

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/22/21**

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 1/22/21 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.

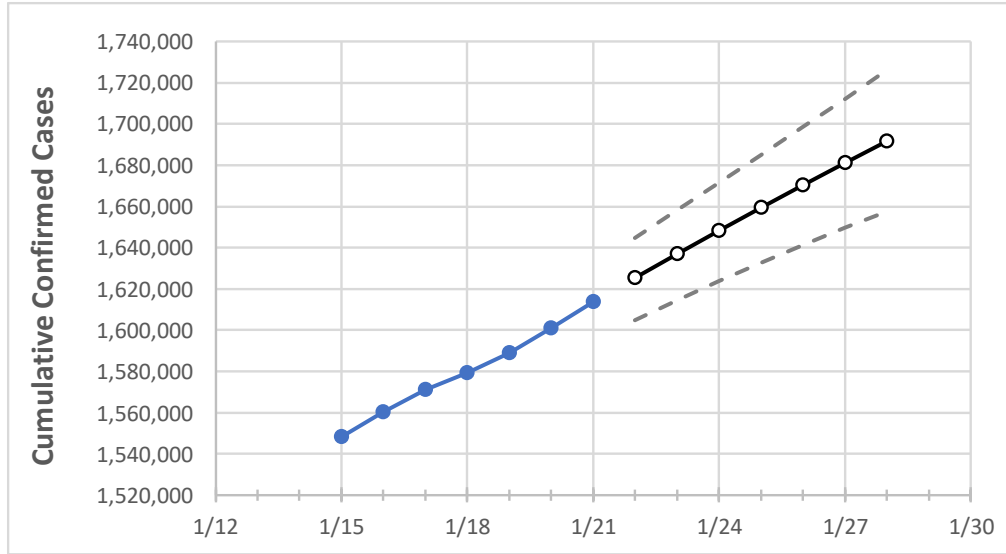
IEM's Modeling Lead

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:						
	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28
Florida	1,579,281	1,589,097	1,601,011	1,613,884	1,625,457	1,637,101	1,648,353	1,659,465	1,670,476	1,681,162	1,691,518

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:						
	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28
Alachua	18,862	18,986	19,136	19,274	19,440	19,601	19,760	19,925	20,084	20,247	20,411
Broward	159,670	160,514	161,624	162,720	163,808	164,893	165,973	167,027	168,059	169,111	170,149
Charlotte	9,023	9,059	9,138	9,195	9,259	9,320	9,382	9,442	9,501	9,558	9,615
Collier	25,874	25,979	26,164	26,361	26,536	26,713	26,884	27,057	27,224	27,390	27,560
Duval	75,178	75,731	76,171	76,707	77,208	77,710	78,212	78,696	79,196	79,669	80,140
Hillsborough	92,891	93,487	94,012	94,870	95,609	96,325	97,028	97,731	98,429	99,115	99,795
Lake	19,547	19,713	19,897	20,128	20,319	20,509	20,699	20,886	21,069	21,252	21,433
Lee	48,438	48,778	49,116	49,493	49,843	50,187	50,523	50,848	51,172	51,487	51,794
Manatee	26,175	26,267	26,602	26,755	26,936	27,119	27,298	27,475	27,652	27,823	28,003
Miami-Dade	346,090	347,965	350,252	352,405	354,625	356,812	359,004	361,131	363,268	365,363	367,463
Okaloosa	15,227	15,282	15,451	15,549	15,682	15,817	15,946	16,081	16,212	16,345	16,480
Orange	93,599	94,273	95,406	96,170	97,036	97,889	98,717	99,549	100,388	101,222	102,040
Osceola	30,692	30,920	31,205	31,498	31,768	32,028	32,287	32,546	32,807	33,063	33,320
Palm Beach	98,067	98,692	99,379	100,208	100,983	101,755	102,516	103,293	104,052	104,830	105,603
Pasco	27,006	27,190	27,367	27,610	27,830	28,040	28,244	28,443	28,641	28,835	29,019
Pinellas	54,529	54,924	55,241	55,564	55,931	56,286	56,640	56,991	57,331	57,651	57,964
Polk	45,853	46,137	46,486	46,855	47,222	47,579	47,929	48,275	48,619	48,948	49,268
Sarasota	22,705	22,895	23,037	23,227	23,401	23,576	23,744	23,912	24,080	24,234	24,388
Seminole	22,054	22,161	22,373	22,574	22,753	22,934	23,111	23,288	23,462	23,636	23,799
St. Johns	16,673	16,763	16,887	17,044	17,182	17,315	17,444	17,568	17,692	17,814	17,935
Sumter	6,461	6,485	6,553	6,605	6,658	6,707	6,757	6,807	6,856	6,904	6,952
Volusia	27,542	27,790	28,015	28,289	28,547	28,798	29,044	29,295	29,540	29,778	30,022

