

IEM's AI Modeling: Short-term COVID-19 Projections

Date: 2/25/21

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 2/25/21 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.

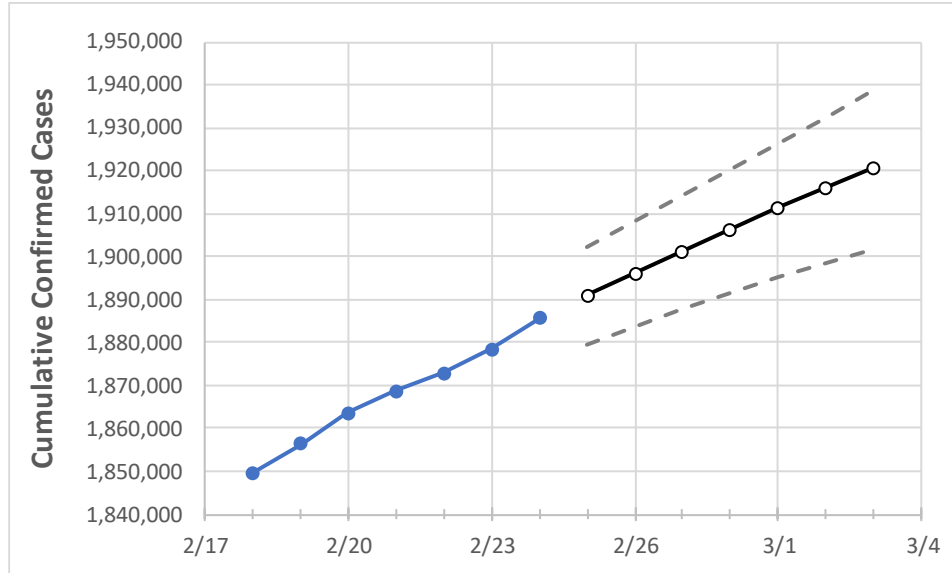
IEM's Modeling Lead

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Florida	1,868,772	1,872,923	1,878,533	1,885,661	1,890,956	1,896,149	1,901,303	1,906,339	1,911,342	1,916,057	1,920,597

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Alachua	22,133	22,154	22,197	22,228	22,260	22,291	22,320	22,349	22,376	22,402	22,426
Broward	189,833	190,364	191,065	191,968	192,636	193,318	193,985	194,635	195,298	195,955	196,607
Charlotte	10,523	10,537	10,567	10,596	10,625	10,654	10,681	10,708	10,734	10,760	10,787
Collier	29,706	29,751	29,865	29,963	30,036	30,109	30,182	30,252	30,321	30,389	30,455
Duval	87,607	87,745	87,885	88,057	88,220	88,375	88,528	88,668	88,808	88,944	89,079
Hillsborough	108,964	109,174	109,527	110,086	110,442	110,792	111,139	111,485	111,820	112,164	112,498
Lake	23,978	24,030	24,110	24,228	24,297	24,362	24,427	24,491	24,552	24,610	24,667
Lee	56,638	56,787	56,937	57,124	57,271	57,415	57,555	57,695	57,835	57,973	58,108
Manatee	31,098	31,173	31,314	31,469	31,571	31,675	31,775	31,874	31,973	32,068	32,167
Miami-Dade	402,265	403,259	404,499	405,563	406,653	407,704	408,736	409,737	410,767	411,757	412,709
Okaloosa	18,381	18,404	18,467	18,513	18,561	18,607	18,653	18,698	18,741	18,780	18,822
Orange	111,886	112,161	112,508	112,975	113,295	113,616	113,923	114,223	114,523	114,824	115,116
Osceola	36,097	36,168	36,271	36,387	36,469	36,549	36,630	36,708	36,784	36,861	36,933
Palm Beach	117,559	117,842	118,151	118,853	119,252	119,653	120,051	120,436	120,819	121,192	121,562
Pasco	32,581	32,662	32,754	32,900	33,016	33,131	33,245	33,357	33,466	33,574	33,680
Pinellas	64,951	65,191	65,375	65,623	65,836	66,043	66,250	66,448	66,651	66,852	67,048
Polk	55,861	55,986	56,153	56,409	56,585	56,762	56,933	57,091	57,252	57,407	57,559
Sarasota	26,488	26,573	26,622	26,714	26,773	26,830	26,888	26,944	26,999	27,053	27,104
Seminole	26,616	26,674	26,781	26,869	26,963	27,058	27,150	27,242	27,331	27,417	27,502
St. Johns	19,835	19,860	19,905	19,945	19,980	20,014	20,044	20,074	20,103	20,129	20,155
Sumter	7,768	7,774	7,810	7,908	7,932	7,958	7,983	8,008	8,033	8,057	8,080
Volusia	33,752	33,861	33,964	34,090	34,187	34,283	34,374	34,465	34,555	34,638	34,722

