

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/29/20**

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 12/29/20 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.

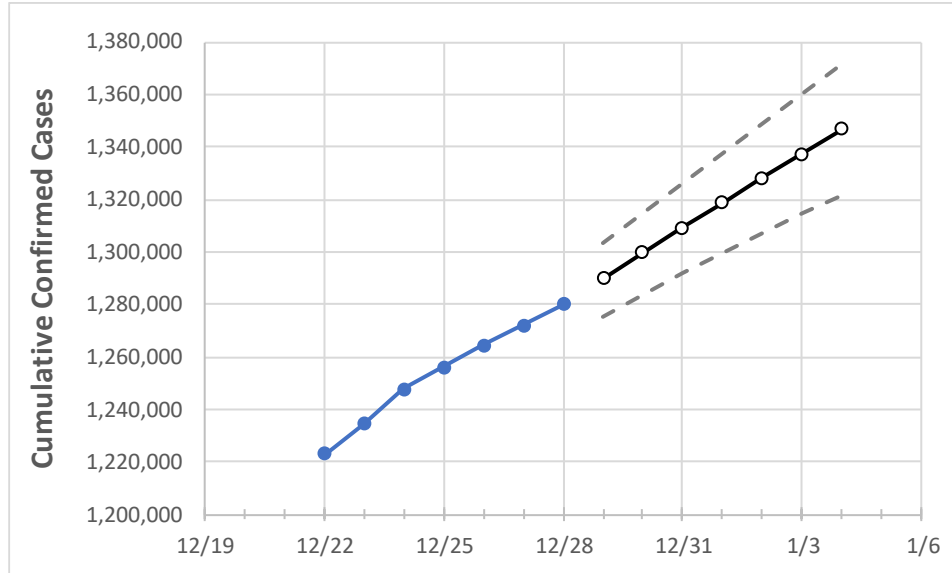
IEM's Modeling Lead

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:							
	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4	
Florida	1,256,067	1,264,588	1,271,979	1,280,177	1,289,879	1,299,593	1,309,157	1,318,606	1,328,205	1,337,485	1,346,690	

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:						
	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4
Alachua	15,276	15,370	15,420	15,473	15,559	15,644	15,728	15,810	15,893	15,974	16,053
Broward	131,586	132,193	132,897	133,480	134,271	135,058	135,809	136,567	137,329	138,063	138,789
Charlotte	6,927	7,000	7,065	7,128	7,197	7,261	7,331	7,399	7,467	7,535	7,600
Collier	21,493	21,558	21,683	22,004	22,144	22,290	22,428	22,568	22,710	22,855	23,001
Duval	57,525	57,999	58,296	58,491	59,028	59,559	60,106	60,643	61,188	61,727	62,272
Hillsborough	73,420	73,980	74,368	74,788	75,391	76,003	76,614	77,230	77,821	78,442	79,046
Lake	14,454	14,627	14,723	14,841	15,016	15,197	15,373	15,548	15,723	15,903	16,085
Lee	38,432	38,575	39,003	39,332	39,648	39,963	40,280	40,597	40,900	41,214	41,521
Manatee	21,154	21,277	21,406	21,539	21,703	21,868	22,023	22,181	22,341	22,495	22,650
Miami-Dade	284,974	286,662	288,306	290,363	292,331	294,299	296,220	298,143	300,016	301,861	303,684
Okaloosa	12,195	12,289	12,325	12,407	12,524	12,643	12,753	12,868	12,981	13,094	13,205
Orange	72,094	72,663	73,050	73,691	74,271	74,841	75,403	75,966	76,527	77,076	77,614
Osceola	24,062	24,224	24,290	24,512	24,679	24,846	25,012	25,174	25,331	25,488	25,640
Palm Beach	79,341	79,830	80,239	80,865	81,416	81,965	82,522	83,060	83,605	84,157	84,706
Pasco	20,697	20,919	21,036	21,222	21,437	21,650	21,864	22,077	22,287	22,497	22,707
Pinellas	42,575	42,973	43,210	43,480	43,835	44,194	44,539	44,883	45,223	45,565	45,916
Polk	35,119	35,393	35,656	35,942	36,280	36,620	36,958	37,298	37,640	37,986	38,338
Sarasota	17,612	17,748	17,834	17,916	18,053	18,187	18,320	18,452	18,584	18,712	18,842
Seminole	17,131	17,266	17,341	17,445	17,563	17,678	17,796	17,907	18,021	18,128	18,234
St. Johns	12,151	12,299	12,407	12,481	12,636	12,791	12,948	13,104	13,263	13,420	13,582
Sumter	4,706	4,754	4,783	4,819	4,871	4,923	4,978	5,031	5,084	5,137	5,190
Volusia	21,052	21,209	21,275	21,365	21,544	21,720	21,896	22,071	22,248	22,424	22,595

