

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/12/21**

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 1/12/21 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.

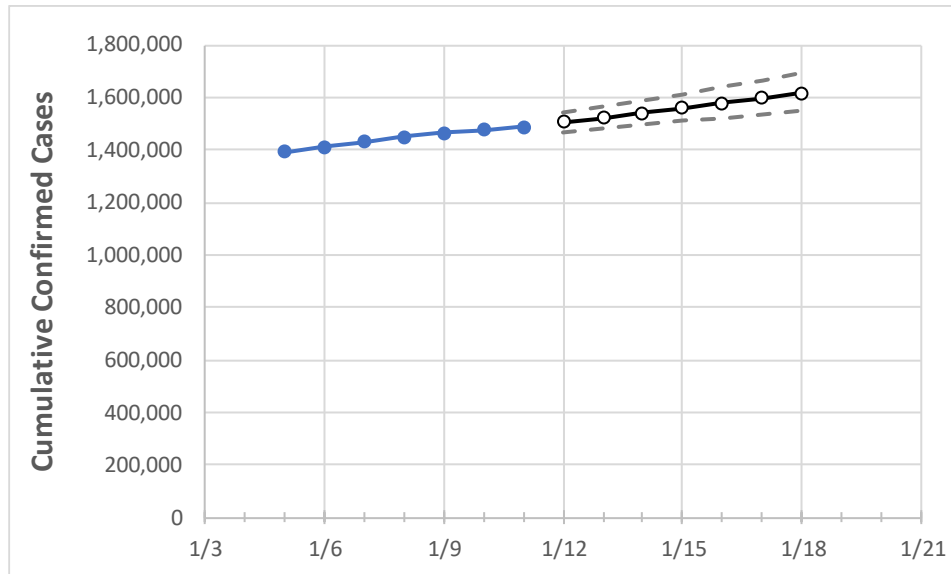
IEM's Modeling Lead

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:						
	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18
Florida	1,449,252	1,464,697	1,477,010	1,488,586	1,505,588	1,523,039	1,540,686	1,558,674	1,576,988	1,596,481	1,615,469

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:						
	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18
Alachua	17,254	17,430	17,614	17,727	17,927	18,132	18,344	18,565	18,791	19,026	19,274
Broward	147,944	149,168	150,371	151,524	152,981	154,478	156,030	157,591	159,199	160,847	162,536
Charlotte	8,293	8,382	8,456	8,522	8,633	8,746	8,860	8,974	9,093	9,214	9,336
Collier	24,012	24,304	24,443	24,575	24,784	24,995	25,211	25,430	25,648	25,878	26,116
Duval	68,971	69,773	70,524	70,905	71,886	72,886	73,919	74,980	76,047	77,095	78,210
Hillsborough	84,714	85,855	86,509	87,511	88,547	89,605	90,714	91,831	92,966	94,135	95,318
Lake	17,489	17,742	17,973	18,142	18,405	18,672	18,940	19,216	19,498	19,783	20,073
Lee	44,395	44,819	45,282	45,650	46,157	46,674	47,200	47,735	48,274	48,830	49,383
Manatee	24,278	24,530	24,755	24,871	25,132	25,401	25,683	25,965	26,255	26,545	26,842
Miami-Dade	321,555	324,260	326,607	328,701	331,604	334,567	337,536	340,487	343,487	346,551	349,595
Okaloosa	13,952	14,131	14,233	14,313	14,458	14,603	14,749	14,899	15,046	15,196	15,349
Orange	84,854	85,875	86,634	87,688	88,891	90,127	91,379	92,696	94,048	95,429	96,867
Osceola	27,934	28,251	28,480	28,827	29,181	29,545	29,914	30,296	30,682	31,080	31,500
Palm Beach	90,058	91,049	91,711	92,542	93,550	94,593	95,670	96,753	97,873	99,074	100,246
Pasco	24,363	24,663	24,942	25,224	25,545	25,870	26,197	26,536	26,887	27,226	27,577
Pinellas	49,771	50,491	50,978	51,384	52,029	52,699	53,377	54,067	54,787	55,493	56,242
Polk	41,620	42,056	42,422	42,880	43,441	44,018	44,603	45,196	45,803	46,424	47,058
Sarasota	20,774	21,017	21,223	21,328	21,609	21,899	22,194	22,496	22,807	23,119	23,444
Seminole	20,103	20,328	20,464	20,616	20,876	21,135	21,402	21,671	21,952	22,237	22,529
St. Johns	15,000	15,165	15,329	15,492	15,732	15,981	16,228	16,483	16,746	17,007	17,277
Sumter	5,829	5,904	5,975	6,029	6,130	6,236	6,344	6,458	6,572	6,690	6,807
Volusia	24,890	25,200	25,461	25,624	25,954	26,295	26,652	27,013	27,381	27,780	28,175

