

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

Date: 1/25/21

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 1/25/21 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.

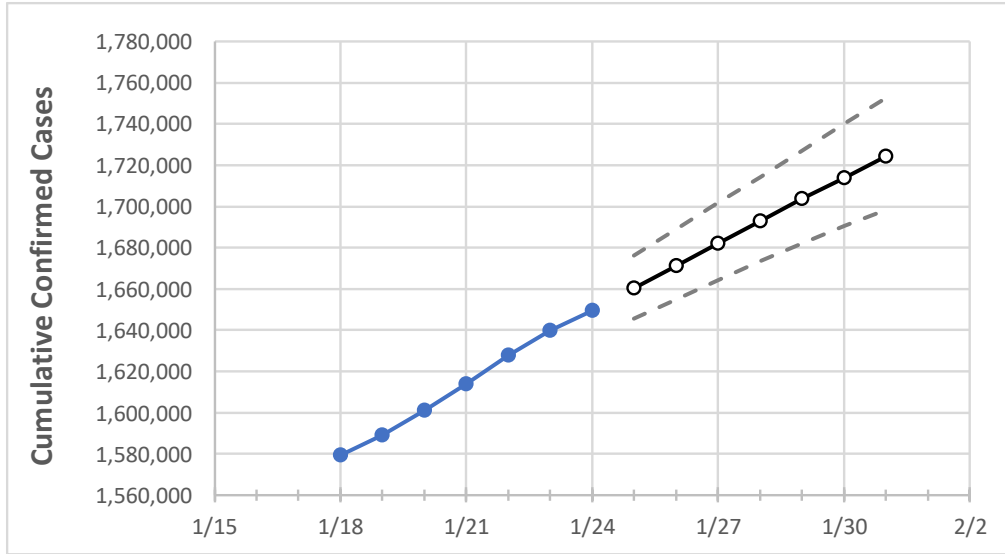
IEM's Modeling Lead

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:						
	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31
Florida	1,613,884	1,627,603	1,639,914	1,649,449	1,660,395	1,671,206	1,682,131	1,692,908	1,703,573	1,713,906	1,724,210

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:						
	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31
Alachua	19,274	19,408	19,581	19,723	19,876	20,025	20,176	20,326	20,479	20,630	20,779
Broward	162,720	163,896	165,045	166,058	167,154	168,236	169,318	170,386	171,440	172,484	173,519
Charlotte	9,195	9,257	9,316	9,367	9,422	9,476	9,527	9,577	9,625	9,672	9,717
Collier	26,361	26,573	26,709	26,832	26,999	27,165	27,328	27,488	27,647	27,800	27,957
Duval	76,707	77,741	78,161	78,492	78,986	79,480	79,969	80,431	80,888	81,347	81,810
Hillsborough	94,870	95,477	96,338	96,795	97,466	98,121	98,767	99,411	100,047	100,663	101,257
Lake	20,128	20,296	20,470	20,664	20,847	21,029	21,211	21,391	21,570	21,747	21,921
Lee	49,493	49,890	50,278	50,625	50,967	51,304	51,633	51,964	52,287	52,606	52,917
Manatee	26,755	26,990	27,224	27,381	27,563	27,741	27,920	28,098	28,272	28,439	28,611
Miami-Dade	352,405	354,704	357,038	358,801	360,920	362,997	365,055	367,079	369,085	371,045	372,975
Okaloosa	15,549	15,729	15,827	15,932	16,050	16,169	16,288	16,405	16,523	16,646	16,763
Orange	96,170	96,848	97,842	98,491	99,279	100,049	100,796	101,550	102,300	103,033	103,759
Osceola	31,498	31,734	32,033	32,273	32,528	32,785	33,037	33,284	33,526	33,772	34,015
Palm Beach	100,208	101,019	101,831	102,367	103,097	103,820	104,539	105,250	105,951	106,642	107,338
Pasco	27,610	27,865	28,076	28,299	28,514	28,720	28,930	29,133	29,335	29,534	29,729
Pinellas	55,564	56,247	56,564	56,935	57,329	57,728	58,118	58,501	58,868	59,244	59,619
Polk	46,855	47,254	47,795	48,119	48,495	48,875	49,241	49,608	49,972	50,319	50,668
Sarasota	23,227	23,603	23,718	23,806	23,981	24,149	24,312	24,480	24,639	24,804	24,962
Seminole	22,574	22,757	22,928	23,088	23,262	23,434	23,605	23,772	23,937	24,098	24,266
St. Johns	17,044	17,242	17,379	17,492	17,631	17,765	17,897	18,024	18,147	18,275	18,401
Sumter	6,605	6,646	6,706	6,750	6,798	6,846	6,890	6,935	6,979	7,023	7,067
Volusia	28,289	28,850	29,051	29,245	29,505	29,777	30,043	30,325	30,594	30,866	31,142

