

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 7/16/20**

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 7/16/20 11 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.

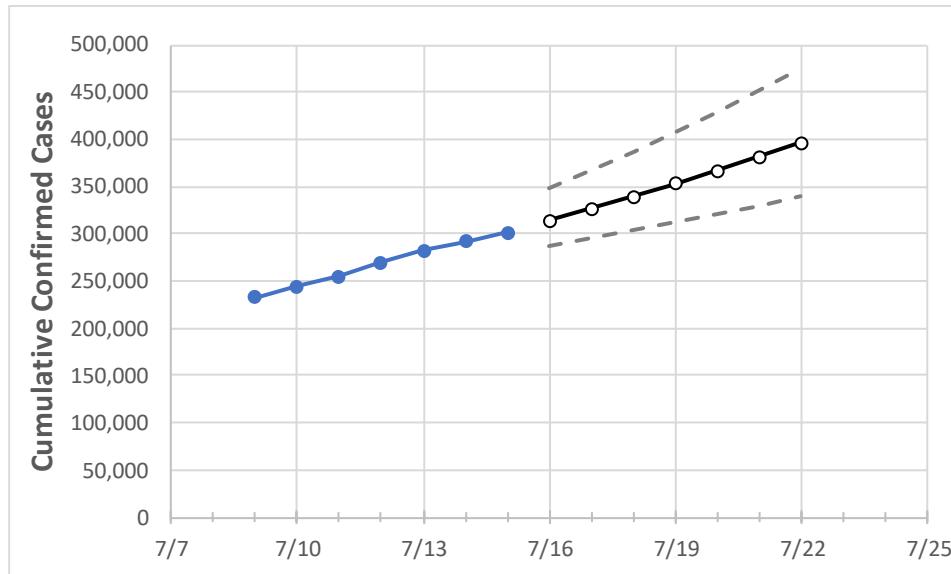
IEM's Modeling Lead

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:						
	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22
Florida	269,811	282,435	291,629	301,810	314,084	326,756	339,838	353,342	367,280	381,666	396,511

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:						
	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22
Alachua	2,098	2,173	2,258	2,322	2,397	2,473	2,551	2,629	2,708	2,788	2,870
Broward	30,025	31,484	32,814	34,153	35,902	37,754	39,713	41,787	43,981	46,302	48,757
Charlotte	1,117	1,158	1,212	1,281	1,324	1,369	1,417	1,467	1,519	1,575	1,633
Collier	6,220	6,465	6,731	6,872	7,091	7,318	7,554	7,800	8,056	8,322	8,598
Duval	12,864	13,370	13,724	14,152	14,635	15,119	15,603	16,088	16,574	17,061	17,550
Hillsborough	19,150	19,828	20,508	21,018	21,673	22,334	23,000	23,672	24,349	25,033	25,722
Lake	2,517	2,645	2,783	2,882	3,001	3,124	3,251	3,382	3,518	3,658	3,803
Lee	10,123	10,344	10,631	10,849	11,142	11,439	11,740	12,044	12,351	12,663	12,978
Manatee	5,112	5,266	5,419	5,564	5,769	5,983	6,204	6,434	6,673	6,921	7,178
Miami-Dade	64,444	67,713	69,803	72,317	75,389	78,604	81,966	85,480	89,153	92,990	96,997
Okaloosa	1,285	1,385	1,445	1,532	1,607	1,688	1,774	1,866	1,963	2,067	2,178
Orange	18,001	18,937	19,377	19,909	20,527	21,151	21,781	22,416	23,056	23,702	24,353
Osceola	4,167	4,442	4,575	4,751	4,961	5,179	5,404	5,638	5,881	6,133	6,395
Palm Beach	21,018	21,806	22,279	22,788	23,416	24,061	24,721	25,398	26,092	26,803	27,532
Pasco	3,875	4,060	4,189	4,363	4,529	4,697	4,869	5,043	5,221	5,403	5,587
Pinellas	10,844	11,442	11,754	12,080	12,442	12,805	13,171	13,538	13,908	14,281	14,656
Polk	7,246	7,630	7,881	8,206	8,517	8,834	9,157	9,488	9,825	10,169	10,521
Sarasota	3,106	3,219	3,334	3,447	3,584	3,727	3,876	4,031	4,193	4,361	4,536
Seminole	4,229	4,466	4,536	4,665	4,787	4,909	5,030	5,150	5,269	5,388	5,505
St. Johns	1,843	1,905	2,019	2,079	2,157	2,237	2,317	2,399	2,481	2,565	2,650
Sumter	655	679	681	721	748	777	808	842	877	915	955
Volusia	3,805	3,972	4,163	4,355	4,547	4,747	4,956	5,174	5,400	5,637	5,883

