

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 3/30/21**

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 3/30/21 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.

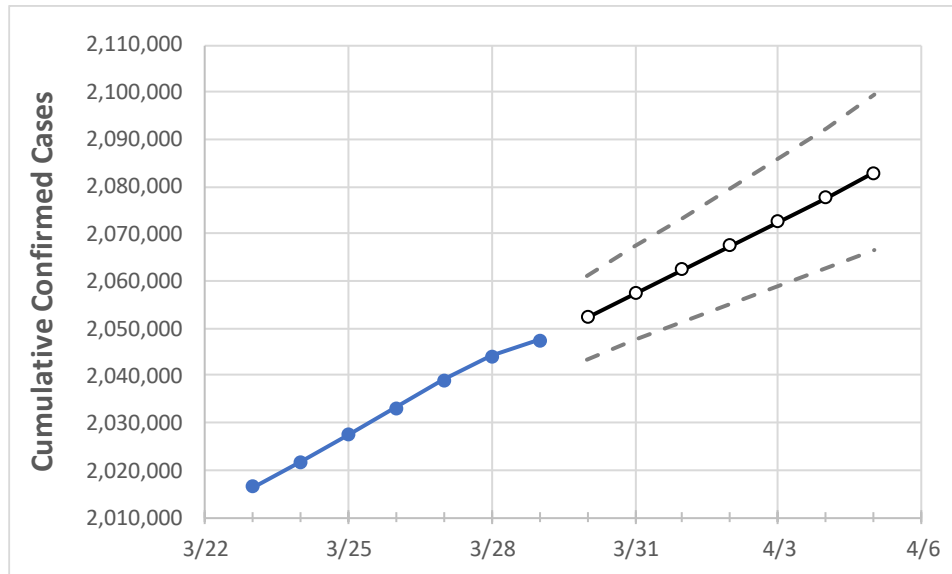
IEM's Modeling Lead

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:					
	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	
Florida	2,033,179	2,039,062	2,044,005	2,047,379	2,052,405	2,057,409	2,062,414	2,067,444	2,072,546	2,077,702	2,082,890	

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:						
	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5
Alachua	23,192	23,239	23,273	23,283	23,318	23,354	23,389	23,426	23,463	23,500	23,537
Broward	211,231	211,935	212,641	213,158	213,810	214,469	215,124	215,805	216,464	217,136	217,813
Charlotte	11,355	11,402	11,436	11,475	11,518	11,562	11,607	11,654	11,702	11,753	11,805
Collier	32,078	32,191	32,253	32,315	32,389	32,463	32,538	32,613	32,686	32,760	32,838
Duval	92,022	92,143	92,242	92,305	92,408	92,513	92,615	92,717	92,818	92,919	93,019
Hillsborough	119,790	120,274	120,680	120,893	121,262	121,641	122,024	122,411	122,806	123,207	123,608
Lake	26,354	26,418	26,470	26,507	26,569	26,630	26,691	26,750	26,812	26,871	26,932
Lee	61,776	61,968	62,143	62,300	62,482	62,667	62,854	63,042	63,232	63,425	63,619
Manatee	34,371	34,487	34,567	34,620	34,717	34,815	34,913	35,012	35,112	35,211	35,311
Miami-Dade	439,970	441,275	442,337	443,207	444,357	445,483	446,601	447,749	448,903	450,043	451,198
Okaloosa	19,682	19,704	19,719	19,722	19,735	19,747	19,759	19,772	19,783	19,794	19,805
Orange	121,980	122,410	122,800	123,018	123,401	123,787	124,185	124,585	124,991	125,412	125,839
Osceola	39,174	39,271	39,356	39,411	39,507	39,602	39,697	39,795	39,891	39,987	40,085
Palm Beach	129,904	130,358	130,727	130,904	131,257	131,608	131,952	132,304	132,655	133,002	133,355
Pasco	35,863	35,990	36,074	36,147	36,253	36,361	36,470	36,582	36,696	36,810	36,927
Pinellas	71,265	71,499	71,696	71,839	72,048	72,264	72,477	72,697	72,922	73,147	73,371
Polk	60,449	60,602	60,765	60,852	60,993	61,137	61,281	61,424	61,568	61,712	61,861
Sarasota	28,913	28,997	29,096	29,178	29,274	29,372	29,474	29,577	29,683	29,792	29,901
Seminole	29,518	29,653	29,751	29,816	29,927	30,038	30,149	30,262	30,380	30,498	30,619
St. Johns	20,960	21,025	21,062	21,080	21,120	21,159	21,200	21,242	21,284	21,327	21,372
Sumter	8,693	8,730	8,751	8,755	8,785	8,815	8,845	8,879	8,910	8,943	8,976
Volusia	37,453	37,623	37,763	37,895	38,061	38,235	38,415	38,597	38,785	38,980	39,182

