

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

**Date: 12/30/20**

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 12/30/20 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.**

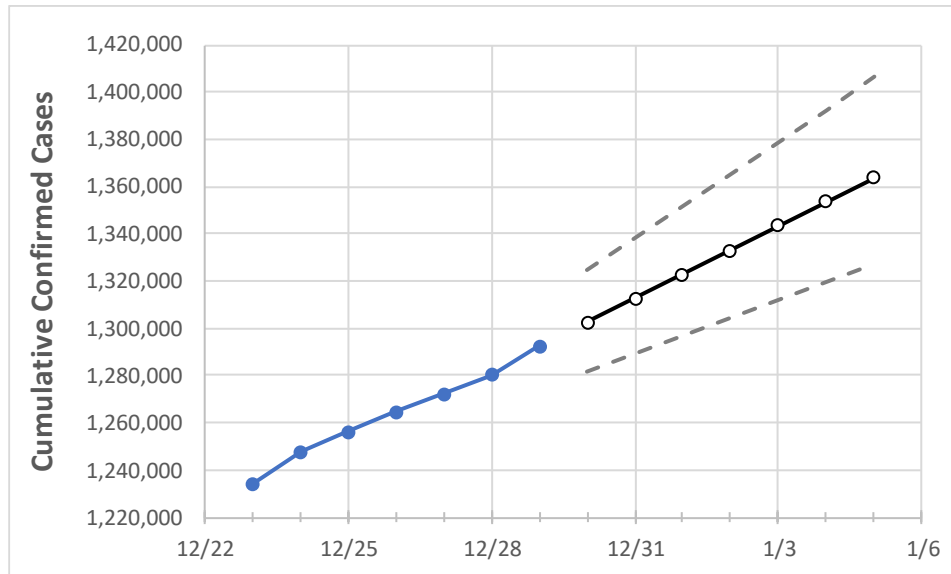
### **IEM's Modeling Lead**

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:							
	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4	1/5	
Florida	1,264,588	1,271,979	1,280,177	1,292,252	1,302,434	1,312,673	1,322,800	1,333,034	1,343,335	1,353,522	1,363,556	

*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:						
	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4	1/5
Alachua	15,370	15,420	15,473	15,574	15,663	15,749	15,832	15,917	16,000	16,084	16,167
Broward	132,193	132,897	133,480	134,582	135,401	136,201	137,007	137,768	138,537	139,308	140,069
Charlotte	7,000	7,065	7,128	7,192	7,262	7,331	7,401	7,471	7,538	7,607	7,675
Collier	21,558	21,683	22,004	22,132	22,274	22,412	22,551	22,689	22,829	22,973	23,115
Duval	57,999	58,296	58,491	59,515	60,141	60,778	61,419	62,053	62,720	63,379	64,059
Hillsborough	73,980	74,368	74,788	75,547	76,159	76,762	77,362	77,984	78,596	79,217	79,823
Lake	14,627	14,723	14,841	14,998	15,169	15,340	15,509	15,677	15,849	16,024	16,195
Lee	38,575	39,003	39,332	39,679	40,002	40,317	40,640	40,957	41,274	41,595	41,917
Manatee	21,277	21,406	21,539	21,711	21,877	22,043	22,201	22,359	22,525	22,686	22,845
Miami-Dade	286,662	288,306	290,363	293,188	295,302	297,402	299,472	301,562	303,622	305,703	307,722
Okaloosa	12,289	12,325	12,407	12,480	12,584	12,688	12,797	12,899	12,998	13,102	13,207
Orange	72,663	73,050	73,691	74,273	74,841	75,401	75,953	76,499	77,032	77,568	78,097
Osceola	24,224	24,290	24,512	24,684	24,858	25,027	25,193	25,356	25,516	25,679	25,831
Palm Beach	79,830	80,239	80,865	81,390	81,924	82,451	82,989	83,520	84,038	84,557	85,079
Pasco	20,919	21,036	21,222	21,370	21,584	21,794	22,003	22,210	22,418	22,618	22,823
Pinellas	42,973	43,210	43,480	43,869	44,232	44,597	44,949	45,300	45,657	45,997	46,338
Polk	35,393	35,656	35,942	36,253	36,577	36,910	37,247	37,580	37,917	38,255	38,589
Sarasota	17,748	17,834	17,916	18,144	18,294	18,449	18,603	18,752	18,903	19,058	19,210
Seminole	17,266	17,341	17,445	17,642	17,771	17,897	18,024	18,148	18,268	18,389	18,506
St. Johns	12,299	12,407	12,481	12,660	12,815	12,977	13,139	13,306	13,471	13,642	13,810
Sumter	4,754	4,783	4,819	4,889	4,948	5,007	5,067	5,128	5,191	5,253	5,316
Volusia	21,209	21,275	21,365	21,715	21,920	22,127	22,341	22,547	22,757	22,967	23,182

