

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/1/20**

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

The projections shown in this document are based on data pulled in as of 12/1/20 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.

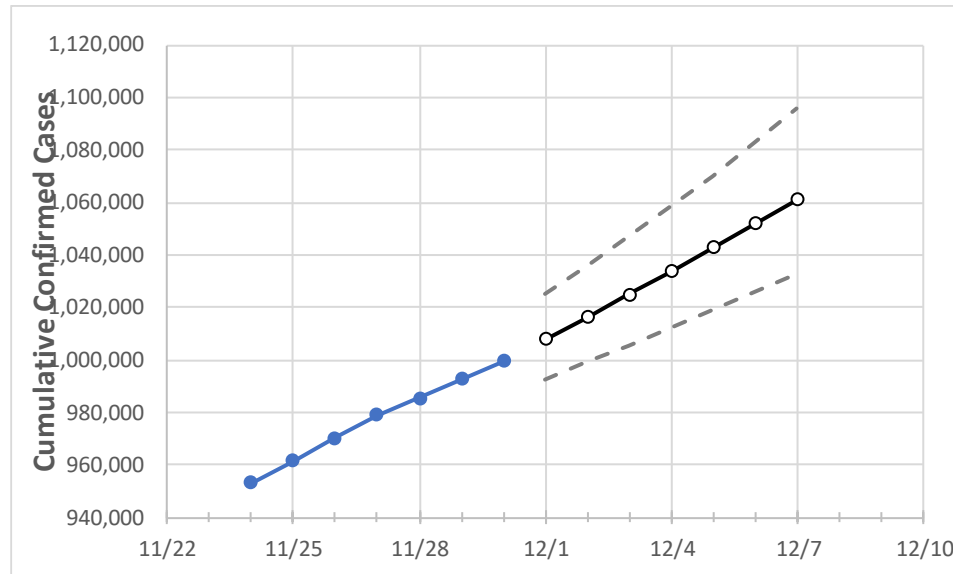
IEM's Modeling Lead

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:						
	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7
Florida	979,020	985,297	992,660	999,319	1,007,767	1,016,338	1,025,036	1,033,861	1,042,817	1,051,903	1,061,122

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:						
	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7
Alachua	12,704	12,769	12,813	12,864	12,930	12,997	13,062	13,128	13,193	13,258	13,322
Broward	105,084	105,877	106,698	107,524	108,410	109,306	110,210	111,124	112,047	112,979	113,921
Charlotte	4,968	5,003	5,052	5,087	5,142	5,197	5,253	5,309	5,366	5,423	5,480
Collier	17,556	17,647	17,693	17,757	17,871	17,986	18,101	18,216	18,332	18,449	18,565
Duval	42,974	43,241	43,599	43,978	44,479	45,004	45,553	46,128	46,729	47,357	48,015
Hillsborough	57,371	57,728	58,092	58,293	58,658	59,026	59,395	59,766	60,139	60,514	60,891
Lake	10,472	10,531	10,623	10,671	10,749	10,828	10,908	10,989	11,071	11,155	11,240
Lee	29,334	29,613	29,868	30,113	30,380	30,648	30,919	31,191	31,466	31,742	32,020
Manatee	16,474	16,570	16,703	16,860	17,020	17,184	17,352	17,524	17,701	17,882	18,068
Miami-Dade	224,166	225,632	227,656	229,618	231,697	233,814	235,969	238,163	240,398	242,672	244,989
Okaloosa	8,742	8,793	8,865	8,885	8,947	9,008	9,069	9,129	9,188	9,246	9,303
Orange	57,101	57,321	57,805	58,325	58,803	59,287	59,778	60,275	60,779	61,290	61,807
Osceola	17,966	18,047	18,248	18,354	18,512	18,671	18,833	18,996	19,161	19,328	19,497
Palm Beach	64,300	64,670	65,011	65,372	65,824	66,274	66,722	67,169	67,613	68,056	68,498
Pasco	14,488	14,619	14,783	14,899	15,077	15,258	15,442	15,630	15,820	16,014	16,212
Pinellas	32,408	32,630	32,808	33,058	33,349	33,644	33,943	34,245	34,551	34,861	35,175
Polk	27,149	27,300	27,481	27,611	27,769	27,927	28,086	28,245	28,405	28,565	28,726
Sarasota	13,375	13,453	13,647	13,763	13,960	14,163	14,374	14,591	14,815	15,047	15,287
Seminole	12,685	12,740	12,871	12,940	13,037	13,135	13,234	13,333	13,434	13,536	13,638
St. Johns	8,539	8,649	8,727	8,832	8,945	9,063	9,184	9,310	9,441	9,575	9,715
Sumter	3,412	3,428	3,442	3,467	3,492	3,518	3,544	3,572	3,601	3,630	3,661
Volusia	16,197	16,255	16,358	16,506	16,687	16,875	17,070	17,272	17,482	17,700	17,927

