

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

Date: 7/1/21

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 7/1/21 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.**

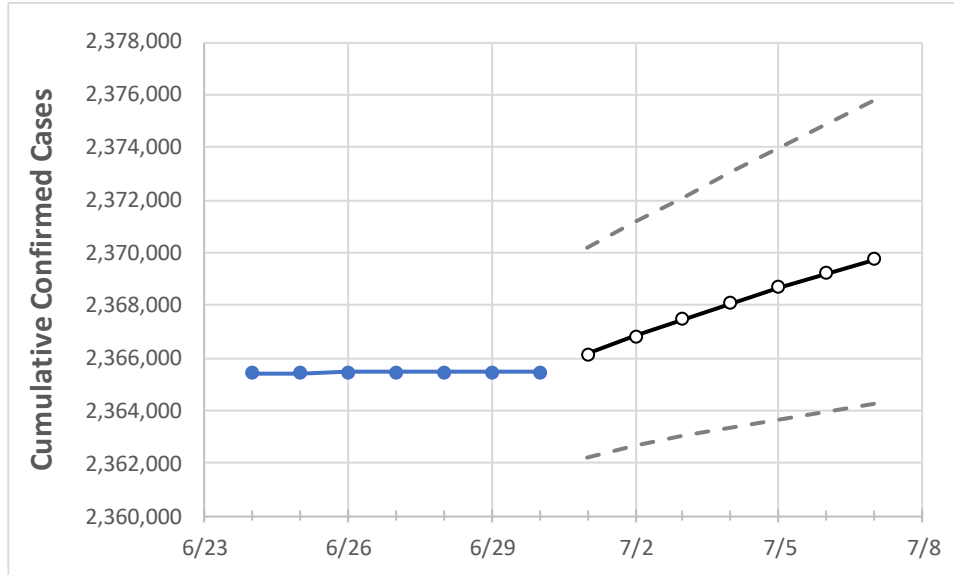
### IEM's Modeling Lead

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:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7

Florida	2,365,464	2,365,464	2,365,464	2,365,464	2,366,149	2,366,830	2,367,470	2,368,086	2,368,691	2,369,234	2,369,747
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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:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7
Alachua	25,741	25,741	25,741	25,741	25,745	25,749	25,753	25,756	25,760	25,763	25,766
Broward	248,830	248,830	248,830	248,830	248,894	248,957	249,018	249,078	249,132	249,183	249,235
Charlotte	13,644	13,644	13,644	13,644	13,648	13,652	13,655	13,659	13,662	13,665	13,668
Collier	37,773	37,773	37,773	37,773	37,783	37,792	37,801	37,809	37,817	37,824	37,831
Duval	103,256	103,256	103,256	103,256	103,310	103,363	103,413	103,461	103,507	103,552	103,595
Hillsborough	146,442	146,442	146,442	146,442	146,490	146,535	146,577	146,617	146,653	146,689	146,724
Lake	31,659	31,659	31,659	31,659	31,671	31,683	31,694	31,705	31,714	31,724	31,733
Lee	74,945	74,945	74,945	74,945	74,968	74,990	75,009	75,029	75,048	75,067	75,083
Manatee	40,454	40,454	40,454	40,454	40,462	40,469	40,475	40,481	40,487	40,493	40,498
Miami-Dade	508,464	508,464	508,464	508,464	508,592	508,712	508,828	508,938	509,044	509,143	509,242
Okaloosa	21,195	21,195	21,195	21,195	21,202	21,209	21,216	21,222	21,228	21,235	21,241
Orange	145,712	145,712	145,712	145,712	145,754	145,795	145,833	145,867	145,902	145,934	145,964
Osceola	47,253	47,253	47,253	47,253	47,267	47,280	47,292	47,303	47,314	47,324	47,334
Palm Beach	150,857	150,857	150,857	150,857	150,903	150,948	150,992	151,034	151,074	151,112	151,149
Pasco	43,521	43,521	43,521	43,521	43,526	43,530	43,534	43,537	43,540	43,543	43,546
Pinellas	82,576	82,576	82,576	82,576	82,599	82,621	82,641	82,661	82,680	82,699	82,717
Polk	72,452	72,452	72,452	72,452	72,479	72,504	72,529	72,552	72,574	72,596	72,617
Sarasota	34,091	34,091	34,091	34,091	34,095	34,099	34,103	34,107	34,110	34,113	34,116
Seminole	36,264	36,264	36,264	36,264	36,282	36,298	36,314	36,329	36,343	36,357	36,371
St. Johns	23,862	23,862	23,862	23,862	23,882	23,902	23,921	23,941	23,960	23,980	23,999
Sumter	9,626	9,626	9,626	9,626	9,629	9,632	9,634	9,637	9,639	9,642	9,644
Volusia	45,835	45,835	45,835	45,835	45,856	45,876	45,895	45,913	45,931	45,948	45,966

