

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

Date: 10/2/20

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 10/2/20 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.

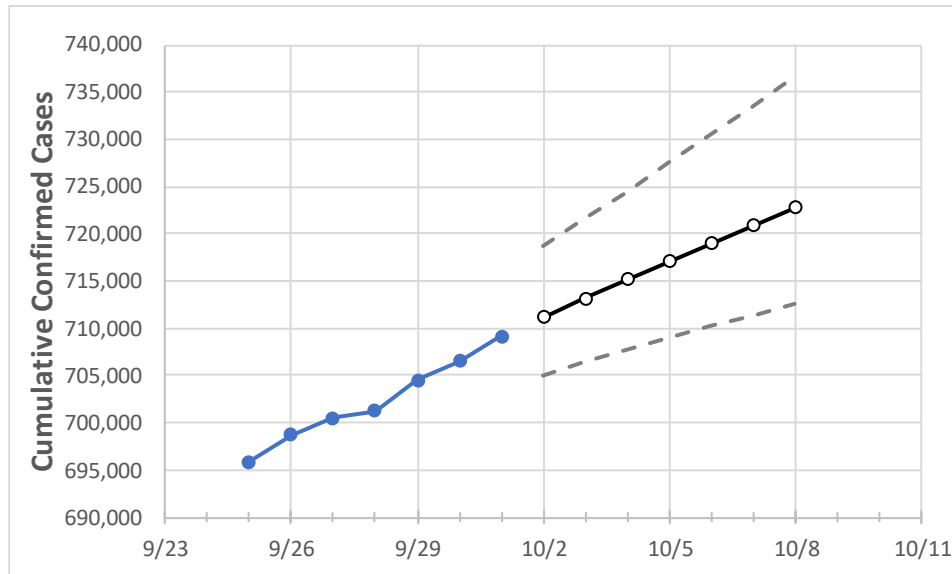
IEM's Modeling Lead

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:						
	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7	10/8
Florida	701,302	704,568	706,516	709,144	711,183	713,190	715,166	717,112	719,029	720,916	722,775

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:						
	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7	10/8
Alachua	8,164	8,230	8,293	8,352	8,408	8,461	8,511	8,559	8,605	8,649	8,690
Broward	76,874	77,122	77,220	77,433	77,563	77,692	77,818	77,943	78,065	78,186	78,306
Charlotte	3,046	3,074	3,082	3,097	3,110	3,122	3,135	3,148	3,161	3,174	3,188
Collier	12,692	12,732	12,751	12,789	12,816	12,844	12,870	12,897	12,923	12,950	12,975
Duval	30,264	30,418	30,548	30,666	30,780	30,894	31,008	31,122	31,235	31,348	31,461
Hillsborough	41,947	42,118	42,248	42,380	42,520	42,658	42,794	42,929	43,062	43,194	43,324
Lake	7,475	7,517	7,542	7,567	7,587	7,607	7,626	7,645	7,663	7,680	7,697
Lee	20,388	20,445	20,516	20,586	20,638	20,690	20,742	20,793	20,845	20,896	20,947
Manatee	11,486	11,546	11,579	11,619	11,657	11,696	11,734	11,773	11,812	11,851	11,890
Miami-Dade	169,466	170,086	170,400	170,882	171,170	171,453	171,732	172,007	172,277	172,542	172,804
Okaloosa	4,971	5,010	5,036	5,082	5,110	5,139	5,168	5,198	5,229	5,261	5,293
Orange	39,990	40,224	40,329	40,485	40,601	40,717	40,832	40,945	41,059	41,171	41,282
Osceola	12,455	12,513	12,556	12,605	12,650	12,696	12,741	12,786	12,832	12,878	12,923
Palm Beach	46,310	46,485	46,552	46,698	46,793	46,886	46,975	47,063	47,148	47,230	47,311
Pasco	9,233	9,279	9,322	9,371	9,423	9,475	9,529	9,583	9,639	9,695	9,753
Pinellas	22,049	22,129	22,181	22,266	22,329	22,392	22,454	22,515	22,576	22,636	22,696
Polk	19,888	19,974	20,032	20,120	20,198	20,274	20,349	20,422	20,494	20,564	20,634
Sarasota	8,147	8,177	8,189	8,233	8,254	8,275	8,295	8,315	8,334	8,354	8,373
Seminole	9,009	9,053	9,097	9,107	9,129	9,151	9,173	9,194	9,215	9,236	9,256
St. Johns	5,334	5,364	5,391	5,423	5,452	5,482	5,511	5,541	5,571	5,600	5,630
Sumter	2,228	2,251	2,313	2,397	2,410	2,424	2,438	2,453	2,468	2,485	2,502
Volusia	10,834	10,898	10,945	10,991	11,023	11,055	11,086	11,117	11,147	11,176	11,205