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:											
		7/12	7/13	7/14	7/15	7/17				7/19				7/21			
	Alachua	2,098	2,173	2,258	2,322	2,473	(495)	[119]	{59}	2,629	(526)	[126]	{63}	2,788	(558)	[134]	{67}
	Broward	30,025	31,484	32,814	34,153	37,754	(7,551)	[1,812]	{906}	41,787	(8,357)	[2,006]	{1,003}	46,302	(9,260)	[2,222]	{1,111}
	Charlotte	1,117	1,158	1,212	1,281	1,369	(274)	[66]	{33}	1,467	(293)	[70]	{35}	1,575	(315)	[76]	{38}
	Collier	6,220	6,465	6,731	6,872	7,318	(1,464)	[351]	{176}	7,800	(1,560)	[374]	{187}	8,322	(1,664)	[399]	{200}
	Duval	12,864	13,370	13,724	14,152	15,119	(3,024)	[726]	{363}	16,088	(3,218)	[772]	{386}	17,061	(3,412)	[819]	{409}
	Hillsborough	19,150	19,828	20,508	21,018	22,334	(4,467)	[1,072]	{536}	23,672	(4,734)	[1,136]	{568}	25,033	(5,007)	[1,202]	{601}
	Lake	2,517	2,645	2,783	2,882	3,124	(625)	[150]	{75}	3,382	(676)	[162]	{81}	3,658	(732)	[176]	{88}
	Lee	10,123	10,344	10,631	10,849	11,439	(2,288)	[549]	{275}	12,044	(2,409)	[578]	{289}	12,663	(2,533)	[608]	{304}
	Manatee	5,112	5,266	5,419	5,564	5,983	(1,197)	[287]	{144}	6,434	(1,287)	[309]	{154}	6,921	(1,384)	[332]	{166}
	Miami-Dade	64,444	67,713	69,803	72,317	78,604	(15,721)	[3,773]	{1,886}	85,480	(17,096)	[4,103]	{2,052}	92,990	(18,598)	[4,464]	{2,232}
	Okaloosa	1,285	1,385	1,445	1,532	1,688	(338)	[81]	{41}	1,866	(373)	[90]	{45}	2,067	(413)	[99]	{50}
	Orange	18,001	18,937	19,377	19,909	21,151	(4,230)	[1,015]	{508}	22,416	(4,483)	[1,076]	{538}	23,702	(4,740)	[1,138]	{569}
	Osceola	4,167	4,442	4,575	4,751	5,179	(1,036)	[249]	{124}	5,638	(1,128)	[271]	{135}	6,133	(1,227)	[294]	{147}
	Palm Beach	21,018	21,806	22,279	22,788	24,061	(4,812)	[1,155]	{577}	25,398	(5,080)	[1,219]	{610}	26,803	(5,361)	[1,287]	{643}
	Pasco	3,875	4,060	4,189	4,363	4,697	(939)	[225]	{113}	5,043	(1,009)	[242]	{121}	5,403	(1,081)	[259]	{130}
	Pinellas	10,844	11,442	11,754	12,080	12,805	(2,561)	[615]	{307}	13,538	(2,708)	[650]	{325}	14,281	(2,856)	[685]	{343}
	Polk	7,246	7,630	7,881	8,206	8,834	(1,767)	[424]	{212}	9,488	(1,898)	[455]	{228}	10,169	(2,034)	[488]	{244}
	Sarasota	3,106	3,219	3,334	3,447	3,727	(745)	[179]	{89}	4,031	(806)	[193]	{97}	4,361	(872)	[209]	{105}
	Seminole	4,229	4,466	4,536	4,665	4,909	(982)	[236]	{118}	5,150	(1,030)	[247]	{124}	5,388	(1,078)	[259]	{129}
	St. Johns	1,843	1,905	2,019	2,079	2,237	(447)	[107]	{54}	2,399	(480)	[115]	{58}	2,565	(513)	[123]	{62}
	Sumter	655	679	681	721	777	(155)	[37]	{19}	842	(168)	[40]	{20}	915	(183)	[44]	{22}
	Volusia	3,805	3,972	4,163	4,355	4,747	(949)	[228]	{114}	5,174	(1,035)	[248]	{124}	5,637	(1,127)	[271]	{135}

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.