

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/14/22**

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 1/14/22 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.

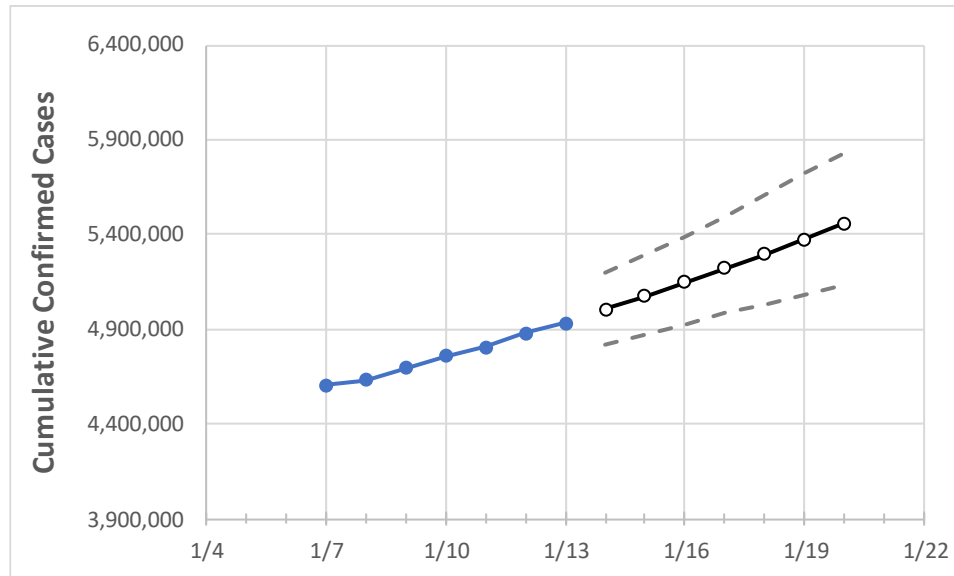
IEM's Modeling Lead

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:						
	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19	1/20
Florida	4,759,073	4,806,782	4,878,524	4,933,518	5,004,350	5,076,296	5,147,923	5,221,670	5,296,588	5,375,035	5,459,717

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:						
	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19	1/20
Alachua	47,373	47,373	47,373	47,373	48,312	49,301	50,333	51,412	52,542	53,759	55,011
Broward	493,231	493,231	493,231	493,231	500,270	507,284	514,275	521,397	528,555	535,868	543,312
Charlotte	26,596	26,596	26,596	26,596	27,046	27,524	28,042	28,583	29,169	29,793	30,460
Collier	68,382	68,382	68,382	68,382	69,534	70,735	71,990	73,313	74,694	76,141	77,649
Duval	192,849	192,849	192,849	192,849	196,406	200,037	203,837	207,845	212,032	216,446	221,100
Hillsborough	291,842	291,842	291,842	291,842	296,539	301,452	306,557	311,821	317,273	323,035	328,925
Lake	64,245	64,245	64,245	64,245	65,138	66,078	67,026	68,045	69,078	70,181	71,304
Lee	148,309	148,309	148,309	148,309	150,875	153,499	156,309	159,255	162,272	165,467	168,885
Manatee	75,155	75,155	75,155	75,155	76,212	77,322	78,490	79,696	80,954	82,287	83,688
Miami-Dade	965,111	965,111	965,111	965,111	981,834	998,636	#####	#####	#####	#####	#####
Okaloosa	38,313	38,313	38,313	38,313	38,840	39,403	39,997	40,627	41,301	42,018	42,791
Orange	291,356	291,356	291,356	291,356	296,938	302,624	308,448	314,513	320,720	327,001	333,586
Osceola	90,045	90,045	90,045	90,045	91,671	93,350	95,067	96,838	98,671	100,570	102,518
Palm Beach	300,062	300,062	300,062	300,062	305,164	310,412	315,735	321,074	326,562	332,231	337,963
Pasco	91,837	91,837	91,837	91,837	93,407	95,027	96,719	98,534	100,436	102,422	104,537
Pinellas	159,079	159,079	159,079	159,079	161,767	164,606	167,551	170,602	173,857	177,267	180,799
Polk	153,418	153,418	153,418	153,418	156,339	159,389	162,567	165,893	169,326	172,939	176,715
Sarasota	67,036	67,036	67,036	67,036	68,279	69,572	70,945	72,389	73,915	75,502	77,172
Seminole	78,398	78,398	78,398	78,398	79,859	81,327	82,845	84,412	86,056	87,730	89,446
St. Johns	47,452	47,452	47,452	47,452	48,220	49,020	49,865	50,756	51,679	52,660	53,695
Sumter	16,339	16,339	16,339	16,339	16,566	16,807	17,061	17,336	17,624	17,935	18,269
Volusia	90,179	90,179	90,179	90,179	91,694	93,260	94,907	96,620	98,410	100,317	102,297