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:											
	1/18	1/19	1/20	1/21	1/23				1/25				1/27			
Alachua	18,862	18,986	19,136	19,274	19,601	(3,920)	[941]	{470}	19,925	(3,985)	[956]	{478}	20,247	(4,049)	[972]	{486}
Broward	159,670	160,514	161,624	162,720	164,893	(32,979)	[7,915]	{3,957}	167,027	(33,405)	[8,017]	{4,009}	169,111	(33,822)	[8,117]	{4,059}
Charlotte	9,023	9,059	9,138	9,195	9,320	(1,864)	[447]	{224}	9,442	(1,888)	[453]	{227}	9,558	(1,912)	[459]	{229}
Collier	25,874	25,979	26,164	26,361	26,713	(5,343)	[1,282]	{641}	27,057	(5,411)	[1,299]	{649}	27,390	(5,478)	[1,315]	{657}
Duval	75,178	75,731	76,171	76,707	77,710	(15,542)	[3,730]	{1,865}	78,696	(15,739)	[3,777]	{1,889}	79,669	(15,934)	[3,824]	{1,912}
Hillsborough	92,891	93,487	94,012	94,870	96,325	(19,265)	[4,624]	{2,312}	97,731	(19,546)	[4,691]	{2,346}	99,115	(19,823)	[4,758]	{2,379}
Lake	19,547	19,713	19,897	20,128	20,509	(4,102)	[984]	{492}	20,886	(4,177)	[1,003]	{501}	21,252	(4,250)	[1,020]	{510}
Lee	48,438	48,778	49,116	49,493	50,187	(10,037)	[2,409]	{1,204}	50,848	(10,170)	[2,441]	{1,220}	51,487	(10,297)	[2,471]	{1,236}
Manatee	26,175	26,267	26,602	26,755	27,119	(5,424)	[1,302]	{651}	27,475	(5,495)	[1,319]	{659}	27,823	(5,565)	[1,336]	{668}
Miami-Dade	346,090	347,965	350,252	352,405	356,812	(71,362)	[17,127]	{8,563}	361,131	(72,226)	[17,334]	{8,667}	365,363	(73,073)	[17,537]	{8,769}
Okaloosa	15,227	15,282	15,451	15,549	15,817	(3,163)	[759]	{380}	16,081	(3,216)	[772]	{386}	16,345	(3,269)	[785]	{392}
Orange	93,599	94,273	95,406	96,170	97,889	(19,578)	[4,699]	{2,349}	99,549	(19,910)	[4,778]	{2,389}	101,222	(20,244)	[4,859]	{2,429}
Osceola	30,692	30,920	31,205	31,498	32,028	(6,406)	[1,537]	{769}	32,546	(6,509)	[1,562]	{781}	33,063	(6,613)	[1,587]	{794}
Palm Beach	98,067	98,692	99,379	100,208	101,755	(20,351)	[4,884]	{2,442}	103,293	(20,659)	[4,958]	{2,479}	104,830	(20,966)	[5,032]	{2,516}
Pasco	27,006	27,190	27,367	27,610	28,040	(5,608)	[1,346]	{673}	28,443	(5,689)	[1,365]	{683}	28,835	(5,767)	[1,384]	{692}
Pinellas	54,529	54,924	55,241	55,564	56,286	(11,257)	[2,702]	{1,351}	56,991	(11,398)	[2,736]	{1,368}	57,651	(11,530)	[2,767]	{1,384}
Polk	45,853	46,137	46,486	46,855	47,579	(9,516)	[2,284]	{1,142}	48,275	(9,655)	[2,317]	{1,159}	48,948	(9,790)	[2,350]	{1,175}
Sarasota	22,705	22,895	23,037	23,227	23,576	(4,715)	[1,132]	{566}	23,912	(4,782)	[1,148]	{574}	24,234	(4,847)	[1,163]	{582}
Seminole	22,054	22,161	22,373	22,574	22,934	(4,587)	[1,101]	{550}	23,288	(4,658)	[1,118]	{559}	23,636	(4,727)	[1,135]	{567}
St. Johns	16,673	16,763	16,887	17,044	17,315	(3,463)	[831]	{416}	17,568	(3,514)	[843]	{422}	17,814	(3,563)	[855]	{428}
Sumter	6,461	6,485	6,553	6,605	6,707	(1,341)	[322]	{161}	6,807	(1,361)	[327]	{163}	6,904	(1,381)	[331]	{166}
Volusia	27,542	27,790	28,015	28,289	28,798	(5,760)	[1,382]	{691}	29,295	(5,859)	[1,406]	{703}	29,778	(5,956)	[1,429]	{715}

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.