

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/7/20**

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 12/7/20 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.

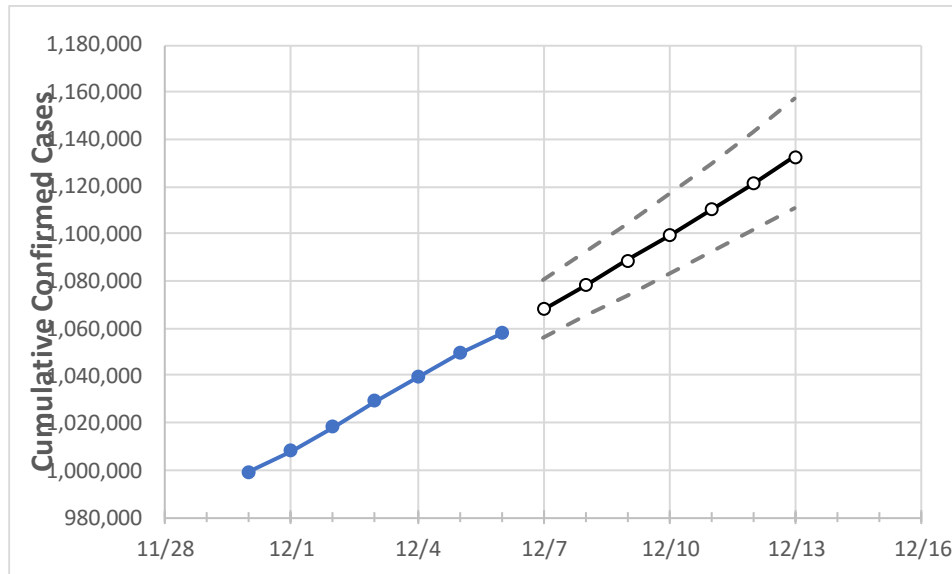
IEM's Modeling Lead

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:						
	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13
Florida	1,029,030	1,039,207	1,049,638	1,058,074	1,068,021	1,078,191	1,088,587	1,099,214	1,110,077	1,121,182	1,132,533

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:						
	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13
Alachua	13,118	13,190	13,314	13,382	13,459	13,537	13,616	13,696	13,777	13,858	13,941
Broward	110,517	111,629	112,729	113,634	114,719	115,833	116,976	118,149	119,353	120,589	121,857
Charlotte	5,293	5,354	5,437	5,527	5,597	5,669	5,743	5,818	5,896	5,975	6,056
Collier	18,334	18,548	18,751	18,926	19,088	19,255	19,426	19,602	19,782	19,968	20,158
Duval	45,575	46,112	46,606	47,036	47,628	48,243	48,882	49,546	50,236	50,953	51,698
Hillsborough	59,809	60,241	60,761	61,276	61,757	62,251	62,756	63,275	63,807	64,351	64,910
Lake	10,899	10,982	11,091	11,183	11,270	11,360	11,450	11,543	11,637	11,734	11,832
Lee	31,243	31,571	31,897	32,209	32,558	32,917	33,286	33,665	34,053	34,453	34,863
Manatee	17,324	17,450	17,606	17,713	17,862	18,012	18,164	18,317	18,472	18,628	18,786
Miami-Dade	236,308	238,813	241,051	243,050	245,458	247,925	250,451	253,037	255,685	258,395	261,168
Okaloosa	9,431	9,605	9,714	9,776	9,873	9,973	10,074	10,178	10,283	10,391	10,501
Orange	59,791	60,392	61,030	61,474	62,008	62,551	63,102	63,664	64,234	64,815	65,405
Osceola	19,066	19,255	19,487	19,625	19,820	20,018	20,221	20,428	20,639	20,854	21,074
Palm Beach	67,106	67,736	68,381	68,912	69,465	70,026	70,594	71,171	71,756	72,349	72,951
Pasco	15,480	15,700	15,948	16,153	16,369	16,591	16,820	17,056	17,298	17,548	17,805
Pinellas	33,857	34,152	34,603	34,899	35,214	35,535	35,862	36,194	36,531	36,875	37,224
Polk	28,399	28,640	28,918	29,135	29,365	29,601	29,843	30,091	30,346	30,608	30,876
Sarasota	14,257	14,384	14,575	14,753	14,941	15,133	15,330	15,530	15,735	15,944	16,158
Seminole	13,323	13,427	13,556	13,642	13,753	13,865	13,978	14,094	14,211	14,329	14,449
St. Johns	9,217	9,339	9,433	9,542	9,672	9,805	9,943	10,085	10,230	10,381	10,535
Sumter	3,602	3,644	3,701	3,716	3,753	3,791	3,832	3,875	3,920	3,967	4,017
Volusia	16,921	17,080	17,286	17,388	17,565	17,747	17,934	18,125	18,322	18,525	18,732