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:											
	1/10	1/11	1/12	1/13	1/15				1/17				1/19			
Alachua	47,373	47,373	47,373	47,373	49,301	(9,860)	[2,366]	{1,183}	51,412	(10,282)	[2,468]	{1,234}	53,759	(10,752)	[2,580]	{1,290}
Broward	493,231	493,231	493,231	493,231	507,284	(101,457)	[24,350]	{12,175}	521,397	(104,279)	[25,027]	{12,514}	535,868	(107,174)	[25,722]	{12,861}
Charlotte	26,596	26,596	26,596	26,596	27,524	(5,505)	[1,321]	{661}	28,583	(5,717)	[1,372]	{686}	29,793	(5,959)	[1,430]	{715}
Collier	68,382	68,382	68,382	68,382	70,735	(14,147)	[3,395]	{1,698}	73,313	(14,663)	[3,519]	{1,760}	76,141	(15,228)	[3,655]	{1,827}
Duval	192,849	192,849	192,849	192,849	200,037	(40,007)	[9,602]	{4,801}	207,845	(41,569)	[9,977]	{4,988}	216,446	(43,289)	[10,389]	{5,195}
Hillsborough	291,842	291,842	291,842	291,842	301,452	(60,290)	[14,470]	{7,235}	311,821	(62,364)	[14,967]	{7,484}	323,035	(64,607)	[15,506]	{7,753}
Lake	64,245	64,245	64,245	64,245	66,078	(13,216)	[3,172]	{1,586}	68,045	(13,609)	[3,266]	{1,633}	70,181	(14,036)	[3,369]	{1,684}
Lee	148,309	148,309	148,309	148,309	153,499	(30,700)	[7,368]	{3,684}	159,255	(31,851)	[7,644]	{3,822}	165,467	(33,093)	[7,942]	{3,971}
Manatee	75,155	75,155	75,155	75,155	77,322	(15,464)	[3,711]	{1,856}	79,696	(15,939)	[3,825]	{1,913}	82,287	(16,457)	[3,950]	{1,975}
Miami-Dade	965,111	965,111	965,111	965,111	998,636	(199,727)	[47,935]	{23,967}	1,032,011	(206,402)	[49,537]	{24,761}	1,065,475	(213,095)	[51,143]	{25,571}
Okaloosa	38,313	38,313	38,313	38,313	39,403	(7,881)	[1,891]	{946}	40,627	(8,125)	[1,950]	{975}	42,018	(8,404)	[2,017]	{1,008}
Orange	291,356	291,356	291,356	291,356	302,624	(60,525)	[14,526]	{7,263}	314,513	(62,903)	[15,097]	{7,548}	327,001	(65,400)	[15,696]	{7,848}
Osceola	90,045	90,045	90,045	90,045	93,350	(18,670)	[4,481]	{2,240}	96,838	(19,368)	[4,648]	{2,324}	100,570	(20,114)	[4,827]	{2,414}
Palm Beach	300,062	300,062	300,062	300,062	310,412	(62,082)	[14,900]	{7,450}	321,074	(64,215)	[15,412]	{7,706}	332,231	(66,446)	[15,947]	{7,974}
Pasco	91,837	91,837	91,837	91,837	95,027	(19,005)	[4,561]	{2,281}	98,534	(19,707)	[4,730]	{2,365}	102,422	(20,484)	[4,916]	{2,458}
Pinellas	159,079	159,079	159,079	159,079	164,606	(32,921)	[7,901]	{3,951}	170,602	(34,120)	[8,189]	{4,094}	177,267	(35,453)	[8,509]	{4,254}
Polk	153,418	153,418	153,418	153,418	159,389	(31,878)	[7,651]	{3,825}	165,893	(33,179)	[7,963]	{3,981}	172,939	(34,588)	[8,301]	{4,151}
Sarasota	67,036	67,036	67,036	67,036	69,572	(13,914)	[3,339]	{1,670}	72,389	(14,478)	[3,475]	{1,737}	75,502	(15,100)	[3,624]	{1,812}
Seminole	78,398	78,398	78,398	78,398	81,327	(16,265)	[3,904]	{1,952}	84,412	(16,882)	[4,052]	{2,026}	87,730	(17,546)	[4,211]	{2,106}
St. Johns	47,452	47,452	47,452	47,452	49,020	(9,804)	[2,353]	{1,176}	50,756	(10,151)	[2,436]	{1,218}	52,660	(10,532)	[2,528]	{1,264}
Sumter	16,339	16,339	16,339	16,339	16,807	(3,361)	[807]	{403}	17,336	(3,467)	[832]	{416}	17,935	(3,587)	[861]	{430}
Volusia	90,179	90,179	90,179	90,179	93,260	(18,652)	[4,476]	{2,238}	96,620	(19,324)	[4,638]	{2,319}	100,317	(20,063)	[4,815]	{2,408}

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.