

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

Date: 8/27/20

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 8/27/20 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.

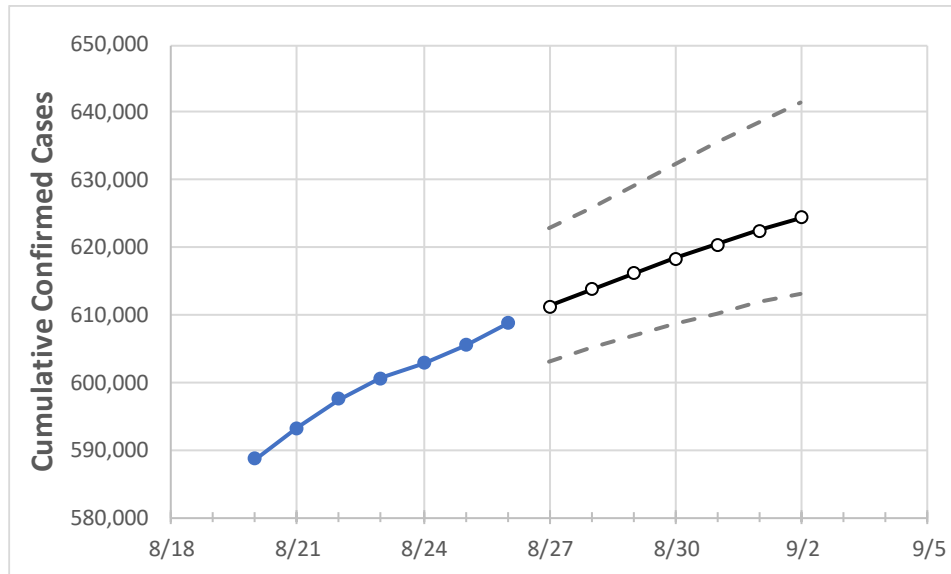
IEM's Modeling Lead

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Florida	600,571	602,829	605,502	608,722	611,289	613,740	616,078	618,308	620,435	622,464	624,399

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Alachua	4,950	4,981	5,023	5,053	5,088	5,123	5,156	5,189	5,221	5,253	5,283
Broward	69,136	69,383	69,584	69,883	70,128	70,360	70,581	70,791	70,990	71,180	71,360
Charlotte	2,519	2,538	2,569	2,582	2,596	2,609	2,623	2,636	2,648	2,660	2,672
Collier	11,245	11,268	11,351	11,376	11,411	11,445	11,477	11,508	11,538	11,567	11,595
Duval	25,558	25,658	25,732	25,879	25,969	26,056	26,140	26,220	26,297	26,371	26,442
Hillsborough	35,721	35,814	35,953	36,157	36,293	36,424	36,550	36,671	36,787	36,900	37,007
Lake	6,046	6,089	6,122	6,163	6,206	6,248	6,289	6,330	6,371	6,411	6,450
Lee	18,009	18,064	18,140	18,217	18,277	18,336	18,392	18,447	18,499	18,550	18,599
Manatee	10,170	10,209	10,241	10,278	10,314	10,349	10,383	10,415	10,447	10,477	10,506
Miami-Dade	151,986	152,612	153,385	154,135	154,813	155,464	156,087	156,686	157,259	157,809	158,337
Okaloosa	3,955	3,965	3,998	4,020	4,039	4,058	4,075	4,093	4,109	4,125	4,140
Orange	34,662	34,781	34,910	35,083	35,208	35,329	35,446	35,559	35,667	35,772	35,873
Osceola	10,732	10,772	10,804	10,844	10,885	10,925	10,962	10,999	11,033	11,067	11,099
Palm Beach	40,570	40,746	40,853	41,013	41,152	41,285	41,412	41,533	41,649	41,760	41,866
Pasco	7,758	7,777	7,807	7,868	7,898	7,927	7,955	7,981	8,007	8,032	8,056
Pinellas	19,431	19,478	19,522	19,605	19,666	19,724	19,780	19,833	19,885	19,934	19,981
Polk	16,251	16,322	16,388	16,498	16,580	16,659	16,735	16,809	16,881	16,950	17,017
Sarasota	7,021	7,016	7,042	7,066	7,098	7,129	7,159	7,188	7,217	7,244	7,270
Seminole	7,756	7,778	7,811	7,839	7,864	7,888	7,911	7,934	7,955	7,976	7,995
St. Johns	4,153	4,160	4,197	4,219	4,236	4,252	4,268	4,283	4,297	4,311	4,324
Sumter	1,717	1,718	1,724	1,742	1,755	1,768	1,780	1,793	1,805	1,817	1,829
Volusia	8,914	8,952	8,997	9,069	9,114	9,158	9,200	9,241	9,280	9,318	9,355