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:											
	1/21	1/22	1/23	1/24	1/26				1/28				1/30			
Alachua	19,274	19,408	19,581	19,723	20,025	(4,005)	[961]	{481}	20,326	(4,065)	[976]	{488}	20,630	(4,126)	[990]	{495}
Broward	162,720	163,896	165,045	166,058	168,236	(33,647)	[8,075]	{4,038}	170,386	(34,077)	[8,179]	{4,089}	172,484	(34,497)	[8,279]	{4,140}
Charlotte	9,195	9,257	9,316	9,367	9,476	(1,895)	[455]	{227}	9,577	(1,915)	[460]	{230}	9,672	(1,934)	[464]	{232}
Collier	26,361	26,573	26,709	26,832	27,165	(5,433)	[1,304]	{652}	27,488	(5,498)	[1,319]	{660}	27,800	(5,560)	[1,334]	{667}
Duval	76,707	77,741	78,161	78,492	79,480	(15,896)	[3,815]	{1,908}	80,431	(16,086)	[3,861]	{1,930}	81,347	(16,269)	[3,905]	{1,952}
Hillsborough	94,870	95,477	96,338	96,795	98,121	(19,624)	[4,710]	{2,355}	99,411	(19,882)	[4,772]	{2,386}	100,663	(20,133)	[4,832]	{2,416}
Lake	20,128	20,296	20,470	20,664	21,029	(4,206)	[1,009]	{505}	21,391	(4,278)	[1,027]	{513}	21,747	(4,349)	[1,044]	{522}
Lee	49,493	49,890	50,278	50,625	51,304	(10,261)	[2,463]	{1,231}	51,964	(10,393)	[2,494]	{1,247}	52,606	(10,521)	[2,525]	{1,263}
Manatee	26,755	26,990	27,224	27,381	27,741	(5,548)	[1,332]	{666}	28,098	(5,620)	[1,349]	{674}	28,439	(5,688)	[1,365]	{683}
Miami-Dade	352,405	354,704	357,038	358,801	362,997	(72,599)	[17,424]	{8,712}	367,079	(73,416)	[17,620]	{8,810}	371,045	(74,209)	[17,810]	{8,905}
Okaloosa	15,549	15,729	15,827	15,932	16,169	(3,234)	[776]	{388}	16,405	(3,281)	[787]	{394}	16,646	(3,329)	[799]	{399}
Orange	96,170	96,848	97,842	98,491	100,049	(20,010)	[4,802]	{2,401}	101,550	(20,310)	[4,874]	{2,437}	103,033	(20,607)	[4,946]	{2,473}
Osceola	31,498	31,734	32,033	32,273	32,785	(6,557)	[1,574]	{787}	33,284	(6,657)	[1,598]	{799}	33,772	(6,754)	[1,621]	{811}
Palm Beach	100,208	101,019	101,831	102,367	103,820	(20,764)	[4,983]	{2,492}	105,250	(21,050)	[5,052]	{2,526}	106,642	(21,328)	[5,119]	{2,559}
Pasco	27,610	27,865	28,076	28,299	28,720	(5,744)	[1,379]	{689}	29,133	(5,827)	[1,398]	{699}	29,534	(5,907)	[1,418]	{709}
Pinellas	55,564	56,247	56,564	56,935	57,728	(11,546)	[2,771]	{1,385}	58,501	(11,700)	[2,808]	{1,404}	59,244	(11,849)	[2,844]	{1,422}
Polk	46,855	47,254	47,795	48,119	48,875	(9,775)	[2,346]	{1,173}	49,608	(9,922)	[2,381]	{1,191}	50,319	(10,064)	[2,415]	{1,208}
Sarasota	23,227	23,603	23,718	23,806	24,149	(4,830)	[1,159]	{580}	24,480	(4,896)	[1,175]	{588}	24,804	(4,961)	[1,191]	{595}
Seminole	22,574	22,757	22,928	23,088	23,434	(4,687)	[1,125]	{562}	23,772	(4,754)	[1,141]	{571}	24,098	(4,820)	[1,157]	{578}
St. Johns	17,044	17,242	17,379	17,492	17,765	(3,553)	[853]	{426}	18,024	(3,605)	[865]	{433}	18,275	(3,655)	[877]	{439}
Sumter	6,605	6,646	6,706	6,750	6,846	(1,369)	[329]	{164}	6,935	(1,387)	[333]	{166}	7,023	(1,405)	[337]	{169}
Volusia	28,289	28,850	29,051	29,245	29,777	(5,955)	[1,429]	{715}	30,325	(6,065)	[1,456]	{728}	30,866	(6,173)	[1,482]	{741}

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.