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:											
	12/26	12/27	12/28	12/29	12/31			1/2			1/4					
Alachua	15,370	15,420	15,473	15,574	15,749	(3,150)	[756]	{378}	15,917	(3,183)	[764]	{382}	16,084	(3,217)	[772]	{386}
Broward	132,193	132,897	133,480	134,582	136,201	(27,240)	[6,538]	{3,269}	137,768	(27,554)	[6,613]	{3,306}	139,308	(27,862)	[6,687]	{3,343}
Charlotte	7,000	7,065	7,128	7,192	7,331	(1,466)	[352]	{176}	7,471	(1,494)	[359]	{179}	7,607	(1,521)	[365]	{183}
Collier	21,558	21,683	22,004	22,132	22,412	(4,482)	[1,076]	{538}	22,689	(4,538)	[1,089]	{545}	22,973	(4,595)	[1,103]	{551}
Duval	57,999	58,296	58,491	59,515	60,778	(12,156)	[2,917]	{1,459}	62,053	(12,411)	[2,979]	{1,489}	63,379	(12,676)	[3,042]	{1,521}
Hillsborough	73,980	74,368	74,788	75,547	76,762	(15,352)	[3,685]	{1,842}	77,984	(15,597)	[3,743]	{1,872}	79,217	(15,843)	[3,802]	{1,901}
Lake	14,627	14,723	14,841	14,998	15,340	(3,068)	[736]	{368}	15,677	(3,135)	[753]	{376}	16,024	(3,205)	[769]	{385}
Lee	38,575	39,003	39,332	39,679	40,317	(8,063)	[1,935]	{968}	40,957	(8,191)	[1,966]	{983}	41,595	(8,319)	[1,997]	{998}
Manatee	21,277	21,406	21,539	21,711	22,043	(4,409)	[1,058]	{529}	22,359	(4,472)	[1,073]	{537}	22,686	(4,537)	[1,089]	{544}
Miami-Dade	286,662	288,306	290,363	293,188	297,402	(59,480)	[14,275]	{7,138}	301,562	(60,312)	[14,475]	{7,237}	305,703	(61,141)	[14,674]	{7,337}
Okaloosa	12,289	12,325	12,407	12,480	12,688	(2,538)	[609]	{305}	12,899	(2,580)	[619]	{310}	13,102	(2,620)	[629]	{314}
Orange	72,663	73,050	73,691	74,273	75,401	(15,080)	[3,619]	{1,810}	76,499	(15,300)	[3,672]	{1,836}	77,568	(15,514)	[3,723]	{1,862}
Osceola	24,224	24,290	24,512	24,684	25,027	(5,005)	[1,201]	{601}	25,356	(5,071)	[1,217]	{609}	25,679	(5,136)	[1,233]	{616}
Palm Beach	79,830	80,239	80,865	81,390	82,451	(16,490)	[3,958]	{1,979}	83,520	(16,704)	[4,009]	{2,004}	84,557	(16,911)	[4,059]	{2,029}
Pasco	20,919	21,036	21,222	21,370	21,794	(4,359)	[1,046]	{523}	22,210	(4,442)	[1,066]	{533}	22,618	(4,524)	[1,086]	{543}
Pinellas	42,973	43,210	43,480	43,869	44,597	(8,919)	[2,141]	{1,070}	45,300	(9,060)	[2,174]	{1,087}	45,997	(9,199)	[2,208]	{1,104}
Polk	35,393	35,656	35,942	36,253	36,910	(7,382)	[1,772]	{886}	37,580	(7,516)	[1,804]	{902}	38,255	(7,651)	[1,836]	{918}
Sarasota	17,748	17,834	17,916	18,144	18,449	(3,690)	[886]	{443}	18,752	(3,750)	[900]	{450}	19,058	(3,812)	[915]	{457}
Seminole	17,266	17,341	17,445	17,642	17,897	(3,579)	[859]	{430}	18,148	(3,630)	[871]	{436}	18,389	(3,678)	[883]	{441}
St. Johns	12,299	12,407	12,481	12,660	12,977	(2,595)	[623]	{311}	13,306	(2,661)	[639]	{319}	13,642	(2,728)	[655]	{327}
Sumter	4,754	4,783	4,819	4,889	5,007	(1,001)	[240]	{120}	5,128	(1,026)	[246]	{123}	5,253	(1,051)	[252]	{126}
Volusia	21,209	21,275	21,365	21,715	22,127	(4,425)	[1,062]	{531}	22,547	(4,509)	[1,082]	{541}	22,967	(4,593)	[1,102]	{551}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.