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:											
	12/3	12/4	12/5	12/6	12/8				12/10				12/12			
Alachua	13,118	13,190	13,314	13,382	13,537	(2,707)	[650]	{325}	13,696	(2,739)	[657]	{329}	13,858	(2,772)	[665]	{333}
Broward	110,517	111,629	112,729	113,634	115,833	(23,167)	[5,560]	{2,780}	118,149	(23,630)	[5,671]	{2,836}	120,589	(24,118)	[5,788]	{2,894}
Charlotte	5,293	5,354	5,437	5,527	5,669	(1,134)	[272]	{136}	5,818	(1,164)	[279]	{140}	5,975	(1,195)	[287]	{143}
Collier	18,334	18,548	18,751	18,926	19,255	(3,851)	[924]	{462}	19,602	(3,920)	[941]	{470}	19,968	(3,994)	[958]	{479}
Duval	45,575	46,112	46,606	47,036	48,243	(9,649)	[2,316]	{1,158}	49,546	(9,909)	[2,378]	{1,189}	50,953	(10,191)	[2,446]	{1,223}
Hillsborough	59,809	60,241	60,761	61,276	62,251	(12,450)	[2,988]	{1,494}	63,275	(12,655)	[3,037]	{1,519}	64,351	(12,870)	[3,089]	{1,544}
Lake	10,899	10,982	11,091	11,183	11,360	(2,272)	[545]	{273}	11,543	(2,309)	[554]	{277}	11,734	(2,347)	[563]	{282}
Lee	31,243	31,571	31,897	32,209	32,917	(6,583)	[1,580]	{790}	33,665	(6,733)	[1,616]	{808}	34,453	(6,891)	[1,654]	{827}
Manatee	17,324	17,450	17,606	17,713	18,012	(3,602)	[865]	{432}	18,317	(3,663)	[879]	{440}	18,628	(3,726)	[894]	{447}
Miami-Dade	236,308	238,813	241,051	243,050	247,925	(49,585)	[11,900]	{5,950}	253,037	(50,607)	[12,146]	{6,073}	258,395	(51,679)	[12,403]	{6,201}
Okaloosa	9,431	9,605	9,714	9,776	9,973	(1,995)	[479]	{239}	10,178	(2,036)	[489]	{244}	10,391	(2,078)	[499]	{249}
Orange	59,791	60,392	61,030	61,474	62,551	(12,510)	[3,002]	{1,501}	63,664	(12,733)	[3,056]	{1,528}	64,815	(12,963)	[3,111]	{1,556}
Osceola	19,066	19,255	19,487	19,625	20,018	(4,004)	[961]	{480}	20,428	(4,086)	[981]	{490}	20,854	(4,171)	[1,001]	{500}
Palm Beach	67,106	67,736	68,381	68,912	70,026	(14,005)	[3,361]	{1,681}	71,171	(14,234)	[3,416]	{1,708}	72,349	(14,470)	[3,473]	{1,736}
Pasco	15,480	15,700	15,948	16,153	16,591	(3,318)	[796]	{398}	17,056	(3,411)	[819]	{409}	17,548	(3,510)	[842]	{421}
Pinellas	33,857	34,152	34,603	34,899	35,535	(7,107)	[1,706]	{853}	36,194	(7,239)	[1,737]	{869}	36,875	(7,375)	[1,770]	{885}
Polk	28,399	28,640	28,918	29,135	29,601	(5,920)	[1,421]	{710}	30,091	(6,018)	[1,444]	{722}	30,608	(6,122)	[1,469]	{735}
Sarasota	14,257	14,384	14,575	14,753	15,133	(3,027)	[726]	{363}	15,530	(3,106)	[745]	{373}	15,944	(3,189)	[765]	{383}
Seminole	13,323	13,427	13,556	13,642	13,865	(2,773)	[666]	{333}	14,094	(2,819)	[677]	{338}	14,329	(2,866)	[688]	{344}
St. Johns	9,217	9,339	9,433	9,542	9,805	(1,961)	[471]	{235}	10,085	(2,017)	[484]	{242}	10,381	(2,076)	[498]	{249}
Sumter	3,602	3,644	3,701	3,716	3,791	(758)	[182]	{91}	3,875	(775)	[186]	{93}	3,967	(793)	[190]	{95}
Volusia	16,921	17,080	17,286	17,388	17,747	(3,549)	[852]	{426}	18,125	(3,625)	[870]	{435}	18,525	(3,705)	[889]	{445}

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.