

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

Date: 2/11/21

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 2/11/21 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.

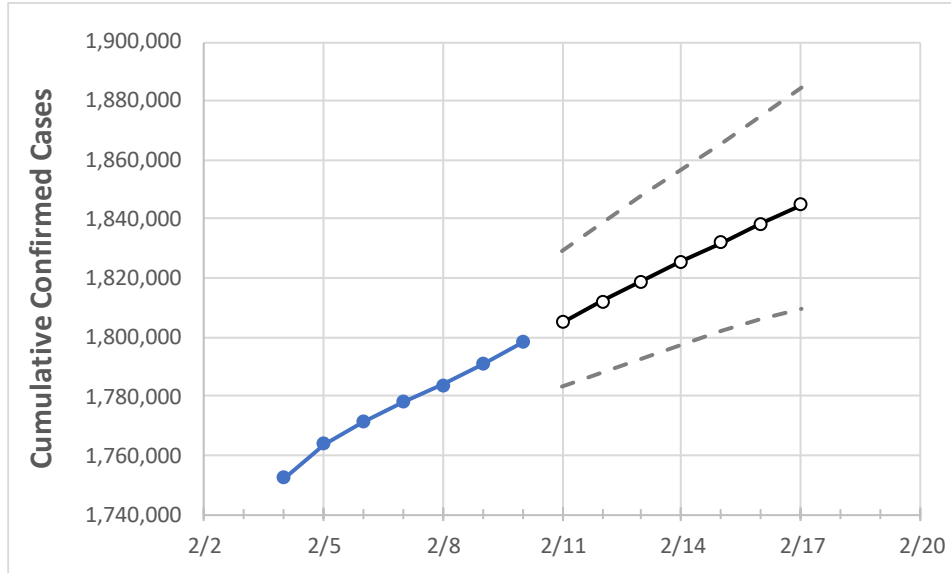
IEM's Modeling Lead

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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17

Florida	1,777,983	1,783,720	1,790,743	1,798,280	1,805,169	1,812,080	1,818,827	1,825,479	1,832,142	1,838,617	1,844,821
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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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Alachua	21,353	21,401	21,482	21,552	21,634	21,718	21,799	21,881	21,959	22,035	22,108
Broward	178,948	179,745	180,501	181,427	182,240	183,040	183,820	184,578	185,324	186,066	186,799
Charlotte	10,005	10,031	10,064	10,099	10,134	10,168	10,201	10,233	10,266	10,296	10,327
Collier	28,524	28,581	28,691	28,783	28,869	28,951	29,032	29,110	29,186	29,262	29,336
Duval	84,201	84,441	84,720	85,069	85,378	85,679	85,984	86,272	86,547	86,831	87,091
Hillsborough	103,599	103,835	104,210	104,604	104,954	105,293	105,624	105,943	106,255	106,567	106,842
Lake	22,728	22,800	22,933	22,989	23,094	23,196	23,294	23,388	23,480	23,570	23,656
Lee	54,234	54,373	54,549	54,762	54,944	55,118	55,286	55,450	55,609	55,767	55,914
Manatee	29,466	29,547	29,690	29,828	29,953	30,075	30,192	30,306	30,419	30,532	30,640
Miami-Dade	383,601	384,971	386,425	387,940	389,379	390,801	392,161	393,526	394,836	396,155	397,482
Okaloosa	17,486	17,527	17,587	17,666	17,754	17,842	17,929	18,012	18,095	18,179	18,259
Orange	106,450	106,868	107,301	107,756	108,153	108,537	108,904	109,253	109,583	109,917	110,247
Osceola	34,543	34,686	34,796	34,927	35,038	35,147	35,253	35,356	35,453	35,545	35,637
Palm Beach	111,024	111,437	111,816	112,367	112,882	113,374	113,871	114,355	114,841	115,293	115,751
Pasco	30,641	30,749	30,883	31,007	31,131	31,251	31,372	31,490	31,601	31,719	31,826
Pinellas	61,546	61,730	61,950	62,132	62,387	62,640	62,888	63,135	63,382	63,610	63,834
Polk	52,533	52,731	53,005	53,316	53,582	53,848	54,111	54,367	54,616	54,859	55,104
Sarasota	25,449	25,510	25,572	25,700	25,788	25,874	25,958	26,041	26,121	26,198	26,277
Seminole	24,999	25,095	25,226	25,323	25,426	25,527	25,629	25,726	25,820	25,914	26,003
St. Johns	19,023	19,089	19,167	19,229	19,309	19,391	19,467	19,543	19,617	19,691	19,761
Sumter	7,380	7,400	7,436	7,476	7,511	7,545	7,579	7,611	7,644	7,676	7,706
Volusia	32,183	32,316	32,472	32,663	32,835	33,009	33,184	33,350	33,517	33,683	33,838