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:											
	11/27	11/28	11/29	11/30	12/2				12/4				12/6			
Alachua	12,704	12,769	12,813	12,864	12,997	(2,599)	[624]	{312}	13,128	(2,626)	[630]	{315}	13,258	(2,652)	[636]	{318}
Broward	105,084	105,877	106,698	107,524	109,306	(21,861)	[5,247]	{2,623}	111,124	(22,225)	[5,334]	{2,667}	112,979	(22,596)	[5,423]	{2,711}
Charlotte	4,968	5,003	5,052	5,087	5,197	(1,039)	[249]	{125}	5,309	(1,062)	[255]	{127}	5,423	(1,085)	[260]	{130}
Collier	17,556	17,647	17,693	17,757	17,986	(3,597)	[863]	{432}	18,216	(3,643)	[874]	{437}	18,449	(3,690)	[886]	{443}
Duval	42,974	43,241	43,599	43,978	45,004	(9,001)	[2,160]	{1,080}	46,128	(9,226)	[2,214]	{1,107}	47,357	(9,471)	[2,273]	{1,137}
Hillsborough	57,371	57,728	58,092	58,293	59,026	(11,805)	[2,833]	{1,417}	59,766	(11,953)	[2,869]	{1,434}	60,514	(12,103)	[2,905]	{1,452}
Lake	10,472	10,531	10,623	10,671	10,828	(2,166)	[520]	{260}	10,989	(2,198)	[527]	{264}	11,155	(2,231)	[535]	{268}
Lee	29,334	29,613	29,868	30,113	30,648	(6,130)	[1,471]	{736}	31,191	(6,238)	[1,497]	{749}	31,742	(6,348)	[1,524]	{762}
Manatee	16,474	16,570	16,703	16,860	17,184	(3,437)	[825]	{412}	17,524	(3,505)	[841]	{421}	17,882	(3,576)	[858]	{429}
Miami-Dade	224,166	225,632	227,656	229,618	233,814	(46,763)	[11,223]	{5,612}	238,163	(47,633)	[11,432]	{5,716}	242,672	(48,534)	[11,648]	{5,824}
Okaloosa	8,742	8,793	8,865	8,885	9,008	(1,802)	[432]	{216}	9,129	(1,826)	[438]	{219}	9,246	(1,849)	[444]	{222}
Orange	57,101	57,321	57,805	58,325	59,287	(11,857)	[2,846]	{1,423}	60,275	(12,055)	[2,893]	{1,447}	61,290	(12,258)	[2,942]	{1,471}
Osceola	17,966	18,047	18,248	18,354	18,671	(3,734)	[896]	{448}	18,996	(3,799)	[912]	{456}	19,328	(3,866)	[928]	{464}
Palm Beach	64,300	64,670	65,011	65,372	66,274	(13,255)	[3,181]	{1,591}	67,169	(13,434)	[3,224]	{1,612}	68,056	(13,611)	[3,267]	{1,633}
Pasco	14,488	14,619	14,783	14,899	15,258	(3,052)	[732]	{366}	15,630	(3,126)	[750]	{375}	16,014	(3,203)	[769]	{384}
Pinellas	32,408	32,630	32,808	33,058	33,644	(6,729)	[1,615]	{807}	34,245	(6,849)	[1,644]	{822}	34,861	(6,972)	[1,673]	{837}
Polk	27,149	27,300	27,481	27,611	27,927	(5,585)	[1,340]	{670}	28,245	(5,649)	[1,356]	{678}	28,565	(5,713)	[1,371]	{686}
Sarasota	13,375	13,453	13,647	13,763	14,163	(2,833)	[680]	{340}	14,591	(2,918)	[700]	{350}	15,047	(3,009)	[722]	{361}
Seminole	12,685	12,740	12,871	12,940	13,135	(2,627)	[630]	{315}	13,333	(2,667)	[640]	{320}	13,536	(2,707)	[650]	{325}
St. Johns	8,539	8,649	8,727	8,832	9,063	(1,813)	[435]	{218}	9,310	(1,862)	[447]	{223}	9,575	(1,915)	[460]	{230}
Sumter	3,412	3,428	3,442	3,467	3,518	(704)	[169]	{84}	3,572	(714)	[171]	{86}	3,630	(726)	[174]	{87}
Volusia	16,197	16,255	16,358	16,506	16,875	(3,375)	[810]	{405}	17,272	(3,454)	[829]	{415}	17,700	(3,540)	[850]	{425}

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.