

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/29/21**

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 1/29/21 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.

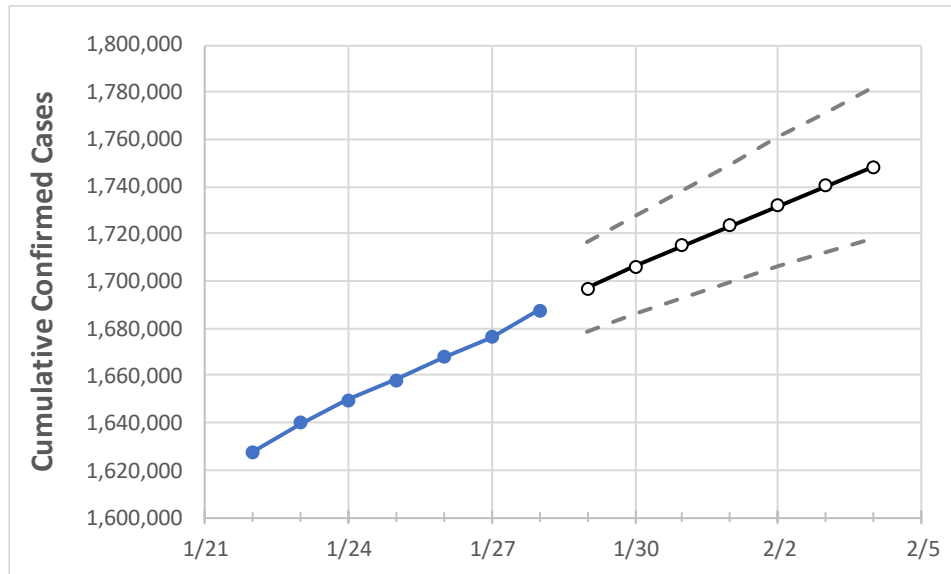
IEM's Modeling Lead

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:							
	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4	
Florida	1,658,169	1,667,763	1,676,171	1,687,594	1,696,993	1,706,026	1,714,932	1,723,508	1,732,054	1,740,481	1,748,605	

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 10%, and are often within 5%, of actual confirmed cases.

Florida Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4	
Alachua	19,799	19,928	20,062	20,227	20,343	20,456	20,571	20,684	20,793	20,903	21,010	
Broward	167,025	168,000	168,653	169,691	170,598	171,480	172,340	173,226	174,064	174,866	175,672	
Charlotte	9,410	9,442	9,493	9,550	9,590	9,630	9,668	9,704	9,740	9,772	9,803	
Collier	26,924	27,060	27,214	27,416	27,547	27,680	27,810	27,936	28,062	28,190	28,312	
Duval	78,776	79,090	79,391	79,790	80,116	80,440	80,747	81,038	81,330	81,600	81,856	
Hillsborough	97,288	97,809	98,230	98,900	99,393	99,869	100,348	100,811	101,260	101,692	102,111	
Lake	20,797	20,972	21,131	21,343	21,506	21,668	21,831	21,991	22,148	22,304	22,459	
Lee	50,892	51,203	51,455	51,814	52,107	52,390	52,672	52,945	53,214	53,482	53,738	
Manatee	27,464	27,641	27,716	27,924	28,065	28,205	28,343	28,488	28,624	28,763	28,892	
Miami-Dade	360,831	362,601	364,123	366,127	367,868	369,580	371,230	372,900	374,489	376,017	377,547	
Okaloosa	15,988	16,135	16,235	16,402	16,503	16,602	16,700	16,795	16,891	16,983	17,072	
Orange	99,143	99,849	100,571	101,246	101,882	102,525	103,138	103,734	104,361	104,949	105,509	
Osceola	32,427	32,599	32,760	32,977	33,170	33,358	33,544	33,720	33,893	34,067	34,232	
Palm Beach	102,968	103,495	103,862	104,693	105,291	105,888	106,458	107,027	107,555	108,109	108,645	
Pasco	28,466	28,624	28,795	29,020	29,194	29,366	29,534	29,700	29,860	30,015	30,168	
Pinellas	57,197	57,493	57,774	58,125	58,420	58,712	58,996	59,267	59,532	59,788	60,040	
Polk	48,371	48,656	48,974	49,348	49,656	49,959	50,251	50,536	50,822	51,098	51,368	
Sarasota	23,878	23,963	24,042	24,119	24,215	24,315	24,405	24,494	24,582	24,663	24,749	
Seminole	23,195	23,404	23,548	23,746	23,891	24,032	24,171	24,309	24,442	24,579	24,709	
St. Johns	17,573	17,695	17,784	17,918	18,014	18,108	18,201	18,290	18,377	18,458	18,537	
Sumter	6,777	6,818	6,867	6,933	6,976	7,017	7,058	7,098	7,137	7,175	7,212	
Volusia	29,371	29,574	29,740	29,929	30,123	30,318	30,505	30,690	30,870	31,042	31,222	

