

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

Date: 5/12/21

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 5/12/21 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.

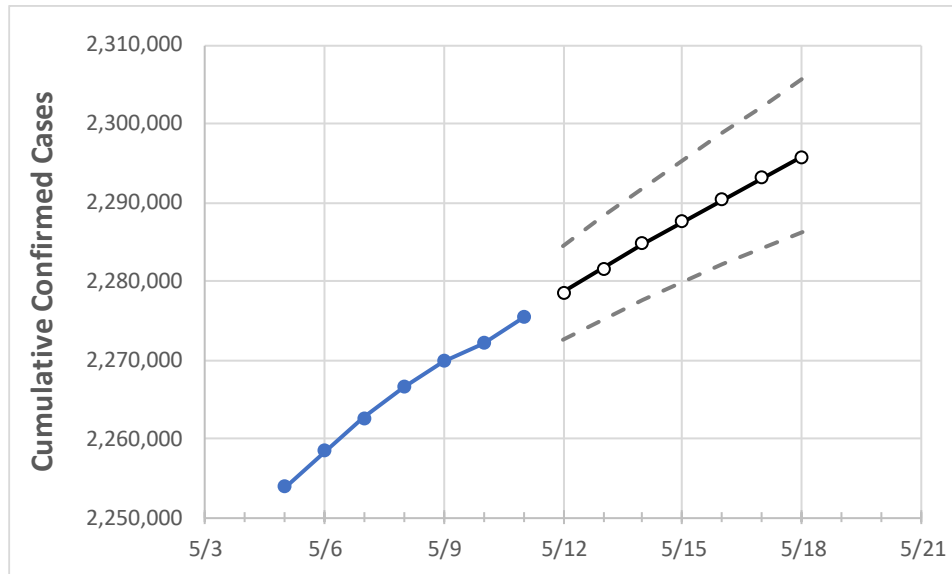
IEM's Modeling Lead

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:						
	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18
Florida	2,266,575	2,269,806	2,272,102	2,275,365	2,278,557	2,281,661	2,284,719	2,287,575	2,290,351	2,293,122	2,295,773

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:						
	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18
Alachua	24,871	24,892	24,915	24,942	24,966	24,990	25,014	25,036	25,059	25,081	25,102
Broward	239,602	239,941	240,143	240,479	240,795	241,096	241,380	241,657	241,919	242,172	242,415
Charlotte	12,934	12,957	12,973	12,991	13,013	13,035	13,056	13,077	13,097	13,118	13,136
Collier	35,941	36,010	36,044	36,129	36,197	36,263	36,328	36,393	36,457	36,521	36,583
Duval	98,417	98,524	98,611	98,730	98,848	98,960	99,070	99,178	99,283	99,384	99,483
Hillsborough	137,950	138,161	138,312	138,598	138,864	139,119	139,369	139,611	139,843	140,062	140,283
Lake	29,808	29,856	29,885	29,932	29,983	30,033	30,082	30,128	30,174	30,219	30,263
Lee	70,939	71,111	71,242	71,399	71,571	71,740	71,905	72,071	72,232	72,391	72,544
Manatee	38,785	38,828	38,879	38,982	39,052	39,123	39,192	39,260	39,329	39,393	39,454
Miami-Dade	489,839	490,499	491,028	491,703	492,323	492,915	493,481	494,043	494,590	495,119	495,618
Okaloosa	20,578	20,597	20,609	20,622	20,640	20,657	20,674	20,691	20,709	20,725	20,741
Orange	138,735	138,989	139,136	139,339	139,572	139,795	140,015	140,222	140,429	140,625	140,821
Osceola	44,867	44,960	45,010	45,071	45,147	45,221	45,294	45,365	45,433	45,497	45,558
Palm Beach	145,126	145,331	145,485	145,657	145,850	146,037	146,213	146,385	146,556	146,712	146,866
Pasco	41,555	41,638	41,687	41,776	41,859	41,941	42,018	42,095	42,167	42,242	42,315
Pinellas	79,767	79,881	79,947	80,044	80,138	80,229	80,317	80,402	80,484	80,564	80,640
Polk	68,925	69,056	69,142	69,261	69,390	69,516	69,637	69,757	69,870	69,981	70,090
Sarasota	32,862	32,922	32,954	32,997	33,039	33,077	33,116	33,154	33,189	33,225	33,258
Seminole	34,230	34,274	34,325	34,382	34,433	34,483	34,530	34,576	34,619	34,660	34,700
St. Johns	22,687	22,718	22,742	22,769	22,799	22,829	22,859	22,888	22,917	22,945	22,973
Sumter	9,345	9,352	9,356	9,364	9,372	9,379	9,387	9,394	9,401	9,408	9,414
Volusia	43,430	43,499	43,553	43,615	43,680	43,742	43,803	43,861	43,917	43,972	44,025

