

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 3/18/21**

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 3/18/21 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.

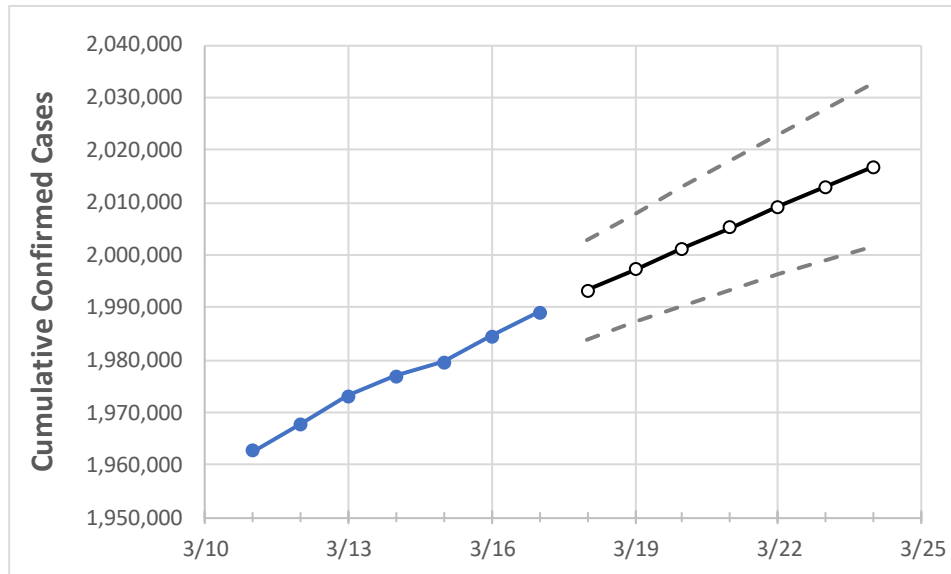
IEM's Modeling Lead

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:						
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24
Florida	1,976,808	1,979,634	1,984,425	1,989,024	1,993,176	1,997,270	2,001,253	2,005,266	2,009,202	2,012,962	2,016,780

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:						
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24
Alachua	22,816	22,828	22,860	22,880	22,905	22,929	22,953	22,976	22,998	23,020	23,043
Broward	203,832	204,247	204,870	205,473	206,045	206,609	207,160	207,706	208,248	208,782	209,311
Charlotte	11,001	11,015	11,037	11,074	11,096	11,117	11,137	11,158	11,179	11,200	11,220
Collier	31,245	31,290	31,363	31,402	31,459	31,514	31,570	31,624	31,677	31,729	31,779
Duval	90,633	90,716	90,819	90,960	91,071	91,181	91,288	91,392	91,497	91,596	91,696
Hillsborough	115,722	115,912	116,309	116,691	116,989	117,294	117,587	117,880	118,177	118,473	118,778
Lake	25,591	25,627	25,678	25,754	25,813	25,869	25,926	25,982	26,036	26,090	26,144
Lee	59,834	59,951	60,117	60,278	60,423	60,570	60,714	60,859	61,004	61,151	61,298
Manatee	33,231	33,267	33,386	33,536	33,626	33,717	33,807	33,897	33,988	34,075	34,164
Miami-Dade	426,900	427,600	428,873	429,834	430,834	431,832	432,845	433,828	434,795	435,771	436,726
Okaloosa	19,452	19,468	19,479	19,507	19,530	19,553	19,574	19,595	19,615	19,635	19,654
Orange	118,154	118,321	118,627	118,902	119,145	119,379	119,611	119,845	120,069	120,295	120,514
Osceola	38,078	38,116	38,205	38,283	38,361	38,437	38,514	38,589	38,660	38,734	38,810
Palm Beach	125,866	126,062	126,355	126,729	127,059	127,381	127,702	128,011	128,319	128,625	128,911
Pasco	34,720	34,778	34,868	34,961	35,041	35,119	35,197	35,272	35,347	35,422	35,495
Pinellas	69,063	69,192	69,334	69,468	69,611	69,754	69,897	70,034	70,170	70,305	70,436
Polk	58,920	58,991	59,111	59,264	59,370	59,474	59,575	59,674	59,768	59,860	59,952
Sarasota	27,973	28,025	28,092	28,175	28,240	28,305	28,371	28,435	28,500	28,566	28,632
Seminole	28,368	28,431	28,503	28,595	28,674	28,752	28,827	28,904	28,983	29,058	29,135
St. Johns	20,557	20,574	20,600	20,644	20,673	20,701	20,730	20,758	20,787	20,814	20,840
Sumter	8,349	8,369	8,392	8,422	8,445	8,467	8,489	8,512	8,533	8,555	8,577
Volusia	35,881	35,955	36,047	36,190	36,283	36,380	36,472	36,567	36,662	36,756	36,850