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:											
	1/8	1/9	1/10	1/11	1/13				1/15				1/17			
Alachua	17,254	17,430	17,614	17,727	18,132	(3,626)	[870]	{435}	18,565	(3,713)	[891]	{446}	19,026	(3,805)	[913]	{457}
Broward	147,944	149,168	150,371	151,524	154,478	(30,896)	[7,415]	{3,707}	157,591	(31,518)	[7,564]	{3,782}	160,847	(32,169)	[7,721]	{3,860}
Charlotte	8,293	8,382	8,456	8,522	8,746	(1,749)	[420]	{210}	8,974	(1,795)	[431]	{215}	9,214	(1,843)	[442]	{221}
Collier	24,012	24,304	24,443	24,575	24,995	(4,999)	[1,200]	{600}	25,430	(5,086)	[1,221]	{610}	25,878	(5,176)	[1,242]	{621}
Duval	68,971	69,773	70,524	70,905	72,886	(14,577)	[3,499]	{1,749}	74,980	(14,996)	[3,599]	{1,800}	77,095	(15,419)	[3,701]	{1,850}
Hillsborough	84,714	85,855	86,509	87,511	89,605	(17,921)	[4,301]	{2,151}	91,831	(18,366)	[4,408]	{2,204}	94,135	(18,827)	[4,518]	{2,259}
Lake	17,489	17,742	17,973	18,142	18,672	(3,734)	[896]	{448}	19,216	(3,843)	[922]	{461}	19,783	(3,957)	[950]	{475}
Lee	44,395	44,819	45,282	45,650	46,674	(9,335)	[2,240]	{1,120}	47,735	(9,547)	[2,291]	{1,146}	48,830	(9,766)	[2,344]	{1,172}
Manatee	24,278	24,530	24,755	24,871	25,401	(5,080)	[1,219]	{610}	25,965	(5,193)	[1,246]	{623}	26,545	(5,309)	[1,274]	{637}
Miami-Dade	321,555	324,260	326,607	328,701	334,567	(66,913)	[16,059]	{8,030}	340,487	(68,097)	[16,343]	{8,172}	346,551	(69,310)	[16,634]	{8,317}
Okaloosa	13,952	14,131	14,233	14,313	14,603	(2,921)	[701]	{350}	14,899	(2,980)	[715]	{358}	15,196	(3,039)	[729]	{365}
Orange	84,854	85,875	86,634	87,688	90,127	(18,025)	[4,326]	{2,163}	92,696	(18,539)	[4,449]	{2,225}	95,429	(19,086)	[4,581]	{2,290}
Osceola	27,934	28,251	28,480	28,827	29,545	(5,909)	[1,418]	{709}	30,296	(6,059)	[1,454]	{727}	31,080	(6,216)	[1,492]	{746}
Palm Beach	90,058	91,049	91,711	92,542	94,593	(18,919)	[4,540]	{2,270}	96,753	(19,351)	[4,644]	{2,322}	99,074	(19,815)	[4,756]	{2,378}
Pasco	24,363	24,663	24,942	25,224	25,870	(5,174)	[1,242]	{621}	26,536	(5,307)	[1,274]	{637}	27,226	(5,445)	[1,307]	{653}
Pinellas	49,771	50,491	50,978	51,384	52,699	(10,540)	[2,530]	{1,265}	54,067	(10,813)	[2,595]	{1,298}	55,493	(11,099)	[2,664]	{1,332}
Polk	41,620	42,056	42,422	42,880	44,018	(8,804)	[2,113]	{1,056}	45,196	(9,039)	[2,169]	{1,085}	46,424	(9,285)	[2,228]	{1,114}
Sarasota	20,774	21,017	21,223	21,328	21,899	(4,380)	[1,051]	{526}	22,496	(4,499)	[1,080]	{540}	23,119	(4,624)	[1,110]	{555}
Seminole	20,103	20,328	20,464	20,616	21,135	(4,227)	[1,014]	{507}	21,671	(4,334)	[1,040]	{520}	22,237	(4,447)	[1,067]	{534}
St. Johns	15,000	15,165	15,329	15,492	15,981	(3,196)	[767]	{384}	16,483	(3,297)	[791]	{396}	17,007	(3,401)	[816]	{408}
Sumter	5,829	5,904	5,975	6,029	6,236	(1,247)	[299]	{150}	6,458	(1,292)	[310]	{155}	6,690	(1,338)	[321]	{161}
Volusia	24,890	25,200	25,461	25,624	26,295	(5,259)	[1,262]	{631}	27,013	(5,403)	[1,297]	{648}	27,780	(5,556)	[1,333]	{667}

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.