

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

Date: 2/2/21

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 2/2/21 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.**

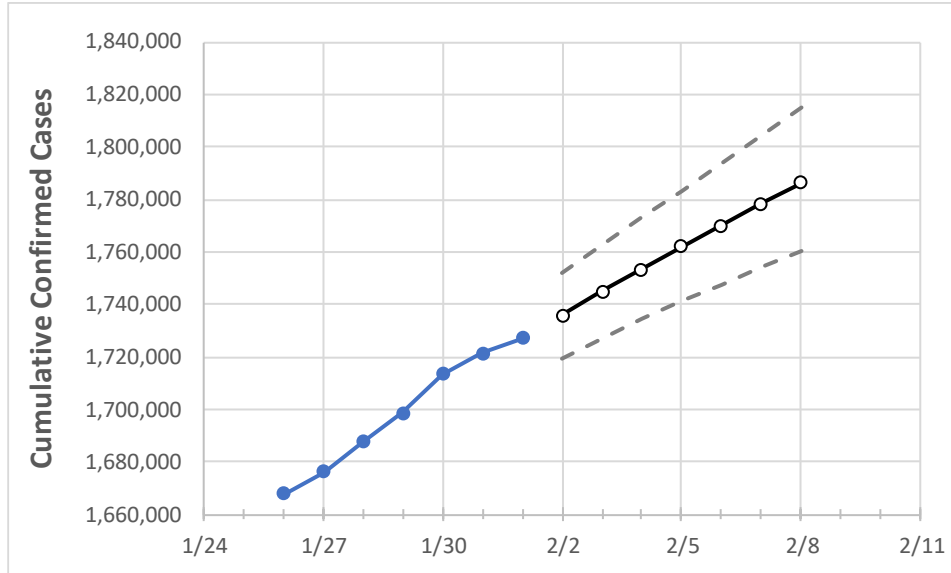
### IEM's Modeling Lead

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:						
	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8

Florida 1,698,570 1,713,589 1,721,377 1,727,107 1,735,997 1,744,762 1,753,445 1,761,889 1,770,125 1,778,443 1,786,485

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:							
	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	
Alachua	20,361	20,566	20,655	20,692	20,803	20,908	21,012	21,116	21,216	21,312	21,411	
Broward	170,709	172,082	172,864	173,652	174,565	175,441	176,323	177,181	178,028	178,873	179,694	
Charlotte	9,614	9,688	9,719	9,745	9,783	9,821	9,857	9,892	9,926	9,957	9,989	
Collier	27,543	27,723	27,810	27,867	27,987	28,102	28,218	28,329	28,439	28,549	28,652	
Duval	80,580	81,530	81,927	82,216	82,630	83,039	83,442	83,832	84,211	84,579	84,946	
Hillsborough	99,421	100,334	100,764	100,990	101,467	101,925	102,377	102,808	103,232	103,634	104,043	
Lake	21,511	21,697	21,824	21,864	22,007	22,147	22,283	22,414	22,544	22,671	22,796	
Lee	52,073	52,420	52,653	52,820	53,070	53,311	53,549	53,779	54,003	54,216	54,429	
Manatee	28,160	28,468	28,589	28,702	28,863	29,019	29,174	29,329	29,481	29,636	29,786	
Miami-Dade	368,137	370,642	372,120	373,423	375,085	376,704	378,296	379,845	381,366	382,846	384,319	
Okaloosa	16,515	16,639	16,707	16,730	16,821	16,909	17,001	17,088	17,177	17,262	17,346	
Orange	101,955	102,897	103,337	103,649	104,231	104,815	105,382	105,931	106,476	107,003	107,522	
Osceola	33,174	33,447	33,608	33,722	33,895	34,067	34,235	34,401	34,560	34,717	34,871	
Palm Beach	105,540	106,691	107,242	107,619	108,252	108,863	109,472	110,089	110,684	111,272	111,866	
Pasco	29,171	29,432	29,608	29,693	29,851	30,006	30,154	30,301	30,443	30,579	30,714	
Pinellas	58,591	59,207	59,475	59,716	60,037	60,347	60,648	60,949	61,241	61,532	61,821	
Polk	49,692	50,201	50,474	50,702	50,987	51,274	51,553	51,821	52,085	52,354	52,603	
Sarasota	24,353	24,645	24,759	24,833	24,953	25,070	25,187	25,301	25,413	25,520	25,625	
Seminole	23,861	24,055	24,153	24,227	24,354	24,480	24,603	24,723	24,838	24,953	25,066	
St. Johns	18,085	18,261	18,328	18,397	18,494	18,587	18,678	18,763	18,847	18,931	19,014	
Sumter	6,997	7,070	7,104	7,119	7,159	7,199	7,236	7,272	7,308	7,344	7,379	
Volusia	30,320	30,750	30,961	31,125	31,357	31,582	31,800	32,028	32,245	32,461	32,685	

