

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

Date: 3/8/21

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 3/8/21 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.

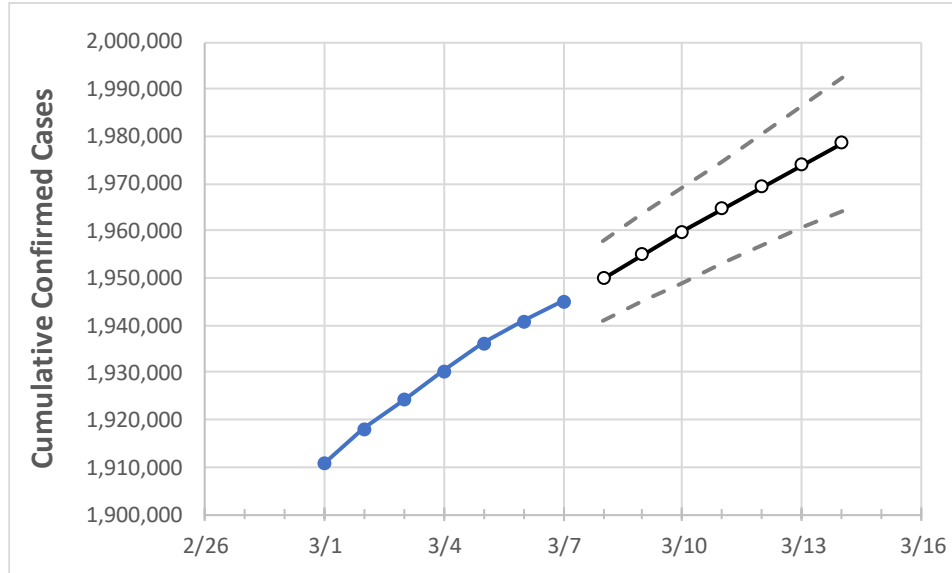
IEM's Modeling Lead

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:							
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	
Florida	1,930,232	1,936,207	1,940,897	1,944,995	1,949,977	1,954,930	1,959,794	1,964,665	1,969,396	1,974,056	1,978,676	

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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Alachua	22,512	22,555	22,588	22,599	22,625	22,651	22,676	22,701	22,725	22,748	22,769
Broward	197,542	198,387	198,995	199,643	200,307	200,968	201,625	202,278	202,938	203,590	204,238
Charlotte	10,781	10,801	10,823	10,836	10,855	10,873	10,890	10,908	10,924	10,940	10,957
Collier	30,572	30,640	30,725	30,777	30,847	30,915	30,982	31,049	31,115	31,181	31,243
Duval	89,337	89,491	89,637	89,724	89,848	89,971	90,092	90,208	90,322	90,437	90,547
Hillsborough	112,672	113,045	113,332	113,623	113,920	114,220	114,520	114,812	115,096	115,378	115,656
Lake	24,928	25,010	25,083	25,156	25,232	25,306	25,380	25,454	25,528	25,599	25,671
Lee	58,360	58,529	58,653	58,768	58,906	59,043	59,178	59,311	59,440	59,571	59,703
Manatee	32,309	32,443	32,553	32,603	32,702	32,801	32,899	32,994	33,092	33,185	33,281
Miami-Dade	416,021	417,447	418,411	419,479	420,663	421,847	423,003	424,151	425,321	426,484	427,643
Okaloosa	19,125	19,174	19,213	19,238	19,292	19,345	19,396	19,447	19,498	19,549	19,598
Orange	115,475	115,818	116,129	116,367	116,649	116,934	117,214	117,485	117,757	118,018	118,279
Osceola	37,188	37,291	37,413	37,497	37,590	37,684	37,776	37,871	37,963	38,056	38,147
Palm Beach	122,226	122,709	123,033	123,304	123,673	124,033	124,401	124,755	125,107	125,445	125,786
Pasco	33,778	33,888	33,975	34,054	34,147	34,238	34,328	34,417	34,502	34,587	34,669
Pinellas	67,359	67,554	67,717	67,844	68,026	68,205	68,379	68,553	68,720	68,894	69,066
Polk	57,655	57,852	58,008	58,116	58,246	58,366	58,486	58,607	58,725	58,840	58,948
Sarasota	27,301	27,376	27,440	27,472	27,535	27,598	27,662	27,724	27,786	27,848	27,911
Seminole	27,554	27,640	27,725	27,792	27,868	27,941	28,013	28,084	28,156	28,224	28,292
St. Johns	20,242	20,278	20,303	20,334	20,363	20,391	20,418	20,444	20,470	20,495	20,520
Sumter	8,125	8,147	8,165	8,192	8,219	8,245	8,270	8,294	8,319	8,345	8,371
Volusia	34,891	34,993	35,109	35,159	35,246	35,329	35,409	35,490	35,569	35,646	35,721

