

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

Date: 9/4/20

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 9/4/20 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.**

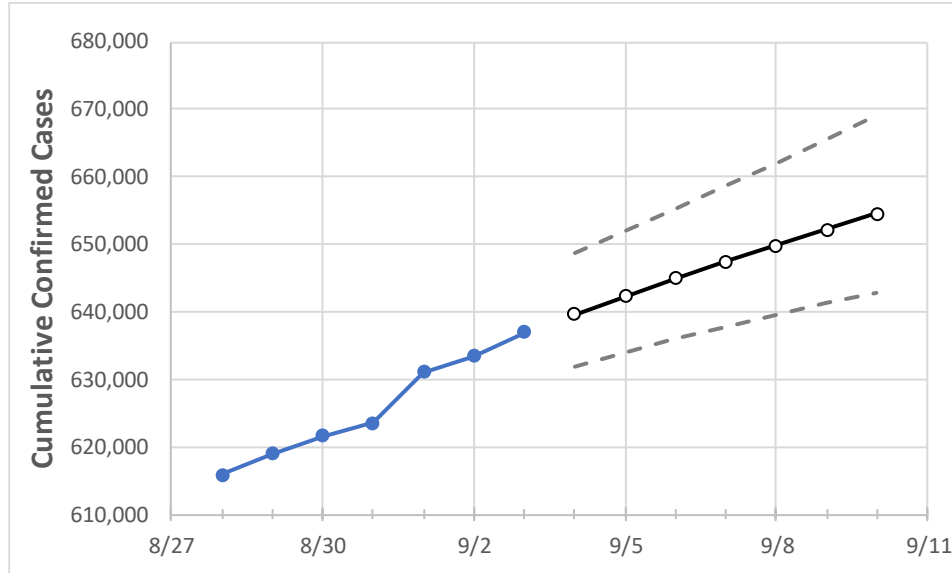
### IEM's Modeling Lead

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:						
	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	9/8	9/9	9/10
Florida	623,471	631,040	633,442	637,013	639,700	642,326	644,892	647,399	649,848	652,241	654,579

*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 20%, and are often within 10%, of actual confirmed cases.*

## Florida Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	9/8	9/9	9/10
Alachua	5,196	5,251	5,303	5,345	5,367	5,389	5,410	5,429	5,448	5,466	5,484
Broward	71,121	72,245	72,371	72,634	72,824	73,006	73,180	73,347	73,507	73,660	73,806
Charlotte	2,677	2,713	2,729	2,744	2,764	2,783	2,803	2,822	2,842	2,861	2,880
Collier	11,609	11,796	11,819	11,853	11,879	11,903	11,927	11,950	11,972	11,993	12,014
Duval	26,460	26,683	26,807	27,241	27,363	27,485	27,606	27,726	27,846	27,966	28,084
Hillsborough	37,136	37,458	37,668	37,821	37,988	38,153	38,317	38,479	38,639	38,797	38,954
Lake	6,396	6,538	6,581	6,622	6,660	6,698	6,735	6,772	6,808	6,843	6,878
Lee	18,673	18,824	18,878	18,960	19,028	19,095	19,160	19,225	19,289	19,352	19,414
Manatee	10,426	10,490	10,532	10,557	10,580	10,602	10,623	10,643	10,662	10,680	10,697
Miami-Dade	156,910	159,059	159,400	159,978	160,442	160,886	161,308	161,711	162,095	162,461	162,810
Okaloosa	4,154	4,199	4,245	4,278	4,301	4,323	4,345	4,367	4,388	4,409	4,430
Orange	35,902	36,400	36,488	36,668	36,814	36,958	37,099	37,239	37,376	37,512	37,645
Osceola	11,134	11,260	11,298	11,342	11,379	11,415	11,449	11,483	11,515	11,546	11,577
Palm Beach	41,965	42,387	42,518	42,643	42,761	42,875	42,985	43,090	43,192	43,290	43,385
Pasco	8,048	8,135	8,165	8,198	8,225	8,251	8,276	8,301	8,325	8,348	8,371
Pinellas	19,929	20,026	20,080	20,177	20,235	20,291	20,346	20,400	20,452	20,503	20,553
Polk	17,011	17,159	17,292	17,418	17,516	17,614	17,710	17,806	17,901	17,996	18,090
Sarasota	7,207	7,239	7,281	7,305	7,327	7,348	7,368	7,388	7,407	7,424	7,442
Seminole	8,029	8,173	8,198	8,240	8,275	8,309	8,344	8,378	8,412	8,445	8,479
St. Johns	4,332	4,389	4,413	4,485	4,507	4,529	4,551	4,572	4,594	4,615	4,636
Sumter	1,852	1,881	1,914	1,957	1,969	1,981	1,993	2,005	2,017	2,028	2,040
Volusia	9,283	9,417	9,483	9,589	9,640	9,691	9,741	9,791	9,839	9,888	9,935