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:											
	3/14	3/15	3/16	3/17	3/19				3/21				3/23			
Alachua	22,816	22,828	22,860	22,880	22,929	(4,586)	[1,101]	{550}	22,976	(4,595)	[1,103]	{551}	23,020	(4,604)	[1,105]	{552}
Broward	203,832	204,247	204,870	205,473	206,609	(41,322)	[9,917]	{4,959}	207,706	(41,541)	[9,970]	{4,985}	208,782	(41,756)	[10,022]	{5,011}
Charlotte	11,001	11,015	11,037	11,074	11,117	(2,223)	[534]	{267}	11,158	(2,232)	[536]	{268}	11,200	(2,240)	[538]	{269}
Collier	31,245	31,290	31,363	31,402	31,514	(6,303)	[1,513]	{756}	31,624	(6,325)	[1,518]	{759}	31,729	(6,346)	[1,523]	{761}
Duval	90,633	90,716	90,819	90,960	91,181	(18,236)	[4,377]	{2,188}	91,392	(18,278)	[4,387]	{2,193}	91,596	(18,319)	[4,397]	{2,198}
Hillsborough	115,722	115,912	116,309	116,691	117,294	(23,459)	[5,630]	{2,815}	117,880	(23,576)	[5,658]	{2,829}	118,473	(23,695)	[5,687]	{2,843}
Lake	25,591	25,627	25,678	25,754	25,869	(5,174)	[1,242]	{621}	25,982	(5,196)	[1,247]	{624}	26,090	(5,218)	[1,252]	{626}
Lee	59,834	59,951	60,117	60,278	60,570	(12,114)	[2,907]	{1,454}	60,859	(12,172)	[2,921]	{1,461}	61,151	(12,230)	[2,935]	{1,468}
Manatee	33,231	33,267	33,386	33,536	33,717	(6,743)	[1,618]	{809}	33,897	(6,779)	[1,627]	{814}	34,075	(6,815)	[1,636]	{818}
Miami-Dade	426,900	427,600	428,873	429,834	431,832	(86,366)	[20,728]	{10,364}	433,828	(86,766)	[20,824]	{10,412}	435,771	(87,154)	[20,917]	{10,458}
Okaloosa	19,452	19,468	19,479	19,507	19,553	(3,911)	[939]	{469}	19,595	(3,919)	[941]	{470}	19,635	(3,927)	[942]	{471}
Orange	118,154	118,321	118,627	118,902	119,379	(23,876)	[5,730]	{2,865}	119,845	(23,969)	[5,753]	{2,876}	120,295	(24,059)	[5,774]	{2,887}
Osceola	38,078	38,116	38,205	38,283	38,437	(7,687)	[1,845]	{922}	38,589	(7,718)	[1,852]	{926}	38,734	(7,747)	[1,859]	{930}
Palm Beach	125,866	126,062	126,355	126,729	127,381	(25,476)	[6,114]	{3,057}	128,011	(25,602)	[6,145]	{3,072}	128,625	(25,725)	[6,174]	{3,087}
Pasco	34,720	34,778	34,868	34,961	35,119	(7,024)	[1,686]	{843}	35,272	(7,054)	[1,693]	{847}	35,422	(7,084)	[1,700]	{850}
Pinellas	69,063	69,192	69,334	69,468	69,754	(13,951)	[3,348]	{1,674}	70,034	(14,007)	[3,362]	{1,681}	70,305	(14,061)	[3,375]	{1,687}
Polk	58,920	58,991	59,111	59,264	59,474	(11,895)	[2,855]	{1,427}	59,674	(11,935)	[2,864]	{1,432}	59,860	(11,972)	[2,873]	{1,437}
Sarasota	27,973	28,025	28,092	28,175	28,305	(5,661)	[1,359]	{679}	28,435	(5,687)	[1,365]	{682}	28,566	(5,713)	[1,371]	{686}
Seminole	28,368	28,431	28,503	28,595	28,752	(5,750)	[1,380]	{690}	28,904	(5,781)	[1,387]	{694}	29,058	(5,812)	[1,395]	{697}
St. Johns	20,557	20,574	20,600	20,644	20,701	(4,140)	[994]	{497}	20,758	(4,152)	[996]	{498}	20,814	(4,163)	[999]	{500}
Sumter	8,349	8,369	8,392	8,422	8,467	(1,693)	[406]	{203}	8,512	(1,702)	[409]	{204}	8,555	(1,711)	[411]	{205}
Volusia	35,881	35,955	36,047	36,190	36,380	(7,276)	[1,746]	{873}	36,567	(7,313)	[1,755]	{878}	36,756	(7,351)	[1,764]	{882}

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.