

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

Date: 9/1/20

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 9/1/20 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.

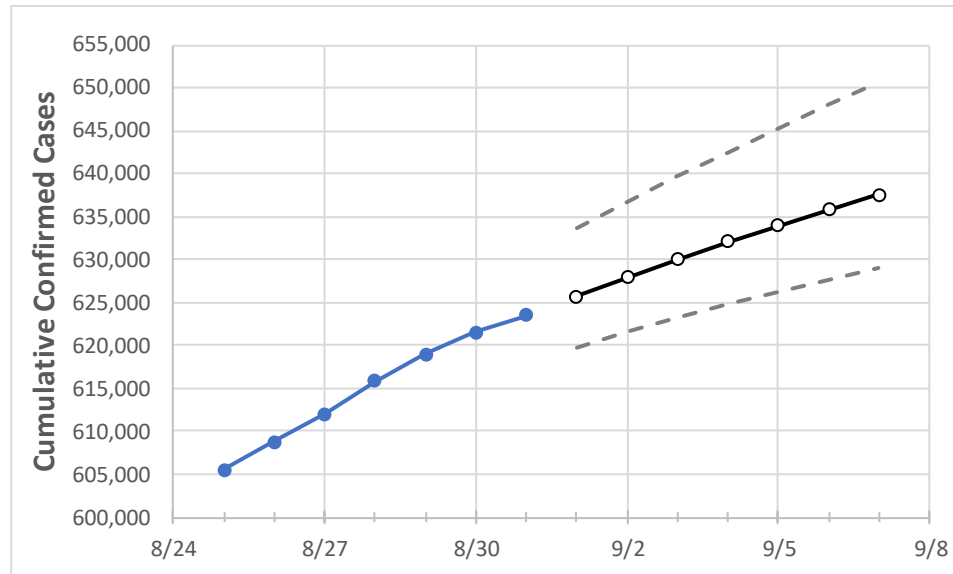
IEM's Modeling Lead

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:						
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7
Florida	615,806	619,003	621,586	623,471	625,760	627,952	630,050	632,058	633,980	635,820	637,579

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:						
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7
Alachua	5,117	5,165	5,193	5,196	5,217	5,237	5,256	5,274	5,291	5,307	5,322
Broward	70,513	70,764	70,950	71,121	71,304	71,478	71,641	71,796	71,942	72,080	72,210
Charlotte	2,622	2,635	2,656	2,677	2,697	2,717	2,737	2,757	2,778	2,798	2,819
Collier	11,517	11,570	11,604	11,609	11,635	11,660	11,684	11,707	11,729	11,750	11,770
Duval	26,169	26,284	26,391	26,460	26,555	26,648	26,738	26,825	26,910	26,993	27,073
Hillsborough	36,574	36,784	37,013	37,136	37,295	37,451	37,605	37,755	37,903	38,048	38,190
Lake	6,275	6,345	6,385	6,396	6,429	6,461	6,493	6,523	6,552	6,580	6,607
Lee	18,461	18,584	18,634	18,673	18,740	18,805	18,870	18,932	18,994	19,054	19,114
Manatee	10,340	10,391	10,418	10,426	10,449	10,471	10,492	10,511	10,530	10,548	10,564
Miami-Dade	155,418	156,038	156,559	156,910	157,368	157,801	158,208	158,592	158,953	159,294	159,614
Okaloosa	4,094	4,124	4,134	4,154	4,173	4,191	4,209	4,226	4,242	4,257	4,272
Orange	35,449	35,613	35,770	35,902	36,034	36,162	36,288	36,410	36,528	36,644	36,757
Osceola	10,988	11,055	11,091	11,134	11,169	11,203	11,236	11,267	11,296	11,324	11,351
Palm Beach	41,558	41,730	41,865	41,965	42,089	42,207	42,320	42,428	42,532	42,631	42,726
Pasco	7,949	7,989	8,028	8,048	8,078	8,107	8,135	8,162	8,189	8,214	8,239
Pinellas	19,740	19,813	19,888	19,929	19,978	20,025	20,070	20,113	20,154	20,193	20,230
Polk	16,692	16,803	16,894	17,011	17,092	17,172	17,249	17,324	17,397	17,468	17,538
Sarasota	7,136	7,162	7,193	7,207	7,229	7,250	7,270	7,290	7,308	7,325	7,342
Seminole	7,934	7,979	8,006	8,029	8,056	8,081	8,106	8,131	8,154	8,177	8,199
St. Johns	4,263	4,286	4,321	4,332	4,347	4,362	4,376	4,389	4,402	4,415	4,427
Sumter	1,819	1,832	1,848	1,852	1,862	1,871	1,880	1,888	1,897	1,905	1,913
Volusia	9,174	9,223	9,244	9,283	9,319	9,354	9,387	9,419	9,450	9,479	9,508

