,311	(4,462)	[1,071]	{535}	22,439	(4,488)	[1,077]	{539}
Polk	19,647	19,765	19,849	19,888	20,057	(4,011)	[963]	{481}	20,223	(4,045)	[971]	{485}	20,386	(4,077)	[979]	{489}
Sarasota	8,065	8,107	8,142	8,147	8,201	(1,640)	[394]	{197}	8,255	(1,651)	[396]	{198}	8,309	(1,662)	[399]	{199}
Seminole	8,946	8,972	8,998	9,009	9,060	(1,812)	[435]	{217}	9,109	(1,822)	[437]	{219}	9,157	(1,831)	[440]	{220}
St. Johns	5,235	5,279	5,308	5,334	5,390	(1,078)	[259]	{129}	5,445	(1,089)	[261]	{131}	5,501	(1,100)	[264]	{132}
Sumter	2,210	2,217	2,222	2,228	2,238	(448)	[107]	{54}	2,248	(450)	[108]	{54}	2,258	(452)	[108]	{54}
Volusia	10,738	10,789	10,815	10,834	10,902	(2,180)	[523]	{262}	10,968	(2,194)	[526]	{263}	11,032	(2,206)	[530]	{265}

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.