

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/14/20**

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 12/14/20 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.**

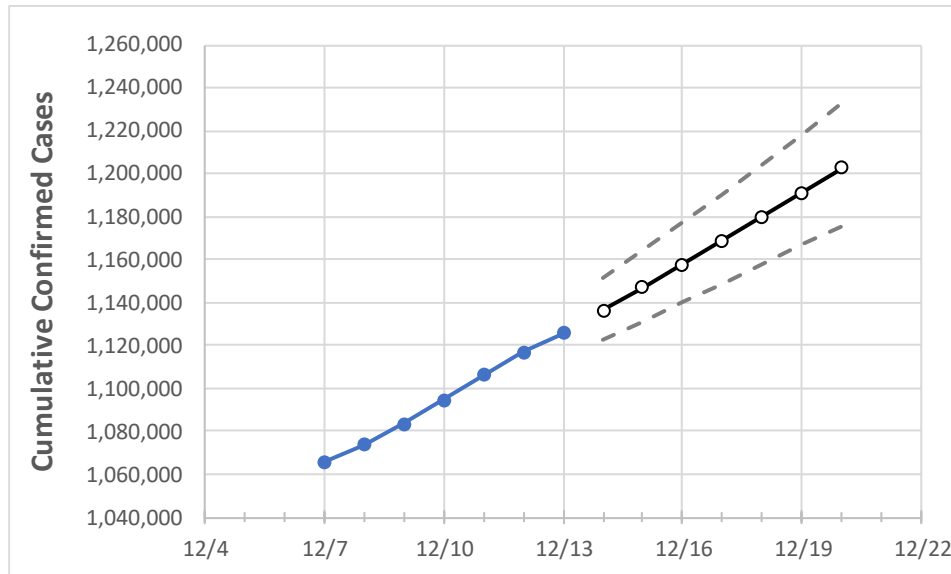
**IEM's Modeling Lead**

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:						
	12/10	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20
Florida	1,094,697	1,106,396	1,116,973	1,125,931	1,136,404	1,147,038	1,157,833	1,168,792	1,179,917	1,191,211	1,202,674

*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:							
	12/10	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	
Alachua	13,782	13,869	13,971	14,039	14,134	14,230	14,328	14,428	14,530	14,634	14,739	
Broward	117,525	118,512	119,429	120,166	121,150	122,138	123,129	124,123	125,121	126,122	127,127	
Charlotte	5,840	5,923	6,004	6,066	6,150	6,237	6,326	6,416	6,510	6,605	6,703	
Collier	19,496	19,684	19,854	19,935	20,094	20,256	20,420	20,586	20,754	20,925	21,099	
Duval	48,732	49,320	49,697	50,230	50,730	51,235	51,746	52,262	52,783	53,310	53,842	
Hillsborough	63,339	64,281	64,999	65,502	66,064	66,640	67,231	67,837	68,459	69,096	69,750	
Lake	11,798	11,985	12,136	12,291	12,450	12,618	12,793	12,978	13,172	13,376	13,590	
Lee	33,431	33,829	34,177	34,478	34,835	35,196	35,563	35,934	36,311	36,692	37,079	
Manatee	18,351	18,512	18,720	18,812	18,963	19,115	19,268	19,422	19,578	19,735	19,893	
Miami-Dade	251,283	253,403	255,462	257,857	260,121	262,399	264,693	267,002	269,327	271,666	274,022	
Okaloosa	10,326	10,472	10,647	10,728	10,865	11,006	11,152	11,301	11,455	11,614	11,777	
Orange	61,697	62,522	63,281	63,814	64,515	65,234	65,971	66,726	67,500	68,293	69,105	
Osceola	20,818	21,056	21,268	21,416	21,667	21,925	22,189	22,460	22,737	23,021	23,313	
Palm Beach	70,966	71,691	72,247	72,708	73,287	73,871	74,462	75,058	75,661	76,269	76,883	
Pasco	16,988	17,315	17,578	17,810	18,068	18,334	18,608	18,891	19,181	19,480	19,788	
Pinellas	36,426	36,962	37,387	37,753	38,171	38,603	39,048	39,507	39,981	40,470	40,974	
Polk	30,365	30,628	30,967	31,173	31,498	31,834	32,183	32,544	32,917	33,304	33,705	
Sarasota	15,342	15,527	15,659	15,793	15,943	16,092	16,242	16,391	16,540	16,689	16,838	
Seminole	14,765	14,982	15,175	15,297	15,489	15,688	15,895	16,111	16,335	16,568	16,810	
St. Johns	9,942	10,080	10,215	10,331	10,457	10,584	10,714	10,846	10,979	11,115	11,253	
Sumter	3,893	3,947	3,987	4,015	4,066	4,119	4,175	4,234	4,295	4,358	4,425	
Volusia	18,042	18,239	18,419	18,585	18,762	18,942	19,126	19,314	19,504	19,699	19,897	

