

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

Date: 3/25/21

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 3/25/21 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.**

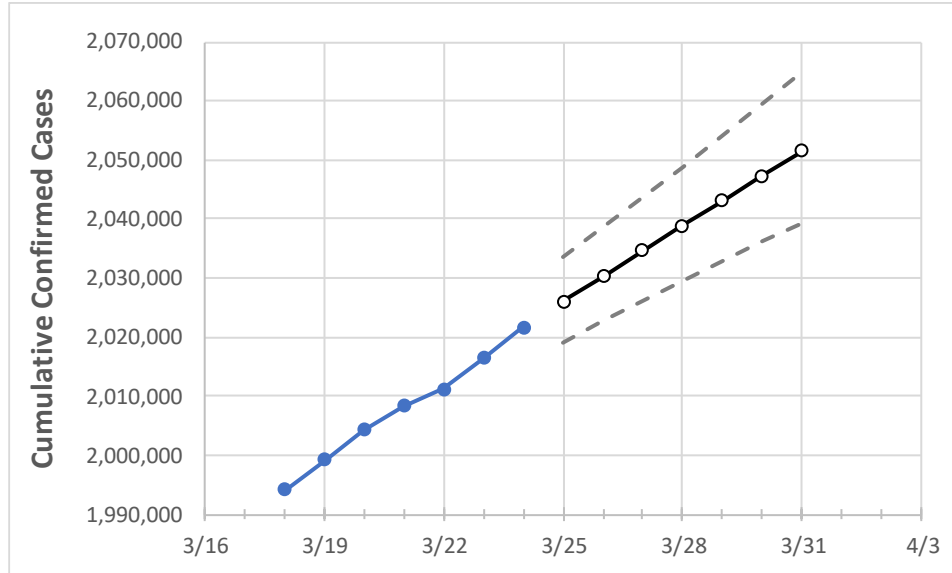
### IEM's Modeling Lead

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Florida	2,008,349	2,011,211	2,016,513	2,021,656	2,025,993	2,030,333	2,034,614	2,038,917	2,043,085	2,047,313	2,051,509

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Alachua	23,015	23,039	23,068	23,098	23,124	23,150	23,176	23,202	23,228	23,253	23,280
Broward	208,096	208,462	209,170	209,748	210,305	210,859	211,410	211,971	212,512	213,051	213,589
Charlotte	11,187	11,209	11,241	11,274	11,302	11,330	11,359	11,388	11,418	11,449	11,479
Collier	31,736	31,763	31,857	31,950	32,015	32,082	32,149	32,217	32,283	32,349	32,414
Duval	91,450	91,536	91,651	91,772	91,880	91,986	92,089	92,195	92,299	92,402	92,501
Hillsborough	118,061	118,190	118,558	118,911	119,221	119,535	119,836	120,140	120,441	120,749	121,061
Lake	25,978	26,009	26,092	26,199	26,255	26,312	26,367	26,422	26,477	26,532	26,584
Lee	60,914	61,015	61,202	61,388	61,547	61,710	61,872	62,034	62,199	62,362	62,530
Manatee	33,832	33,905	34,036	34,135	34,218	34,300	34,383	34,465	34,547	34,628	34,708
Miami-Dade	434,352	435,135	436,394	437,452	438,447	439,454	440,434	441,409	442,358	443,310	444,260
Okaloosa	19,599	19,601	19,623	19,643	19,657	19,671	19,684	19,697	19,709	19,720	19,731
Orange	120,183	120,412	120,795	121,173	121,472	121,772	122,073	122,379	122,690	122,998	123,313
Osceola	38,661	38,723	38,843	38,968	39,054	39,141	39,228	39,315	39,400	39,487	39,572
Palm Beach	128,154	128,321	128,620	129,029	129,336	129,639	129,935	130,234	130,521	130,808	131,096
Pasco	35,336	35,373	35,492	35,583	35,667	35,751	35,834	35,913	35,994	36,071	36,153
Pinellas	70,251	70,382	70,580	70,708	70,869	71,027	71,188	71,343	71,499	71,650	71,803
Polk	59,767	59,834	59,991	60,115	60,218	60,320	60,423	60,523	60,622	60,717	60,814
Sarasota	28,455	28,515	28,592	28,684	28,755	28,827	28,900	28,971	29,044	29,116	29,190
Seminole	28,997	29,062	29,165	29,270	29,364	29,460	29,557	29,654	29,753	29,853	29,954
St. Johns	20,774	20,788	20,829	20,872	20,903	20,932	20,963	20,993	21,024	21,055	21,086
Sumter	8,501	8,518	8,562	8,644	8,671	8,699	8,728	8,756	8,783	8,813	8,842
Volusia	36,709	36,785	36,887	37,103	37,233	37,365	37,498	37,634	37,773	37,913	38,053