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:											
	1/29	1/30	1/31	2/1	2/3		2/5		2/7							
Alachua	20,361	20,566	20,655	20,692	20,908	(4,182)	[1,004]	{502}	21,116	(4,223)	[1,014]	{507}	21,312	(4,262)	[1,023]	{511}
Broward	170,709	172,082	172,864	173,652	175,441	(35,088)	[8,421]	{4,211}	177,181	(35,436)	[8,505]	{4,252}	178,873	(35,775)	[8,586]	{4,293}
Charlotte	9,614	9,688	9,719	9,745	9,821	(1,964)	[471]	{236}	9,892	(1,978)	[475]	{237}	9,957	(1,991)	[478]	{239}
Collier	27,543	27,723	27,810	27,867	28,102	(5,620)	[1,349]	{674}	28,329	(5,666)	[1,360]	{680}	28,549	(5,710)	[1,370]	{685}
Duval	80,580	81,530	81,927	82,216	83,039	(16,608)	[3,986]	{1,993}	83,832	(16,766)	[4,024]	{2,012}	84,579	(16,916)	[4,060]	{2,030}
Hillsborough	99,421	100,334	100,764	100,990	101,925	(20,385)	[4,892]	{2,446}	102,808	(20,562)	[4,935]	{2,467}	103,634	(20,727)	[4,974]	{2,487}
Lake	21,511	21,697	21,824	21,864	22,147	(4,429)	[1,063]	{532}	22,414	(4,483)	[1,076]	{538}	22,671	(4,534)	[1,088]	{544}
Lee	52,073	52,420	52,653	52,820	53,311	(10,662)	[2,559]	{1,279}	53,779	(10,756)	[2,581]	{1,291}	54,216	(10,843)	[2,602]	{1,301}
Manatee	28,160	28,468	28,589	28,702	29,019	(5,804)	[1,393]	{696}	29,329	(5,866)	[1,408]	{704}	29,636	(5,927)	[1,423]	{711}
Miami-Dade	368,137	370,642	372,120	373,423	376,704	(75,341)	[18,082]	{9,041}	379,845	(75,969)	[18,233]	{9,116}	382,846	(76,569)	[18,377]	{9,188}
Okaloosa	16,515	16,639	16,707	16,730	16,909	(3,382)	[812]	{406}	17,088	(3,418)	[820]	{410}	17,262	(3,452)	[829]	{414}
Orange	101,955	102,897	103,337	103,649	104,815	(20,963)	[5,031]	{2,516}	105,931	(21,186)	[5,085]	{2,542}	107,003	(21,401)	[5,136]	{2,568}
Osceola	33,174	33,447	33,608	33,722	34,067	(6,813)	[1,635]	{818}	34,401	(6,880)	[1,651]	{826}	34,717	(6,943)	[1,666]	{833}
Palm Beach	105,540	106,691	107,242	107,619	108,863	(21,773)	[5,225]	{2,613}	110,089	(22,018)	[5,284]	{2,642}	111,272	(22,254)	[5,341]	{2,671}
Pasco	29,171	29,432	29,608	29,693	30,006	(6,001)	[1,440]	{720}	30,301	(6,060)	[1,454]	{727}	30,579	(6,116)	[1,468]	{734}
Pinellas	58,591	59,207	59,475	59,716	60,347	(12,069)	[2,897]	{1,448}	60,949	(12,190)	[2,926]	{1,463}	61,532	(12,306)	[2,954]	{1,477}
Polk	49,692	50,201	50,474	50,702	51,274	(10,255)	[2,461]	{1,231}	51,821	(10,364)	[2,487]	{1,244}	52,354	(10,471)	[2,513]	{1,257}
Sarasota	24,353	24,645	24,759	24,833	25,070	(5,014)	[1,203]	{602}	25,301	(5,060)	[1,214]	{607}	25,520	(5,104)	[1,225]	{612}
Seminole	23,861	24,055	24,153	24,227	24,480	(4,896)	[1,175]	{588}	24,723	(4,945)	[1,187]	{593}	24,953	(4,991)	[1,198]	{599}
St. Johns	18,085	18,261	18,328	18,397	18,587	(3,717)	[892]	{446}	18,763	(3,753)	[901]	{450}	18,931	(3,786)	[909]	{454}
Sumter	6,997	7,070	7,104	7,119	7,199	(1,440)	[346]	{173}	7,272	(1,454)	[349]	{175}	7,344	(1,469)	[353]	{176}
Volusia	30,320	30,750	30,961	31,125	31,582	(6,316)	[1,516]	{758}	32,028	(6,406)	[1,537]	{769}	32,461	(6,492)	[1,558]	{779}

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.