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:											
	5/8	5/9	5/10	5/11	5/13				5/15				5/17			
Alachua	24,871	24,892	24,915	24,942	24,990	(4,998)	[1,200]	{600}	25,036	(5,007)	[1,202]	{601}	25,081	(5,016)	[1,204]	{602}
Broward	239,602	239,941	240,143	240,479	241,096	(48,219)	[11,573]	{5,786}	241,657	(48,331)	[11,600]	{5,800}	242,172	(48,434)	[11,624]	{5,812}
Charlotte	12,934	12,957	12,973	12,991	13,035	(2,607)	[626]	{313}	13,077	(2,615)	[628]	{314}	13,118	(2,624)	[630]	{315}
Collier	35,941	36,010	36,044	36,129	36,263	(7,253)	[1,741]	{870}	36,393	(7,279)	[1,747]	{873}	36,521	(7,304)	[1,753]	{876}
Duval	98,417	98,524	98,611	98,730	98,960	(19,792)	[4,750]	{2,375}	99,178	(19,836)	[4,761]	{2,380}	99,384	(19,877)	[4,770]	{2,385}
Hillsborough	137,950	138,161	138,312	138,598	139,119	(27,824)	[6,678]	{3,339}	139,611	(27,922)	[6,701]	{3,351}	140,062	(28,012)	[6,723]	{3,361}
Lake	29,808	29,856	29,885	29,932	30,033	(6,007)	[1,442]	{721}	30,128	(6,026)	[1,446]	{723}	30,219	(6,044)	[1,450]	{725}
Lee	70,939	71,111	71,242	71,399	71,740	(14,348)	[3,444]	{1,722}	72,071	(14,414)	[3,459]	{1,730}	72,391	(14,478)	[3,475]	{1,737}
Manatee	38,785	38,828	38,879	38,982	39,123	(7,825)	[1,878]	{939}	39,260	(7,852)	[1,884]	{942}	39,393	(7,879)	[1,891]	{945}
Miami-Dade	489,839	490,499	491,028	491,703	492,915	(98,583)	[23,660]	{11,830}	494,043	(98,809)	[23,714]	{11,857}	495,119	(99,024)	[23,766]	{11,883}
Okaloosa	20,578	20,597	20,609	20,622	20,657	(4,131)	[992]	{496}	20,691	(4,138)	[993]	{497}	20,725	(4,145)	[995]	{497}
Orange	138,735	138,989	139,136	139,339	139,795	(27,959)	[6,710]	{3,355}	140,222	(28,044)	[6,731]	{3,365}	140,625	(28,125)	[6,750]	{3,375}
Osceola	44,867	44,960	45,010	45,071	45,221	(9,044)	[2,171]	{1,085}	45,365	(9,073)	[2,178]	{1,089}	45,497	(9,099)	[2,184]	{1,092}
Palm Beach	145,126	145,331	145,485	145,657	146,037	(29,207)	[7,010]	{3,505}	146,385	(29,277)	[7,026]	{3,513}	146,712	(29,342)	[7,042]	{3,521}
Pasco	41,555	41,638	41,687	41,776	41,941	(8,388)	[2,013]	{1,007}	42,095	(8,419)	[2,021]	{1,010}	42,242	(8,448)	[2,028]	{1,014}
Pinellas	79,767	79,881	79,947	80,044	80,229	(16,046)	[3,851]	{1,925}	80,402	(16,080)	[3,859]	{1,930}	80,564	(16,113)	[3,867]	{1,934}
Polk	68,925	69,056	69,142	69,261	69,516	(13,903)	[3,337]	{1,668}	69,757	(13,951)	[3,348]	{1,674}	69,981	(13,996)	[3,359]	{1,680}
Sarasota	32,862	32,922	32,954	32,997	33,077	(6,615)	[1,588]	{794}	33,154	(6,631)	[1,591]	{796}	33,225	(6,645)	[1,595]	{797}
Seminole	34,230	34,274	34,325	34,382	34,483	(6,897)	[1,655]	{828}	34,576	(6,915)	[1,660]	{830}	34,660	(6,932)	[1,664]	{832}
St. Johns	22,687	22,718	22,742	22,769	22,829	(4,566)	[1,096]	{548}	22,888	(4,578)	[1,099]	{549}	22,945	(4,589)	[1,101]	{551}
Sumter	9,345	9,352	9,356	9,364	9,379	(1,876)	[450]	{225}	9,394	(1,879)	[451]	{225}	9,408	(1,882)	[452]	{226}
Volusia	43,430	43,499	43,553	43,615	43,742	(8,748)	[2,100]	{1,050}	43,861	(8,772)	[2,105]	{1,053}	43,972	(8,794)	[2,111]	{1,055}

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.