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:											
	8/28	8/29	8/30	8/31	9/2			9/4			9/6					
Alachua	5,117	5,165	5,193	5,196	5,237	(1,047)	[251]	{126}	5,274	(1,055)	[253]	{127}	5,307	(1,061)	[255]	{127}
Broward	70,513	70,764	70,950	71,121	71,478	(14,296)	[3,431]	{1,715}	71,796	(14,359)	[3,446]	{1,723}	72,080	(14,416)	[3,460]	{1,730}
Charlotte	2,622	2,635	2,656	2,677	2,717	(543)	[130]	{65}	2,757	(551)	[132]	{66}	2,798	(560)	[134]	{67}
Collier	11,517	11,570	11,604	11,609	11,660	(2,332)	[560]	{280}	11,707	(2,341)	[562]	{281}	11,750	(2,350)	[564]	{282}
Duval	26,169	26,284	26,391	26,460	26,648	(5,330)	[1,279]	{640}	26,825	(5,365)	[1,288]	{644}	26,993	(5,399)	[1,296]	{648}
Hillsborough	36,574	36,784	37,013	37,136	37,451	(7,490)	[1,798]	{899}	37,755	(7,551)	[1,812]	{906}	38,048	(7,610)	[1,826]	{913}
Lake	6,275	6,345	6,385	6,396	6,461	(1,292)	[310]	{155}	6,523	(1,305)	[313]	{157}	6,580	(1,316)	[316]	{158}
Lee	18,461	18,584	18,634	18,673	18,805	(3,761)	[903]	{451}	18,932	(3,786)	[909]	{454}	19,054	(3,811)	[915]	{457}
Manatee	10,340	10,391	10,418	10,426	10,471	(2,094)	[503]	{251}	10,511	(2,102)	[505]	{252}	10,548	(2,110)	[506]	{253}
Miami-Dade	155,418	156,038	156,559	156,910	157,801	(31,560)	[7,574]	{3,787}	158,592	(31,718)	[7,612]	{3,806}	159,294	(31,859)	[7,646]	{3,823}
Okaloosa	4,094	4,124	4,134	4,154	4,191	(838)	[201]	{101}	4,226	(845)	[203]	{101}	4,257	(851)	[204]	{102}
Orange	35,449	35,613	35,770	35,902	36,162	(7,232)	[1,736]	{868}	36,410	(7,282)	[1,748]	{874}	36,644	(7,329)	[1,759]	{879}
Osceola	10,988	11,055	11,091	11,134	11,203	(2,241)	[538]	{269}	11,267	(2,253)	[541]	{270}	11,324	(2,265)	[544]	{272}
Palm Beach	41,558	41,730	41,865	41,965	42,207	(8,441)	[2,026]	{1,013}	42,428	(8,486)	[2,037]	{1,018}	42,631	(8,526)	[2,046]	{1,023}
Pasco	7,949	7,989	8,028	8,048	8,107	(1,621)	[389]	{195}	8,162	(1,632)	[392]	{196}	8,214	(1,643)	[394]	{197}
Pinellas	19,740	19,813	19,888	19,929	20,025	(4,005)	[961]	{481}	20,113	(4,023)	[965]	{483}	20,193	(4,039)	[969]	{485}
Polk	16,692	16,803	16,894	17,011	17,172	(3,434)	[824]	{412}	17,324	(3,465)	[832]	{416}	17,468	(3,494)	[838]	{419}
Sarasota	7,136	7,162	7,193	7,207	7,250	(1,450)	[348]	{174}	7,290	(1,458)	[350]	{175}	7,325	(1,465)	[352]	{176}
Seminole	7,934	7,979	8,006	8,029	8,081	(1,616)	[388]	{194}	8,131	(1,626)	[390]	{195}	8,177	(1,635)	[392]	{196}
St. Johns	4,263	4,286	4,321	4,332	4,362	(872)	[209]	{105}	4,389	(878)	[211]	{105}	4,415	(883)	[212]	{106}
Sumter	1,819	1,832	1,848	1,852	1,871	(374)	[90]	{45}	1,888	(378)	[91]	{45}	1,905	(381)	[91]	{46}
Volusia	9,174	9,223	9,244	9,283	9,354	(1,871)	[449]	{224}	9,419	(1,884)	[452]	{226}	9,479	(1,896)	[455]	{228}

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.