

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

**Date: 12/23/20**

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 12/23/20 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.**

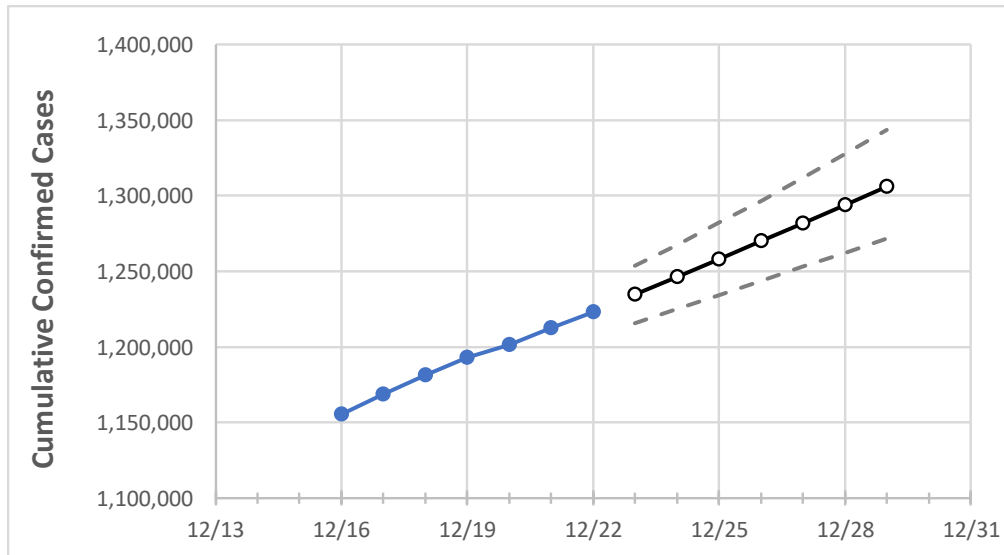
### **IEM's Modeling Lead**

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:						
	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28	12/29
Florida	1,193,165	1,201,566	1,212,581	1,223,015	1,234,558	1,246,363	1,257,979	1,269,909	1,281,789	1,293,817	1,306,151

*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:						
	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28	12/29
Alachua	14,716	14,768	14,890	14,981	15,096	15,212	15,330	15,450	15,569	15,695	15,821
Broward	126,402	127,240	128,157	128,963	129,928	130,876	131,819	132,765	133,733	134,702	135,679
Charlotte	6,475	6,531	6,610	6,665	6,747	6,829	6,911	6,995	7,082	7,167	7,254
Collier	20,770	20,825	20,971	21,050	21,167	21,286	21,403	21,517	21,626	21,736	21,840
Duval	53,885	54,359	54,956	55,553	56,170	56,794	57,422	58,061	58,702	59,360	60,019
Hillsborough	69,530	70,027	70,849	71,388	72,160	72,948	73,755	74,553	75,389	76,250	77,116
Lake	13,341	13,492	13,698	13,863	14,080	14,304	14,539	14,779	15,033	15,291	15,562
Lee	36,520	36,795	37,170	37,507	37,858	38,213	38,568	38,926	39,284	39,649	40,014
Manatee	20,058	20,171	20,355	20,623	20,834	21,048	21,266	21,488	21,718	21,946	22,176
Miami-Dade	272,098	274,117	276,414	278,739	281,101	283,493	285,906	288,313	290,744	293,194	295,650
Okaloosa	11,380	11,456	11,574	11,752	11,875	11,998	12,121	12,245	12,371	12,497	12,622
Orange	68,367	68,858	69,491	70,103	70,868	71,631	72,414	73,195	73,994	74,803	75,612
Osceola	22,863	23,024	23,251	23,417	23,642	23,866	24,097	24,321	24,546	24,772	24,999
Palm Beach	76,143	76,602	77,241	77,743	78,310	78,906	79,485	80,077	80,668	81,262	81,868
Pasco	19,291	19,496	19,787	19,969	20,235	20,518	20,799	21,084	21,373	21,668	21,966
Pinellas	40,299	40,560	40,987	41,280	41,723	42,164	42,625	43,078	43,547	44,016	44,484
Polk	33,142	33,384	33,741	34,032	34,392	34,750	35,121	35,496	35,881	36,266	36,669
Sarasota	16,689	16,817	16,975	17,110	17,255	17,398	17,544	17,685	17,830	17,976	18,120
Seminole	16,241	16,358	16,480	16,627	16,786	16,942	17,100	17,255	17,406	17,558	17,715
St. Johns	11,172	11,300	11,491	11,659	11,828	12,001	12,179	12,364	12,553	12,751	12,953
Sumter	4,357	4,379	4,421	4,534	4,597	4,662	4,732	4,799	4,868	4,941	5,015
Volusia	19,794	19,961	20,157	20,392	20,619	20,852	21,093	21,337	21,588	21,843	22,103