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:											
	9/28	9/29	9/30	10/1	10/3				10/5				10/7			
Alachua	8,164	8,230	8,293	8,352	8,461	(1,692)	[406]	{203}	8,559	(1,712)	[411]	{205}	8,649	(1,730)	[415]	{208}
Broward	76,874	77,122	77,220	77,433	77,692	(15,538)	[3,729]	{1,865}	77,943	(15,589)	[3,741]	{1,871}	78,186	(15,637)	[3,753]	{1,876}
Charlotte	3,046	3,074	3,082	3,097	3,122	(624)	[150]	{75}	3,148	(630)	[151]	{76}	3,174	(635)	[152]	{76}
Collier	12,692	12,732	12,751	12,789	12,844	(2,569)	[616]	{308}	12,897	(2,579)	[619]	{310}	12,950	(2,590)	[622]	{311}
Duval	30,264	30,418	30,548	30,666	30,894	(6,179)	[1,483]	{741}	31,122	(6,224)	[1,494]	{747}	31,348	(6,270)	[1,505]	{752}
Hillsborough	41,947	42,118	42,248	42,380	42,658	(8,532)	[2,048]	{1,024}	42,929	(8,586)	[2,061]	{1,030}	43,194	(8,639)	[2,073]	{1,037}
Lake	7,475	7,517	7,542	7,567	7,607	(1,521)	[365]	{183}	7,645	(1,529)	[367]	{183}	7,680	(1,536)	[369]	{184}
Lee	20,388	20,445	20,516	20,586	20,690	(4,138)	[993]	{497}	20,793	(4,159)	[998]	{499}	20,896	(4,179)	[1,003]	{501}
Manatee	11,486	11,546	11,579	11,619	11,696	(2,339)	[561]	{281}	11,773	(2,355)	[565]	{283}	11,851	(2,370)	[569]	{284}
Miami-Dade	169,466	170,086	170,400	170,882	171,453	(34,291)	[8,230]	{4,115}	172,007	(34,401)	[8,256]	{4,128}	172,542	(34,508)	[8,282]	{4,141}
Okaloosa	4,971	5,010	5,036	5,082	5,139	(1,028)	[247]	{123}	5,198	(1,040)	[250]	{125}	5,261	(1,052)	[253]	{126}
Orange	39,990	40,224	40,329	40,485	40,717	(8,143)	[1,954]	{977}	40,945	(8,189)	[1,965]	{983}	41,171	(8,234)	[1,976]	{988}
Osceola	12,455	12,513	12,556	12,605	12,696	(2,539)	[609]	{305}	12,786	(2,557)	[614]	{307}	12,878	(2,576)	[618]	{309}
Palm Beach	46,310	46,485	46,552	46,698	46,886	(9,377)	[2,251]	{1,125}	47,063	(9,413)	[2,259]	{1,130}	47,230	(9,446)	[2,267]	{1,134}
Pasco	9,233	9,279	9,322	9,371	9,475	(1,895)	[455]	{227}	9,583	(1,917)	[460]	{230}	9,695	(1,939)	[465]	{233}
Pinellas	22,049	22,129	22,181	22,266	22,392	(4,478)	[1,075]	{537}	22,515	(4,503)	[1,081]	{540}	22,636	(4,527)	[1,087]	{543}
Polk	19,888	19,974	20,032	20,120	20,274	(4,055)	[973]	{487}	20,422	(4,084)	[980]	{490}	20,564	(4,113)	[987]	{494}
Sarasota	8,147	8,177	8,189	8,233	8,275	(1,655)	[397]	{199}	8,315	(1,663)	[399]	{200}	8,354	(1,671)	[401]	{200}
Seminole	9,009	9,053	9,097	9,107	9,151	(1,830)	[439]	{220}	9,194	(1,839)	[441]	{221}	9,236	(1,847)	[443]	{222}
St. Johns	5,334	5,364	5,391	5,423	5,482	(1,096)	[263]	{132}	5,541	(1,108)	[266]	{133}	5,600	(1,120)	[269]	{134}
Sumter	2,228	2,251	2,313	2,397	2,424	(485)	[116]	{58}	2,453	(491)	[118]	{59}	2,485	(497)	[119]	{60}
Volusia	10,834	10,898	10,945	10,991	11,055	(2,211)	[531]	{265}	11,117	(2,223)	[534]	{267}	11,176	(2,235)	[536]	{268}

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.