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:											
	8/31	9/1	9/2	9/3	9/5				9/7				9/9			
Alachua	5,196	5,251	5,303	5,345	5,389	(1,078)	[259]	{129}	5,429	(1,086)	[261]	{130}	5,466	(1,093)	[262]	{131}
Broward	71,121	72,245	72,371	72,634	73,006	(14,601)	[3,504]	{1,752}	73,347	(14,669)	[3,521]	{1,760}	73,660	(14,732)	[3,536]	{1,768}
Charlotte	2,677	2,713	2,729	2,744	2,783	(557)	[134]	{67}	2,822	(564)	[135]	{68}	2,861	(572)	[137]	{69}
Collier	11,609	11,796	11,819	11,853	11,903	(2,381)	[571]	{286}	11,950	(2,390)	[574]	{287}	11,993	(2,399)	[576]	{288}
Duval	26,460	26,683	26,807	27,241	27,485	(5,497)	[1,319]	{660}	27,726	(5,545)	[1,331]	{665}	27,966	(5,593)	[1,342]	{671}
Hillsborough	37,136	37,458	37,668	37,821	38,153	(7,631)	[1,831]	{916}	38,479	(7,696)	[1,847]	{923}	38,797	(7,759)	[1,862]	{931}
Lake	6,396	6,538	6,581	6,622	6,698	(1,340)	[321]	{161}	6,772	(1,354)	[325]	{163}	6,843	(1,369)	[328]	{164}
Lee	18,673	18,824	18,878	18,960	19,095	(3,819)	[917]	{458}	19,225	(3,845)	[923]	{461}	19,352	(3,870)	[929]	{464}
Manatee	10,426	10,490	10,532	10,557	10,602	(2,120)	[509]	{254}	10,643	(2,129)	[511]	{255}	10,680	(2,136)	[513]	{256}
Miami-Dade	156,910	159,059	159,400	159,978	160,886	(32,177)	[7,723]	{3,861}	161,711	(32,342)	[7,762]	{3,881}	162,461	(32,492)	[7,798]	{3,899}
Okaloosa	4,154	4,199	4,245	4,278	4,323	(865)	[208]	{104}	4,367	(873)	[210]	{105}	4,409	(882)	[212]	{106}
Orange	35,902	36,400	36,488	36,668	36,958	(7,392)	[1,774]	{887}	37,239	(7,448)	[1,787]	{894}	37,512	(7,502)	[1,801]	{900}
Osceola	11,134	11,260	11,298	11,342	11,415	(2,283)	[548]	{274}	11,483	(2,297)	[551]	{276}	11,546	(2,309)	[554]	{277}
Palm Beach	41,965	42,387	42,518	42,643	42,875	(8,575)	[2,058]	{1,029}	43,090	(8,618)	[2,068]	{1,034}	43,290	(8,658)	[2,078]	{1,039}
Pasco	8,048	8,135	8,165	8,198	8,251	(1,650)	[396]	{198}	8,301	(1,660)	[398]	{199}	8,348	(1,670)	[401]	{200}
Pinellas	19,929	20,026	20,080	20,177	20,291	(4,058)	[974]	{487}	20,400	(4,080)	[979]	{490}	20,503	(4,101)	[984]	{492}
Polk	17,011	17,159	17,292	17,418	17,614	(3,523)	[845]	{423}	17,806	(3,561)	[855]	{427}	17,996	(3,599)	[864]	{432}
Sarasota	7,207	7,239	7,281	7,305	7,348	(1,470)	[353]	{176}	7,388	(1,478)	[355]	{177}	7,424	(1,485)	[356]	{178}
Seminole	8,029	8,173	8,198	8,240	8,309	(1,662)	[399]	{199}	8,378	(1,676)	[402]	{201}	8,445	(1,689)	[405]	{203}
St. Johns	4,332	4,389	4,413	4,485	4,529	(906)	[217]	{109}	4,572	(914)	[219]	{110}	4,615	(923)	[222]	{111}
Sumter	1,852	1,881	1,914	1,957	1,981	(396)	[95]	{48}	2,005	(401)	[96]	{48}	2,028	(406)	[97]	{49}
Volusia	9,283	9,417	9,483	9,589	9,691	(1,938)	[465]	{233}	9,791	(1,958)	[470]	{235}	9,888	(1,978)	[475]	{237}

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.