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:											
	12/10	12/11	12/12	12/13	12/15				12/17				12/19			
Alachua	13,782	13,869	13,971	14,039	14,230	(2,846)	[683]	{342}	14,428	(2,886)	[693]	{346}	14,634	(2,927)	[702]	{351}
Broward	117,525	118,512	119,429	120,166	122,138	(24,428)	[5,863]	{2,931}	124,123	(24,825)	[5,958]	{2,979}	126,122	(25,224)	[6,054]	{3,027}
Charlotte	5,840	5,923	6,004	6,066	6,237	(1,247)	[299]	{150}	6,416	(1,283)	[308]	{154}	6,605	(1,321)	[317]	{159}
Collier	19,496	19,684	19,854	19,935	20,256	(4,051)	[972]	{486}	20,586	(4,117)	[988]	{494}	20,925	(4,185)	[1,004]	{502}
Duval	48,732	49,320	49,697	50,230	51,235	(10,247)	[2,459]	{1,230}	52,262	(10,452)	[2,509]	{1,254}	53,310	(10,662)	[2,559]	{1,279}
Hillsborough	63,339	64,281	64,999	65,502	66,640	(13,328)	[3,199]	{1,599}	67,837	(13,567)	[3,256]	{1,628}	69,096	(13,819)	[3,317]	{1,658}
Lake	11,798	11,985	12,136	12,291	12,618	(2,524)	[606]	{303}	12,978	(2,596)	[623]	{311}	13,376	(2,675)	[642]	{321}
Lee	33,431	33,829	34,177	34,478	35,196	(7,039)	[1,689]	{845}	35,934	(7,187)	[1,725]	{862}	36,692	(7,338)	[1,761]	{881}
Manatee	18,351	18,512	18,720	18,812	19,115	(3,823)	[918]	{459}	19,422	(3,884)	[932]	{466}	19,735	(3,947)	[947]	{474}
Miami-Dade	251,283	253,403	255,462	257,857	262,399	(52,480)	[12,595]	{6,298}	267,002	(53,400)	[12,816]	{6,408}	271,666	(54,333)	[13,040]	{6,520}
Okaloosa	10,326	10,472	10,647	10,728	11,006	(2,201)	[528]	{264}	11,301	(2,260)	[542]	{271}	11,614	(2,323)	[557]	{279}
Orange	61,697	62,522	63,281	63,814	65,234	(13,047)	[3,131]	{1,566}	66,726	(13,345)	[3,203]	{1,601}	68,293	(13,659)	[3,278]	{1,639}
Osceola	20,818	21,056	21,268	21,416	21,925	(4,385)	[1,052]	{526}	22,460	(4,492)	[1,078]	{539}	23,021	(4,604)	[1,105]	{553}
Palm Beach	70,966	71,691	72,247	72,708	73,871	(14,774)	[3,546]	{1,773}	75,058	(15,012)	[3,603]	{1,801}	76,269	(15,254)	[3,661]	{1,830}
Pasco	16,988	17,315	17,578	17,810	18,334	(3,667)	[880]	{440}	18,891	(3,778)	[907]	{453}	19,480	(3,896)	[935]	{468}
Pinellas	36,426	36,962	37,387	37,753	38,603	(7,721)	[1,853]	{926}	39,507	(7,901)	[1,896]	{948}	40,470	(8,094)	[1,943]	{971}
Polk	30,365	30,628	30,967	31,173	31,834	(6,367)	[1,528]	{764}	32,544	(6,509)	[1,562]	{781}	33,304	(6,661)	[1,599]	{799}
Sarasota	15,342	15,527	15,659	15,793	16,092	(3,218)	[772]	{386}	16,391	(3,278)	[787]	{393}	16,689	(3,338)	[801]	{401}
Seminole	14,765	14,982	15,175	15,297	15,688	(3,138)	[753]	{377}	16,111	(3,222)	[773]	{387}	16,568	(3,314)	[795]	{398}
St. Johns	9,942	10,080	10,215	10,331	10,584	(2,117)	[508]	{254}	10,846	(2,169)	[521]	{260}	11,115	(2,223)	[534]	{267}
Sumter	3,893	3,947	3,987	4,015	4,119	(824)	[198]	{99}	4,234	(847)	[203]	{102}	4,358	(872)	[209]	{105}
Volusia	18,042	18,239	18,419	18,585	18,942	(3,788)	[909]	{455}	19,314	(3,863)	[927]	{464}	19,699	(3,940)	[946]	{473}

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.