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:											
	3/4	3/5	3/6	3/7	3/9				3/11				3/13			
Alachua	22,512	22,555	22,588	22,599	22,651	(4,530)	[1,087]	{544}	22,701	(4,540)	[1,090]	{545}	22,748	(4,550)	[1,092]	{546}
Broward	197,542	198,387	198,995	199,643	200,968	(40,194)	[9,646]	{4,823}	202,278	(40,456)	[9,709]	{4,855}	203,590	(40,718)	[9,772]	{4,886}
Charlotte	10,781	10,801	10,823	10,836	10,873	(2,175)	[522]	{261}	10,908	(2,182)	[524]	{262}	10,940	(2,188)	[525]	{263}
Collier	30,572	30,640	30,725	30,777	30,915	(6,183)	[1,484]	{742}	31,049	(6,210)	[1,490]	{745}	31,181	(6,236)	[1,497]	{748}
Duval	89,337	89,491	89,637	89,724	89,971	(17,994)	[4,319]	{2,159}	90,208	(18,042)	[4,330]	{2,165}	90,437	(18,087)	[4,341]	{2,170}
Hillsborough	112,672	113,045	113,332	113,623	114,220	(22,844)	[5,483]	{2,741}	114,812	(22,962)	[5,511]	{2,755}	115,378	(23,076)	[5,538]	{2,769}
Lake	24,928	25,010	25,083	25,156	25,306	(5,061)	[1,215]	{607}	25,454	(5,091)	[1,222]	{611}	25,599	(5,120)	[1,229]	{614}
Lee	58,360	58,529	58,653	58,768	59,043	(11,809)	[2,834]	{1,417}	59,311	(11,862)	[2,847]	{1,423}	59,571	(11,914)	[2,859]	{1,430}
Manatee	32,309	32,443	32,553	32,603	32,801	(6,560)	[1,574]	{787}	32,994	(6,599)	[1,584]	{792}	33,185	(6,637)	[1,593]	{796}
Miami-Dade	416,021	417,447	418,411	419,479	421,847	(84,369)	[20,249]	{10,124}	424,151	(84,830)	[20,359]	{10,180}	426,484	(85,297)	[20,471]	{10,236}
Okaloosa	19,125	19,174	19,213	19,238	19,345	(3,869)	[929]	{464}	19,447	(3,889)	[933]	{467}	19,549	(3,910)	[938]	{469}
Orange	115,475	115,818	116,129	116,367	116,934	(23,387)	[5,613]	{2,806}	117,485	(23,497)	[5,639]	{2,820}	118,018	(23,604)	[5,665]	{2,832}
Osceola	37,188	37,291	37,413	37,497	37,684	(7,537)	[1,809]	{904}	37,871	(7,574)	[1,818]	{909}	38,056	(7,611)	[1,827]	{913}
Palm Beach	122,226	122,709	123,033	123,304	124,033	(24,807)	[5,954]	{2,977}	124,755	(24,951)	[5,988]	{2,994}	125,445	(25,089)	[6,021]	{3,011}
Pasco	33,778	33,888	33,975	34,054	34,238	(6,848)	[1,643]	{822}	34,417	(6,883)	[1,652]	{826}	34,587	(6,917)	[1,660]	{830}
Pinellas	67,359	67,554	67,717	67,844	68,205	(13,641)	[3,274]	{1,637}	68,553	(13,711)	[3,291]	{1,645}	68,894	(13,779)	[3,307]	{1,653}
Polk	57,655	57,852	58,008	58,116	58,366	(11,673)	[2,802]	{1,401}	58,607	(11,721)	[2,813]	{1,407}	58,840	(11,768)	[2,824]	{1,412}
Sarasota	27,301	27,376	27,440	27,472	27,598	(5,520)	[1,325]	{662}	27,724	(5,545)	[1,331]	{665}	27,848	(5,570)	[1,337]	{668}
Seminole	27,554	27,640	27,725	27,792	27,941	(5,588)	[1,341]	{671}	28,084	(5,617)	[1,348]	{674}	28,224	(5,645)	[1,355]	{677}
St. Johns	20,242	20,278	20,303	20,334	20,391	(4,078)	[979]	{489}	20,444	(4,089)	[981]	{491}	20,495	(4,099)	[984]	{492}
Sumter	8,125	8,147	8,165	8,192	8,245	(1,649)	[396]	{198}	8,294	(1,659)	[398]	{199}	8,345	(1,669)	[401]	{200}
Volusia	34,891	34,993	35,109	35,159	35,329	(7,066)	[1,696]	{848}	35,490	(7,098)	[1,704]	{852}	35,646	(7,129)	[1,711]	{856}

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.