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:											
	3/21	3/22	3/23	3/24	3/26			3/28			3/30					
Alachua	23,015	23,039	23,068	23,098	23,150	(4,630)	[1,111]	{556}	23,202	(4,640)	[1,114]	{557}	23,253	(4,651)	[1,116]	{558}
Broward	208,096	208,462	209,170	209,748	210,859	(42,172)	[10,121]	{5,061}	211,971	(42,394)	[10,175]	{5,087}	213,051	(42,610)	[10,226]	{5,113}
Charlotte	11,187	11,209	11,241	11,274	11,330	(2,266)	[544]	{272}	11,388	(2,278)	[547]	{273}	11,449	(2,290)	[550]	{275}
Collier	31,736	31,763	31,857	31,950	32,082	(6,416)	[1,540]	{770}	32,217	(6,443)	[1,546]	{773}	32,349	(6,470)	[1,553]	{776}
Duval	91,450	91,536	91,651	91,772	91,986	(18,397)	[4,415]	{2,208}	92,195	(18,439)	[4,425]	{2,213}	92,402	(18,480)	[4,435]	{2,218}
Hillsborough	118,061	118,190	118,558	118,911	119,535	(23,907)	[5,738]	{2,869}	120,140	(24,028)	[5,767]	{2,883}	120,749	(24,150)	[5,796]	{2,898}
Lake	25,978	26,009	26,092	26,199	26,312	(5,262)	[1,263]	{631}	26,422	(5,284)	[1,268]	{634}	26,532	(5,306)	[1,274]	{637}
Lee	60,914	61,015	61,202	61,388	61,710	(12,342)	[2,962]	{1,481}	62,034	(12,407)	[2,978]	{1,489}	62,362	(12,472)	[2,993]	{1,497}
Manatee	33,832	33,905	34,036	34,135	34,300	(6,860)	[1,646]	{823}	34,465	(6,893)	[1,654]	{827}	34,628	(6,926)	[1,662]	{831}
Miami-Dade	434,352	435,135	436,394	437,452	439,454	(87,891)	[21,094]	{10,547}	441,409	(88,282)	[21,188]	{10,594}	443,310	(88,662)	[21,279]	{10,639}
Okaloosa	19,599	19,601	19,623	19,643	19,671	(3,934)	[944]	{472}	19,697	(3,939)	[945]	{473}	19,720	(3,944)	[947]	{473}
Orange	120,183	120,412	120,795	121,173	121,772	(24,354)	[5,845]	{2,923}	122,379	(24,476)	[5,874]	{2,937}	122,998	(24,600)	[5,904]	{2,952}
Osceola	38,661	38,723	38,843	38,968	39,141	(7,828)	[1,879]	{939}	39,315	(7,863)	[1,887]	{944}	39,487	(7,897)	[1,895]	{948}
Palm Beach	128,154	128,321	128,620	129,029	129,639	(25,928)	[6,223]	{3,111}	130,234	(26,047)	[6,251]	{3,126}	130,808	(26,162)	[6,279]	{3,139}
Pasco	35,336	35,373	35,492	35,583	35,751	(7,150)	[1,716]	{858}	35,913	(7,183)	[1,724]	{862}	36,071	(7,214)	[1,731]	{866}
Pinellas	70,251	70,382	70,580	70,708	71,027	(14,205)	[3,409]	{1,705}	71,343	(14,269)	[3,424]	{1,712}	71,650	(14,330)	[3,439]	{1,720}
Polk	59,767	59,834	59,991	60,115	60,320	(12,064)	[2,895]	{1,448}	60,523	(12,105)	[2,905]	{1,453}	60,717	(12,143)	[2,914]	{1,457}
Sarasota	28,455	28,515	28,592	28,684	28,827	(5,765)	[1,384]	{692}	28,971	(5,794)	[1,391]	{695}	29,116	(5,823)	[1,398]	{699}
Seminole	28,997	29,062	29,165	29,270	29,460	(5,892)	[1,414]	{707}	29,654	(5,931)	[1,423]	{712}	29,853	(5,971)	[1,433]	{716}
St. Johns	20,774	20,788	20,829	20,872	20,932	(4,186)	[1,005]	{502}	20,993	(4,199)	[1,008]	{504}	21,055	(4,211)	[1,011]	{505}
Sumter	8,501	8,518	8,562	8,644	8,699	(1,740)	[418]	{209}	8,756	(1,751)	[420]	{210}	8,813	(1,763)	[423]	{212}
Volusia	36,709	36,785	36,887	37,103	37,365	(7,473)	[1,794]	{897}	37,634	(7,527)	[1,806]	{903}	37,913	(7,583)	[1,820]	{910}

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.