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:											
	1/25	1/26	1/27	1/28	1/30				2/1				2/3			
Alachua	19,799	19,928	20,062	20,227	20,456	(4,091)	[982]	{491}	20,684	(4,137)	[993]	{496}	20,903	(4,181)	[1,003]	{502}
Broward	167,025	168,000	168,653	169,691	171,480	(34,296)	[8,231]	{4,116}	173,226	(34,645)	[8,315]	{4,157}	174,866	(34,973)	[8,394]	{4,197}
Charlotte	9,410	9,442	9,493	9,550	9,630	(1,926)	[462]	{231}	9,704	(1,941)	[466]	{233}	9,772	(1,954)	[469]	{235}
Collier	26,924	27,060	27,214	27,416	27,680	(5,536)	[1,329]	{664}	27,936	(5,587)	[1,341]	{670}	28,190	(5,638)	[1,353]	{677}
Duval	78,776	79,090	79,391	79,790	80,440	(16,088)	[3,861]	{1,931}	81,038	(16,208)	[3,890]	{1,945}	81,600	(16,320)	[3,917]	{1,958}
Hillsborough	97,288	97,809	98,230	98,900	99,869	(19,974)	[4,794]	{2,397}	100,811	(20,162)	[4,839]	{2,419}	101,692	(20,338)	[4,881]	{2,441}
Lake	20,797	20,972	21,131	21,343	21,668	(4,334)	[1,040]	{520}	21,991	(4,398)	[1,056]	{528}	22,304	(4,461)	[1,071]	{535}
Lee	50,892	51,203	51,455	51,814	52,390	(10,478)	[2,515]	{1,257}	52,945	(10,589)	[2,541]	{1,271}	53,482	(10,696)	[2,567]	{1,284}
Manatee	27,464	27,641	27,716	27,924	28,205	(5,641)	[1,354]	{677}	28,488	(5,698)	[1,367]	{684}	28,763	(5,753)	[1,381]	{690}
Miami-Dade	360,831	362,601	364,123	366,127	369,580	(73,916)	[17,740]	{8,870}	372,900	(74,580)	[17,899]	{8,950}	376,017	(75,203)	[18,049]	{9,024}
Okaloosa	15,988	16,135	16,235	16,402	16,602	(3,320)	[797]	{398}	16,795	(3,359)	[806]	{403}	16,983	(3,397)	[815]	{408}
Orange	99,143	99,849	100,571	101,246	102,525	(20,505)	[4,921]	{2,461}	103,734	(20,747)	[4,979]	{2,490}	104,949	(20,990)	[5,038]	{2,519}
Osceola	32,427	32,599	32,760	32,977	33,358	(6,672)	[1,601]	{801}	33,720	(6,744)	[1,619]	{809}	34,067	(6,813)	[1,635]	{818}
Palm Beach	102,968	103,495	103,862	104,693	105,888	(21,178)	[5,083]	{2,541}	107,027	(21,405)	[5,137]	{2,569}	108,109	(21,622)	[5,189]	{2,595}
Pasco	28,466	28,624	28,795	29,020	29,366	(5,873)	[1,410]	{705}	29,700	(5,940)	[1,426]	{713}	30,015	(6,003)	[1,441]	{720}
Pinellas	57,197	57,493	57,774	58,125	58,712	(11,742)	[2,818]	{1,409}	59,267	(11,853)	[2,845]	{1,422}	59,788	(11,958)	[2,870]	{1,435}
Polk	48,371	48,656	48,974	49,348	49,959	(9,992)	[2,398]	{1,199}	50,536	(10,107)	[2,426]	{1,213}	51,098	(10,220)	[2,453]	{1,226}
Sarasota	23,878	23,963	24,042	24,119	24,315	(4,863)	[1,167]	{584}	24,494	(4,899)	[1,176]	{588}	24,663	(4,933)	[1,184]	{592}
Seminole	23,195	23,404	23,548	23,746	24,032	(4,806)	[1,154]	{577}	24,309	(4,862)	[1,167]	{583}	24,579	(4,916)	[1,180]	{590}
St. Johns	17,573	17,695	17,784	17,918	18,108	(3,622)	[869]	{435}	18,290	(3,658)	[878]	{439}	18,458	(3,692)	[886]	{443}
Sumter	6,777	6,818	6,867	6,933	7,017	(1,403)	[337]	{168}	7,098	(1,420)	[341]	{170}	7,175	(1,435)	[344]	{172}
Volusia	29,371	29,574	29,740	29,929	30,318	(6,064)	[1,455]	{728}	30,690	(6,138)	[1,473]	{737}	31,042	(6,208)	[1,490]	{745}

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.