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:											
	2/7	2/8	2/9	2/10	2/12		2/14		2/16							
Alachua	21,353	21,401	21,482	21,552	21,718	(4,344)	[1,042]	{521}	21,881	(4,376)	[1,050]	{525}	22,035	(4,407)	[1,058]	{529}
Broward	178,948	179,745	180,501	181,427	183,040	(36,608)	[8,786]	{4,393}	184,578	(36,916)	[8,860]	{4,430}	186,066	(37,213)	[8,931]	{4,466}
Charlotte	10,005	10,031	10,064	10,099	10,168	(2,034)	[488]	{244}	10,233	(2,047)	[491]	{246}	10,296	(2,059)	[494]	{247}
Collier	28,524	28,581	28,691	28,783	28,951	(5,790)	[1,390]	{695}	29,110	(5,822)	[1,397]	{699}	29,262	(5,852)	[1,405]	{702}
Duval	84,201	84,441	84,720	85,069	85,679	(17,136)	[4,113]	{2,056}	86,272	(17,254)	[4,141]	{2,071}	86,831	(17,366)	[4,168]	{2,084}
Hillsborough	103,599	103,835	104,210	104,604	105,293	(21,059)	[5,054]	{2,527}	105,943	(21,189)	[5,085]	{2,543}	106,567	(21,313)	[5,115]	{2,558}
Lake	22,728	22,800	22,933	22,989	23,196	(4,639)	[1,113]	{557}	23,388	(4,678)	[1,123]	{561}	23,570	(4,714)	[1,131]	{566}
Lee	54,234	54,373	54,549	54,762	55,118	(11,024)	[2,646]	{1,323}	55,450	(11,090)	[2,662]	{1,331}	55,767	(11,153)	[2,677]	{1,338}
Manatee	29,466	29,547	29,690	29,828	30,075	(6,015)	[1,444]	{722}	30,306	(6,061)	[1,455]	{727}	30,532	(6,106)	[1,466]	{733}
Miami-Dade	383,601	384,971	386,425	387,940	390,801	(78,160)	[18,758]	{9,379}	393,526	(78,705)	[18,889]	{9,445}	396,155	(79,231)	[19,015]	{9,508}
Okaloosa	17,486	17,527	17,587	17,666	17,842	(3,568)	[856]	{428}	18,012	(3,602)	[865]	{432}	18,179	(3,636)	[873]	{436}
Orange	106,450	106,868	107,301	107,756	108,537	(21,707)	[5,210]	{2,605}	109,253	(21,851)	[5,244]	{2,622}	109,917	(21,983)	[5,276]	{2,638}
Osceola	34,543	34,686	34,796	34,927	35,147	(7,029)	[1,687]	{844}	35,356	(7,071)	[1,697]	{849}	35,545	(7,109)	[1,706]	{853}
Palm Beach	111,024	111,437	111,816	112,367	113,374	(22,675)	[5,442]	{2,721}	114,355	(22,871)	[5,489]	{2,745}	115,293	(23,059)	[5,534]	{2,767}
Pasco	30,641	30,749	30,883	31,007	31,251	(6,250)	[1,500]	{750}	31,490	(6,298)	[1,512]	{756}	31,719	(6,344)	[1,522]	{761}
Pinellas	61,546	61,730	61,950	62,132	62,640	(12,528)	[3,007]	{1,503}	63,135	(12,627)	[3,030]	{1,515}	63,610	(12,722)	[3,053]	{1,527}
Polk	52,533	52,731	53,005	53,316	53,848	(10,770)	[2,585]	{1,292}	54,367	(10,873)	[2,610]	{1,305}	54,859	(10,972)	[2,633]	{1,317}
Sarasota	25,449	25,510	25,572	25,700	25,874	(5,175)	[1,242]	{621}	26,041	(5,208)	[1,250]	{625}	26,198	(5,240)	[1,258]	{629}
Seminole	24,999	25,095	25,226	25,323	25,527	(5,105)	[1,225]	{613}	25,726	(5,145)	[1,235]	{617}	25,914	(5,183)	[1,244]	{622}
St. Johns	19,023	19,089	19,167	19,229	19,391	(3,878)	[931]	{465}	19,543	(3,909)	[938]	{469}	19,691	(3,938)	[945]	{473}
Sumter	7,380	7,400	7,436	7,476	7,545	(1,509)	[362]	{181}	7,611	(1,522)	[365]	{183}	7,676	(1,535)	[368]	{184}
Volusia	32,183	32,316	32,472	32,663	33,009	(6,602)	[1,584]	{792}	33,350	(6,670)	[1,601]	{800}	33,683	(6,737)	[1,617]	{808}

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.