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:											
	12/19	12/20	12/21	12/22	12/24				12/26				12/28			
Alachua	14,716	14,768	14,890	14,981	15,212	(3,042)	[730]	{365}	15,450	(3,090)	[742]	{371}	15,695	(3,139)	[753]	{377}
Broward	126,402	127,240	128,157	128,963	130,876	(26,175)	[6,282]	{3,141}	132,765	(26,553)	[6,373]	{3,186}	134,702	(26,940)	[6,466]	{3,233}
Charlotte	6,475	6,531	6,610	6,665	6,829	(1,366)	[328]	{164}	6,995	(1,399)	[336]	{168}	7,167	(1,433)	[344]	{172}
Collier	20,770	20,825	20,971	21,050	21,286	(4,257)	[1,022]	{511}	21,517	(4,303)	[1,033]	{516}	21,736	(4,347)	[1,043]	{522}
Duval	53,885	54,359	54,956	55,553	56,794	(11,359)	[2,726]	{1,363}	58,061	(11,612)	[2,787]	{1,393}	59,360	(11,872)	[2,849]	{1,425}
Hillsborough	69,530	70,027	70,849	71,388	72,948	(14,590)	[3,501]	{1,751}	74,553	(14,911)	[3,579]	{1,789}	76,250	(15,250)	[3,660]	{1,830}
Lake	13,341	13,492	13,698	13,863	14,304	(2,861)	[687]	{343}	14,779	(2,956)	[709]	{355}	15,291	(3,058)	[734]	{367}
Lee	36,520	36,795	37,170	37,507	38,213	(7,643)	[1,834]	{917}	38,926	(7,785)	[1,868]	{934}	39,649	(7,930)	[1,903]	{952}
Manatee	20,058	20,171	20,355	20,623	21,048	(4,210)	[1,010]	{505}	21,488	(4,298)	[1,031]	{516}	21,946	(4,389)	[1,053]	{527}
Miami-Dade	272,098	274,117	276,414	278,739	283,493	(56,699)	[13,608]	{6,804}	288,313	(57,663)	[13,839]	{6,920}	293,194	(58,639)	[14,073]	{7,037}
Okaloosa	11,380	11,456	11,574	11,752	11,998	(2,400)	[576]	{288}	12,245	(2,449)	[588]	{294}	12,497	(2,499)	[600]	{300}
Orange	68,367	68,858	69,491	70,103	71,631	(14,326)	[3,438]	{1,719}	73,195	(14,639)	[3,513]	{1,757}	74,803	(14,961)	[3,591]	{1,795}
Osceola	22,863	23,024	23,251	23,417	23,866	(4,773)	[1,146]	{573}	24,321	(4,864)	[1,167]	{584}	24,772	(4,954)	[1,189]	{595}
Palm Beach	76,143	76,602	77,241	77,743	78,906	(15,781)	[3,787]	{1,894}	80,077	(16,015)	[3,844]	{1,922}	81,262	(16,252)	[3,901]	{1,950}
Pasco	19,291	19,496	19,787	19,969	20,518	(4,104)	[985]	{492}	21,084	(4,217)	[1,012]	{506}	21,668	(4,334)	[1,040]	{520}
Pinellas	40,299	40,560	40,987	41,280	42,164	(8,433)	[2,024]	{1,012}	43,078	(8,616)	[2,068]	{1,034}	44,016	(8,803)	[2,113]	{1,056}
Polk	33,142	33,384	33,741	34,032	34,750	(6,950)	[1,668]	{834}	35,496	(7,099)	[1,704]	{852}	36,266	(7,253)	[1,741]	{870}
Sarasota	16,689	16,817	16,975	17,110	17,398	(3,480)	[835]	{418}	17,685	(3,537)	[849]	{424}	17,976	(3,595)	[863]	{431}
Seminole	16,241	16,358	16,480	16,627	16,942	(3,388)	[813]	{407}	17,255	(3,451)	[828]	{414}	17,558	(3,512)	[843]	{421}
St. Johns	11,172	11,300	11,491	11,659	12,001	(2,400)	[576]	{288}	12,364	(2,473)	[593]	{297}	12,751	(2,550)	[612]	{306}
Sumter	4,357	4,379	4,421	4,534	4,662	(932)	[224]	{112}	4,799	(960)	[230]	{115}	4,941	(988)	[237]	{119}
Volusia	19,794	19,961	20,157	20,392	20,852	(4,170)	[1,001]	{500}	21,337	(4,267)	[1,024]	{512}	21,843	(4,369)	[1,048]	{524}

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.