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:											
	8/23	8/24	8/25	8/26	8/28				8/30				9/1			
Alachua	4,950	4,981	5,023	5,053	5,123	(1,025)	[246]	{123}	5,189	(1,038)	[249]	{125}	5,253	(1,051)	[252]	{126}
Broward	69,136	69,383	69,584	69,883	70,360	(14,072)	[3,377]	{1,689}	70,791	(14,158)	[3,398]	{1,699}	71,180	(14,236)	[3,417]	{1,708}
Charlotte	2,519	2,538	2,569	2,582	2,609	(522)	[125]	{63}	2,636	(527)	[127]	{63}	2,660	(532)	[128]	{64}
Collier	11,245	11,268	11,351	11,376	11,445	(2,289)	[549]	{275}	11,508	(2,302)	[552]	{276}	11,567	(2,313)	[555]	{278}
Duval	25,558	25,658	25,732	25,879	26,056	(5,211)	[1,251]	{625}	26,220	(5,244)	[1,259]	{629}	26,371	(5,274)	[1,266]	{633}
Hillsborough	35,721	35,814	35,953	36,157	36,424	(7,285)	[1,748]	{874}	36,671	(7,334)	[1,760]	{880}	36,900	(7,380)	[1,771]	{886}
Lake	6,046	6,089	6,122	6,163	6,248	(1,250)	[300]	{150}	6,330	(1,266)	[304]	{152}	6,411	(1,282)	[308]	{154}
Lee	18,009	18,064	18,140	18,217	18,336	(3,667)	[880]	{440}	18,447	(3,689)	[885]	{443}	18,550	(3,710)	[890]	{445}
Manatee	10,170	10,209	10,241	10,278	10,349	(2,070)	[497]	{248}	10,415	(2,083)	[500]	{250}	10,477	(2,095)	[503]	{251}
Miami-Dade	151,986	152,612	153,385	154,135	155,464	(31,093)	[7,462]	{3,731}	156,686	(31,337)	[7,521]	{3,760}	157,809	(31,562)	[7,575]	{3,787}
Okaloosa	3,955	3,965	3,998	4,020	4,058	(812)	[195]	{97}	4,093	(819)	[196]	{98}	4,125	(825)	[198]	{99}
Orange	34,662	34,781	34,910	35,083	35,329	(7,066)	[1,696]	{848}	35,559	(7,112)	[1,707]	{853}	35,772	(7,154)	[1,717]	{859}
Osceola	10,732	10,772	10,804	10,844	10,925	(2,185)	[524]	{262}	10,999	(2,200)	[528]	{264}	11,067	(2,213)	[531]	{266}
Palm Beach	40,570	40,746	40,853	41,013	41,285	(8,257)	[1,982]	{991}	41,533	(8,307)	[1,994]	{997}	41,760	(8,352)	[2,004]	{1,002}
Pasco	7,758	7,777	7,807	7,868	7,927	(1,585)	[380]	{190}	7,981	(1,596)	[383]	{192}	8,032	(1,606)	[386]	{193}
Pinellas	19,431	19,478	19,522	19,605	19,724	(3,945)	[947]	{473}	19,833	(3,967)	[952]	{476}	19,934	(3,987)	[957]	{478}
Polk	16,251	16,322	16,388	16,498	16,659	(3,332)	[800]	{400}	16,809	(3,362)	[807]	{403}	16,950	(3,390)	[814]	{407}
Sarasota	7,021	7,016	7,042	7,066	7,129	(1,426)	[342]	{171}	7,188	(1,438)	[345]	{173}	7,244	(1,449)	[348]	{174}
Seminole	7,756	7,778	7,811	7,839	7,888	(1,578)	[379]	{189}	7,934	(1,587)	[381]	{190}	7,976	(1,595)	[383]	{191}
St. Johns	4,153	4,160	4,197	4,219	4,252	(850)	[204]	{102}	4,283	(857)	[206]	{103}	4,311	(862)	[207]	{103}
Sumter	1,717	1,718	1,724	1,742	1,768	(354)	[85]	{42}	1,793	(359)	[86]	{43}	1,817	(363)	[87]	{44}
Volusia	8,914	8,952	8,997	9,069	9,158	(1,832)	[440]	{220}	9,241	(1,848)	[444]	{222}	9,318	(1,864)	[447]	{224}

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.