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:											
	12/25	12/26	12/27	12/28	12/30			1/1			1/3					
Alachua	15,276	15,370	15,420	15,473	15,644	(3,129)	[751]	{375}	15,810	(3,162)	[759]	{379}	15,974	(3,195)	[767]	{383}
Broward	131,586	132,193	132,897	133,480	135,058	(27,012)	[6,483]	{3,241}	136,567	(27,313)	[6,555]	{3,278}	138,063	(27,613)	[6,627]	{3,314}
Charlotte	6,927	7,000	7,065	7,128	7,261	(1,452)	[349]	{174}	7,399	(1,480)	[355]	{178}	7,535	(1,507)	[362]	{181}
Collier	21,493	21,558	21,683	22,004	22,290	(4,458)	[1,070]	{535}	22,568	(4,514)	[1,083]	{542}	22,855	(4,571)	[1,097]	{549}
Duval	57,525	57,999	58,296	58,491	59,559	(11,912)	[2,859]	{1,429}	60,643	(12,129)	[2,911]	{1,455}	61,727	(12,345)	[2,963]	{1,481}
Hillsborough	73,420	73,980	74,368	74,788	76,003	(15,201)	[3,648]	{1,824}	77,230	(15,446)	[3,707]	{1,854}	78,442	(15,688)	[3,765]	{1,883}
Lake	14,454	14,627	14,723	14,841	15,197	(3,039)	[729]	{365}	15,548	(3,110)	[746]	{373}	15,903	(3,181)	[763]	{382}
Lee	38,432	38,575	39,003	39,332	39,963	(7,993)	[1,918]	{959}	40,597	(8,119)	[1,949]	{974}	41,214	(8,243)	[1,978]	{989}
Manatee	21,154	21,277	21,406	21,539	21,868	(4,374)	[1,050]	{525}	22,181	(4,436)	[1,065]	{532}	22,495	(4,499)	[1,080]	{540}
Miami-Dade	284,974	286,662	288,306	290,363	294,299	(58,860)	[14,126]	{7,063}	298,143	(59,629)	[14,311]	{7,155}	301,861	(60,372)	[14,489]	{7,245}
Okaloosa	12,195	12,289	12,325	12,407	12,643	(2,529)	[607]	{303}	12,868	(2,574)	[618]	{309}	13,094	(2,619)	[629]	{314}
Orange	72,094	72,663	73,050	73,691	74,841	(14,968)	[3,592]	{1,796}	75,966	(15,193)	[3,646]	{1,823}	77,076	(15,415)	[3,700]	{1,850}
Osceola	24,062	24,224	24,290	24,512	24,846	(4,969)	[1,193]	{596}	25,174	(5,035)	[1,208]	{604}	25,488	(5,098)	[1,223]	{612}
Palm Beach	79,341	79,830	80,239	80,865	81,965	(16,393)	[3,934]	{1,967}	83,060	(16,612)	[3,987]	{1,993}	84,157	(16,831)	[4,040]	{2,020}
Pasco	20,697	20,919	21,036	21,222	21,650	(4,330)	[1,039]	{520}	22,077	(4,415)	[1,060]	{530}	22,497	(4,499)	[1,080]	{540}
Pinellas	42,575	42,973	43,210	43,480	44,194	(8,839)	[2,121]	{1,061}	44,883	(8,977)	[2,154]	{1,077}	45,565	(9,113)	[2,187]	{1,094}
Polk	35,119	35,393	35,656	35,942	36,620	(7,324)	[1,758]	{879}	37,298	(7,460)	[1,790]	{895}	37,986	(7,597)	[1,823]	{912}
Sarasota	17,612	17,748	17,834	17,916	18,187	(3,637)	[873]	{436}	18,452	(3,690)	[886]	{443}	18,712	(3,742)	[898]	{449}
Seminole	17,131	17,266	17,341	17,445	17,678	(3,536)	[849]	{424}	17,907	(3,581)	[860]	{430}	18,128	(3,626)	[870]	{435}
St. Johns	12,151	12,299	12,407	12,481	12,791	(2,558)	[614]	{307}	13,104	(2,621)	[629]	{314}	13,420	(2,684)	[644]	{322}
Sumter	4,706	4,754	4,783	4,819	4,923	(985)	[236]	{118}	5,031	(1,006)	[241]	{121}	5,137	(1,027)	[247]	{123}
Volusia	21,052	21,209	21,275	21,365	21,720	(4,344)	[1,043]	{521}	22,071	(4,414)	[1,059]	{530}	22,424	(4,485)	[1,076]	{538}

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.