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:											
	6/27	6/28	6/29	6/30	7/2			7/4			7/6					
Alachua	25,741	25,741	25,741	25,741	25,749	(5,150)	[1,236]	{618}	25,756	(5,151)	[1,236]	{618}	25,763	(5,153)	[1,237]	{618}
Broward	248,830	248,830	248,830	248,830	248,957	(49,791)	[11,950]	{5,975}	249,078	(49,816)	[11,956]	{5,978}	249,183	(49,837)	[11,961]	{5,980}
Charlotte	13,644	13,644	13,644	13,644	13,652	(2,730)	[655]	{328}	13,659	(2,732)	[656]	{328}	13,665	(2,733)	[656]	{328}
Collier	37,773	37,773	37,773	37,773	37,792	(7,558)	[1,814]	{907}	37,809	(7,562)	[1,815]	{907}	37,824	(7,565)	[1,816]	{908}
Duval	103,256	103,256	103,256	103,256	103,363	(20,673)	[4,961]	{2,481}	103,461	(20,692)	[4,966]	{2,483}	103,552	(20,710)	[4,970]	{2,485}
Hillsborough	146,442	146,442	146,442	146,442	146,535	(29,307)	[7,034]	{3,517}	146,617	(29,323)	[7,038]	{3,519}	146,689	(29,338)	[7,041]	{3,521}
Lake	31,659	31,659	31,659	31,659	31,683	(6,337)	[1,521]	{760}	31,705	(6,341)	[1,522]	{761}	31,724	(6,345)	[1,523]	{761}
Lee	74,945	74,945	74,945	74,945	74,990	(14,998)	[3,599]	{1,800}	75,029	(15,006)	[3,601]	{1,801}	75,067	(15,013)	[3,603]	{1,802}
Manatee	40,454	40,454	40,454	40,454	40,469	(8,094)	[1,942]	{971}	40,481	(8,096)	[1,943]	{972}	40,493	(8,099)	[1,944]	{972}
Miami-Dade	508,464	508,464	508,464	508,464	508,712	(101,742)	[24,418]	{12,209}	508,938	(101,788)	[24,429]	{12,215}	509,143	(101,829)	[24,439]	{12,219}
Okaloosa	21,195	21,195	21,195	21,195	21,209	(4,242)	[1,018]	{509}	21,222	(4,244)	[1,019]	{509}	21,235	(4,247)	[1,019]	{510}
Orange	145,712	145,712	145,712	145,712	145,795	(29,159)	[6,998]	{3,499}	145,867	(29,173)	[7,002]	{3,501}	145,934	(29,187)	[7,005]	{3,502}
Osceola	47,253	47,253	47,253	47,253	47,280	(9,456)	[2,269]	{1,135}	47,303	(9,461)	[2,271]	{1,135}	47,324	(9,465)	[2,272]	{1,136}
Palm Beach	150,857	150,857	150,857	150,857	150,948	(30,190)	[7,245]	{3,623}	151,034	(30,207)	[7,250]	{3,625}	151,112	(30,222)	[7,253]	{3,627}
Pasco	43,521	43,521	43,521	43,521	43,530	(8,706)	[2,089]	{1,045}	43,537	(8,707)	[2,090]	{1,045}	43,543	(8,709)	[2,090]	{1,045}
Pinellas	82,576	82,576	82,576	82,576	82,621	(16,524)	[3,966]	{1,983}	82,661	(16,532)	[3,968]	{1,984}	82,699	(16,540)	[3,970]	{1,985}
Polk	72,452	72,452	72,452	72,452	72,504	(14,501)	[3,480]	{1,740}	72,552	(14,510)	[3,482]	{1,741}	72,596	(14,519)	[3,485]	{1,742}
Sarasota	34,091	34,091	34,091	34,091	34,099	(6,820)	[1,637]	{818}	34,107	(6,821)	[1,637]	{819}	34,113	(6,823)	[1,637]	{819}
Seminole	36,264	36,264	36,264	36,264	36,298	(7,260)	[1,742]	{871}	36,329	(7,266)	[1,744]	{872}	36,357	(7,271)	[1,745]	{873}
St. Johns	23,862	23,862	23,862	23,862	23,902	(4,780)	[1,147]	{574}	23,941	(4,788)	[1,149]	{575}	23,980	(4,796)	[1,151]	{576}
Sumter	9,626	9,626	9,626	9,626	9,632	(1,926)	[462]	{231}	9,637	(1,927)	[463]	{231}	9,642	(1,928)	[463]	{231}
Volusia	45,835	45,835	45,835	45,835	45,876	(9,175)	[2,202]	{1,101}	45,913	(9,183)	[2,204]	{1,102}	45,948	(9,190)	[2,205]	{1,103}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.