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:											
	2/21	2/22	2/23	2/24	2/26			2/28			3/2					
Alachua	22,133	22,154	22,197	22,228	22,291	(4,458)	[1,070]	{535}	22,349	(4,470)	[1,073]	{536}	22,402	(4,480)	[1,075]	{538}
Broward	189,833	190,364	191,065	191,968	193,318	(38,664)	[9,279]	{4,640}	194,635	(38,927)	[9,342]	{4,671}	195,955	(39,191)	[9,406]	{4,703}
Charlotte	10,523	10,537	10,567	10,596	10,654	(2,131)	[511]	{256}	10,708	(2,142)	[514]	{257}	10,760	(2,152)	[516]	{258}
Collier	29,706	29,751	29,865	29,963	30,109	(6,022)	[1,445]	{723}	30,252	(6,050)	[1,452]	{726}	30,389	(6,078)	[1,459]	{729}
Duval	87,607	87,745	87,885	88,057	88,375	(17,675)	[4,242]	{2,121}	88,668	(17,734)	[4,256]	{2,128}	88,944	(17,789)	[4,269]	{2,135}
Hillsborough	108,964	109,174	109,527	110,086	110,792	(22,158)	[5,318]	{2,659}	111,485	(22,297)	[5,351]	{2,676}	112,164	(22,433)	[5,384]	{2,692}
Lake	23,978	24,030	24,110	24,228	24,362	(4,872)	[1,169]	{585}	24,491	(4,898)	[1,176]	{588}	24,610	(4,922)	[1,181]	{591}
Lee	56,638	56,787	56,937	57,124	57,415	(11,483)	[2,756]	{1,378}	57,695	(11,539)	[2,769]	{1,385}	57,973	(11,595)	[2,783]	{1,391}
Manatee	31,098	31,173	31,314	31,469	31,675	(6,335)	[1,520]	{760}	31,874	(6,375)	[1,530]	{765}	32,068	(6,414)	[1,539]	{770}
Miami-Dade	402,265	403,259	404,499	405,563	407,704	(81,541)	[19,570]	{9,785}	409,737	(81,947)	[19,667]	{9,834}	411,757	(82,351)	[19,764]	{9,882}
Okaloosa	18,381	18,404	18,467	18,513	18,607	(3,721)	[893]	{447}	18,698	(3,740)	[898]	{449}	18,780	(3,756)	[901]	{451}
Orange	111,886	112,161	112,508	112,975	113,616	(22,723)	[5,454]	{2,727}	114,223	(22,845)	[5,483]	{2,741}	114,824	(22,965)	[5,512]	{2,756}
Osceola	36,097	36,168	36,271	36,387	36,549	(7,310)	[1,754]	{877}	36,708	(7,342)	[1,762]	{881}	36,861	(7,372)	[1,769]	{885}
Palm Beach	117,559	117,842	118,151	118,853	119,653	(23,931)	[5,743]	{2,872}	120,436	(24,087)	[5,781]	{2,890}	121,192	(24,238)	[5,817]	{2,909}
Pasco	32,581	32,662	32,754	32,900	33,131	(6,626)	[1,590]	{795}	33,357	(6,671)	[1,601]	{801}	33,574	(6,715)	[1,612]	{806}
Pinellas	64,951	65,191	65,375	65,623	66,043	(13,209)	[3,170]	{1,585}	66,448	(13,290)	[3,189]	{1,595}	66,852	(13,370)	[3,209]	{1,604}
Polk	55,861	55,986	56,153	56,409	56,762	(11,352)	[2,725]	{1,362}	57,091	(11,418)	[2,740]	{1,370}	57,407	(11,481)	[2,756]	{1,378}
Sarasota	26,488	26,573	26,622	26,714	26,830	(5,366)	[1,288]	{644}	26,944	(5,389)	[1,293]	{647}	27,053	(5,411)	[1,299]	{649}
Seminole	26,616	26,674	26,781	26,869	27,058	(5,412)	[1,299]	{649}	27,242	(5,448)	[1,308]	{654}	27,417	(5,483)	[1,316]	{658}
St. Johns	19,835	19,860	19,905	19,945	20,014	(4,003)	[961]	{480}	20,074	(4,015)	[964]	{482}	20,129	(4,026)	[966]	{483}
Sumter	7,768	7,774	7,810	7,908	7,958	(1,592)	[382]	{191}	8,008	(1,602)	[384]	{192}	8,057	(1,611)	[387]	{193}
Volusia	33,752	33,861	33,964	34,090	34,283	(6,857)	[1,646]	{823}	34,465	(6,893)	[1,654]	{827}	34,638	(6,928)	[1,663]	{831}

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.