

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

Date: 3/26/21

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 3/26/21 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.

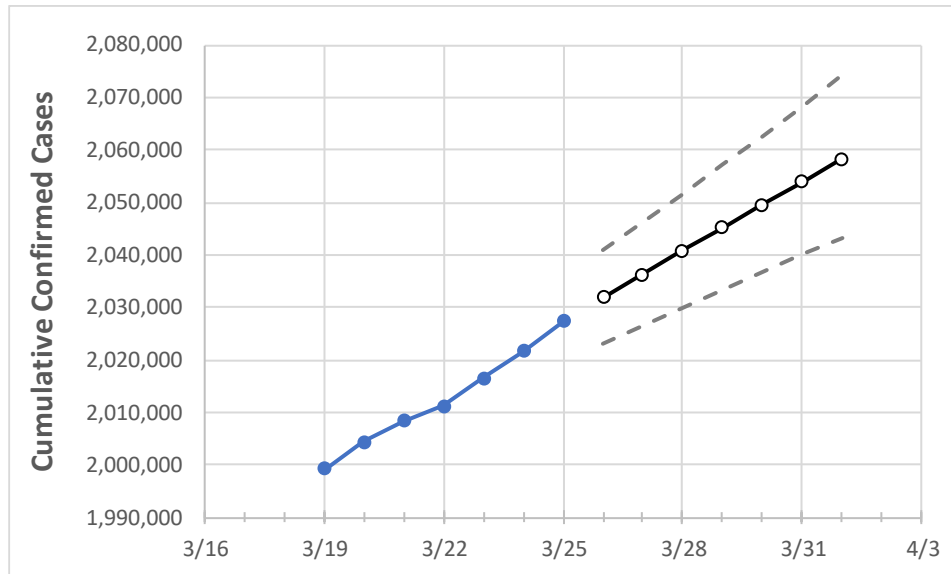
IEM's Modeling Lead

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:						
	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1
Florida	2,011,211	2,016,513	2,021,656	2,027,429	2,031,871	2,036,299	2,040,765	2,045,141	2,049,482	2,053,844	2,058,349

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:						
	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1
Alachua	23,039	23,068	23,098	23,139	23,168	23,197	23,225	23,253	23,282	23,310	23,340
Broward	208,462	209,170	209,748	210,462	211,029	211,600	212,165	212,722	213,293	213,861	214,420
Charlotte	11,209	11,241	11,274	11,313	11,342	11,372	11,404	11,435	11,467	11,500	11,532
Collier	31,763	31,857	31,950	32,004	32,069	32,135	32,199	32,266	32,331	32,395	32,459
Duval	91,536	91,651	91,772	91,915	92,028	92,138	92,247	92,355	92,462	92,567	92,672
Hillsborough	118,190	118,558	118,911	119,339	119,668	120,000	120,326	120,658	120,989	121,324	121,662
Lake	26,009	26,092	26,199	26,298	26,361	26,424	26,488	26,550	26,610	26,671	26,732
Lee	61,015	61,202	61,388	61,572	61,736	61,902	62,069	62,237	62,406	62,574	62,745
Manatee	33,905	34,036	34,135	34,246	34,330	34,410	34,492	34,570	34,651	34,728	34,807
Miami-Dade	435,135	436,394	437,452	438,704	439,724	440,744	441,777	442,797	443,809	444,813	445,837
Okaloosa	19,601	19,623	19,643	19,667	19,681	19,695	19,709	19,722	19,734	19,746	19,757
Orange	120,412	120,795	121,173	121,574	121,889	122,205	122,525	122,845	123,171	123,501	123,839
Osceola	38,723	38,843	38,968	39,075	39,169	39,263	39,355	39,446	39,541	39,637	39,732
Palm Beach	128,321	128,620	129,029	129,478	129,799	130,114	130,431	130,741	131,051	131,357	131,667
Pasco	35,373	35,492	35,583	35,730	35,822	35,916	36,008	36,100	36,193	36,285	36,379
Pinellas	70,382	70,580	70,708	71,011	71,180	71,353	71,521	71,690	71,867	72,038	72,201
Polk	59,834	59,991	60,115	60,278	60,391	60,504	60,620	60,733	60,843	60,953	61,061
Sarasota	28,515	28,592	28,684	28,799	28,877	28,956	29,038	29,121	29,204	29,288	29,372
Seminole	29,062	29,165	29,270	29,388	29,489	29,591	29,696	29,801	29,908	30,017	30,127
St. Johns	20,788	20,829	20,872	20,918	20,950	20,982	21,013	21,044	21,075	21,107	21,139
Sumter	8,518	8,562	8,644	8,678	8,708	8,739	8,772	8,804	8,839	8,874	8,909
Volusia	36,785	36,887	37,103	37,272	37,408	37,548	37,684	37,824	37,964	38,110	38,263