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:											
	3/26	3/27	3/28	3/29	3/31				4/2				4/4			
Alachua	23,192	23,239	23,273	23,283	23,354	(4,671)	[1,121]	{560}	23,426	(4,685)	[1,124]	{562}	23,500	(4,700)	[1,128]	{564}
Broward	211,231	211,935	212,641	213,158	214,469	(42,894)	[10,295]	{5,147}	215,805	(43,161)	[10,359]	{5,179}	217,136	(43,427)	[10,423]	{5,211}
Charlotte	11,355	11,402	11,436	11,475	11,562	(2,312)	[555]	{277}	11,654	(2,331)	[559]	{280}	11,753	(2,351)	[564]	{282}
Collier	32,078	32,191	32,253	32,315	32,463	(6,493)	[1,558]	{779}	32,613	(6,523)	[1,565]	{783}	32,760	(6,552)	[1,572]	{786}
Duval	92,022	92,143	92,242	92,305	92,513	(18,503)	[4,441]	{2,220}	92,717	(18,543)	[4,450]	{2,225}	92,919	(18,584)	[4,460]	{2,230}
Hillsborough	119,790	120,274	120,680	120,893	121,641	(24,328)	[5,839]	{2,919}	122,411	(24,482)	[5,876]	{2,938}	123,207	(24,641)	[5,914]	{2,957}
Lake	26,354	26,418	26,470	26,507	26,630	(5,326)	[1,278]	{639}	26,750	(5,350)	[1,284]	{642}	26,871	(5,374)	[1,290]	{645}
Lee	61,776	61,968	62,143	62,300	62,667	(12,533)	[3,008]	{1,504}	63,042	(12,608)	[3,026]	{1,513}	63,425	(12,685)	[3,044]	{1,522}
Manatee	34,371	34,487	34,567	34,620	34,815	(6,963)	[1,671]	{836}	35,012	(7,002)	[1,681]	{840}	35,211	(7,042)	[1,690]	{845}
Miami-Dade	439,970	441,275	442,337	443,207	445,483	(89,097)	[21,383]	{10,692}	447,749	(89,550)	[21,492]	{10,746}	450,043	(90,009)	[21,602]	{10,801}
Okaloosa	19,682	19,704	19,719	19,722	19,747	(3,949)	[948]	{474}	19,772	(3,954)	[949]	{475}	19,794	(3,959)	[950]	{475}
Orange	121,980	122,410	122,800	123,018	123,787	(24,757)	[5,942]	{2,971}	124,585	(24,917)	[5,980]	{2,990}	125,412	(25,082)	[6,020]	{3,010}
Osceola	39,174	39,271	39,356	39,411	39,602	(7,920)	[1,901]	{950}	39,795	(7,959)	[1,910]	{955}	39,987	(7,997)	[1,919]	{960}
Palm Beach	129,904	130,358	130,727	130,904	131,608	(26,322)	[6,317]	{3,159}	132,304	(26,461)	[6,351]	{3,175}	133,002	(26,600)	[6,384]	{3,192}
Pasco	35,863	35,990	36,074	36,147	36,361	(7,272)	[1,745]	{873}	36,582	(7,316)	[1,756]	{878}	36,810	(7,362)	[1,767]	{883}
Pinellas	71,265	71,499	71,696	71,839	72,264	(14,453)	[3,469]	{1,734}	72,697	(14,539)	[3,489]	{1,745}	73,147	(14,629)	[3,511]	{1,756}
Polk	60,449	60,602	60,765	60,852	61,137	(12,227)	[2,935]	{1,467}	61,424	(12,285)	[2,948]	{1,474}	61,712	(12,342)	[2,962]	{1,481}
Sarasota	28,913	28,997	29,096	29,178	29,372	(5,874)	[1,410]	{705}	29,577	(5,915)	[1,420]	{710}	29,792	(5,958)	[1,430]	{715}
Seminole	29,518	29,653	29,751	29,816	30,038	(6,008)	[1,442]	{721}	30,262	(6,052)	[1,453]	{726}	30,498	(6,100)	[1,464]	{732}
St. Johns	20,960	21,025	21,062	21,080	21,159	(4,232)	[1,016]	{508}	21,242	(4,248)	[1,020]	{510}	21,327	(4,265)	[1,024]	{512}
Sumter	8,693	8,730	8,751	8,755	8,815	(1,763)	[423]	{212}	8,879	(1,776)	[426]	{213}	8,943	(1,789)	[429]	{215}
Volusia	37,453	37,623	37,763	37,895	38,235	(7,647)	[1,835]	{918}	38,597	(7,719)	[1,853]	{926}	38,980	(7,796)	[1,871]	{936}

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.