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:											
	3/22	3/23	3/24	3/25	3/27				3/29				3/31			
Alachua	23,039	23,068	23,098	23,139	23,197	(4,639)	[1,113]	{557}	23,253	(4,651)	[1,116]	{558}	23,310	(4,662)	[1,119]	{559}
Broward	208,462	209,170	209,748	210,462	211,600	(42,320)	[10,157]	{5,078}	212,722	(42,544)	[10,211]	{5,105}	213,861	(42,772)	[10,265]	{5,133}
Charlotte	11,209	11,241	11,274	11,313	11,372	(2,274)	[546]	{273}	11,435	(2,287)	[549]	{274}	11,500	(2,300)	[552]	{276}
Collier	31,763	31,857	31,950	32,004	32,135	(6,427)	[1,542]	{771}	32,266	(6,453)	[1,549]	{774}	32,395	(6,479)	[1,555]	{777}
Duval	91,536	91,651	91,772	91,915	92,138	(18,428)	[4,423]	{2,211}	92,355	(18,471)	[4,433]	{2,217}	92,567	(18,513)	[4,443]	{2,222}
Hillsborough	118,190	118,558	118,911	119,339	120,000	(24,000)	[5,760]	{2,880}	120,658	(24,132)	[5,792]	{2,896}	121,324	(24,265)	[5,824]	{2,912}
Lake	26,009	26,092	26,199	26,298	26,424	(5,285)	[1,268]	{634}	26,550	(5,310)	[1,274]	{637}	26,671	(5,334)	[1,280]	{640}
Lee	61,015	61,202	61,388	61,572	61,902	(12,380)	[2,971]	{1,486}	62,237	(12,447)	[2,987]	{1,494}	62,574	(12,515)	[3,004]	{1,502}
Manatee	33,905	34,036	34,135	34,246	34,410	(6,882)	[1,652]	{826}	34,570	(6,914)	[1,659]	{830}	34,728	(6,946)	[1,667]	{833}
Miami-Dade	435,135	436,394	437,452	438,704	440,744	(88,149)	[21,156]	{10,578}	442,797	(88,559)	[21,254]	{10,627}	444,813	(88,963)	[21,351]	{10,676}
Okaloosa	19,601	19,623	19,643	19,667	19,695	(3,939)	[945]	{473}	19,722	(3,944)	[947]	{473}	19,746	(3,949)	[948]	{474}
Orange	120,412	120,795	121,173	121,574	122,205	(24,441)	[5,866]	{2,933}	122,845	(24,569)	[5,897]	{2,948}	123,501	(24,700)	[5,928]	{2,964}
Osceola	38,723	38,843	38,968	39,075	39,263	(7,853)	[1,885]	{942}	39,446	(7,889)	[1,893]	{947}	39,637	(7,927)	[1,903]	{951}
Palm Beach	128,321	128,620	129,029	129,478	130,114	(26,023)	[6,245]	{3,123}	130,741	(26,148)	[6,276]	{3,138}	131,357	(26,271)	[6,305]	{3,153}
Pasco	35,373	35,492	35,583	35,730	35,916	(7,183)	[1,724]	{862}	36,100	(7,220)	[1,733]	{866}	36,285	(7,257)	[1,742]	{871}
Pinellas	70,382	70,580	70,708	71,011	71,353	(14,271)	[3,425]	{1,712}	71,690	(14,338)	[3,441]	{1,721}	72,038	(14,408)	[3,458]	{1,729}
Polk	59,834	59,991	60,115	60,278	60,504	(12,101)	[2,904]	{1,452}	60,733	(12,147)	[2,915]	{1,458}	60,953	(12,191)	[2,926]	{1,463}
Sarasota	28,515	28,592	28,684	28,799	28,956	(5,791)	[1,390]	{695}	29,121	(5,824)	[1,398]	{699}	29,288	(5,858)	[1,406]	{703}
Seminole	29,062	29,165	29,270	29,388	29,591	(5,918)	[1,420]	{710}	29,801	(5,960)	[1,430]	{715}	30,017	(6,003)	[1,441]	{720}
St. Johns	20,788	20,829	20,872	20,918	20,982	(4,196)	[1,007]	{504}	21,044	(4,209)	[1,010]	{505}	21,107	(4,221)	[1,013]	{507}
Sumter	8,518	8,562	8,644	8,678	8,739	(1,748)	[419]	{210}	8,804	(1,761)	[423]	{211}	8,874	(1,775)	[426]	{213}
Volusia	36,785	36,887	37,103	37,272	37,548	(7,510)	[1,802]	{901}	37,824	(7,565)	[1,816]	{908}	38,110	(7,622)	[1,829]	{915}

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.