

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/22/21**

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 12/22/21 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.

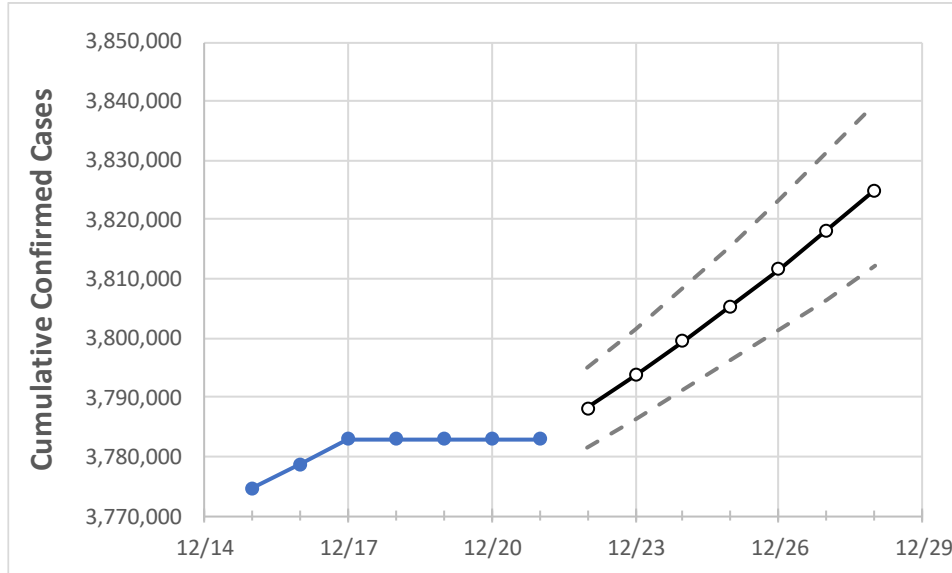
IEM's Modeling Lead

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:							
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28	12/29
Florida	3,782,883	3,782,883	3,782,883	3,782,883	3,788,202	3,793,704	3,799,419	3,805,430	3,811,637	3,818,171	3,824,893	3,831,637

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:						
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28
Alachua	40,831	40,831	40,831	40,831	40,862	40,894	40,926	40,959	40,993	41,027	41,062
Broward	370,708	370,708	370,708	370,708	371,697	372,720	373,843	375,029	376,266	377,581	379,003
Charlotte	24,121	24,121	24,121	24,121	24,144	24,168	24,192	24,217	24,242	24,268	24,294
Collier	59,523	59,523	59,523	59,523	59,569	59,617	59,666	59,716	59,766	59,818	59,871
Duval	168,360	168,360	168,360	168,360	168,462	168,565	168,672	168,784	168,900	169,017	169,139
Hillsborough	249,341	249,341	249,341	249,341	249,562	249,784	250,014	250,251	250,494	250,740	250,995
Lake	56,596	56,596	56,596	56,596	56,642	56,688	56,736	56,784	56,833	56,883	56,934
Lee	129,865	129,865	129,865	129,865	129,949	130,034	130,121	130,209	130,300	130,391	130,485
Manatee	66,931	66,931	66,931	66,931	66,966	67,002	67,038	67,074	67,111	67,148	67,186
Miami-Dade	702,309	702,309	702,309	702,309	704,838	707,512	710,432	713,539	716,850	720,436	724,243
Okaloosa	35,319	35,319	35,319	35,319	35,337	35,355	35,374	35,392	35,411	35,431	35,451
Orange	235,706	235,706	235,706	235,706	235,947	236,194	236,446	236,704	236,970	237,246	237,528
Osceola	74,249	74,249	74,249	74,249	74,302	74,355	74,409	74,464	74,520	74,577	74,634
Palm Beach	234,311	234,311	234,311	234,311	234,777	235,265	235,776	236,317	236,887	237,476	238,113
Pasco	81,220	81,220	81,220	81,220	81,287	81,353	81,423	81,493	81,566	81,641	81,719
Pinellas	139,237	139,237	139,237	139,237	139,319	139,401	139,484	139,568	139,653	139,739	139,826
Polk	131,518	131,518	131,518	131,518	131,594	131,671	131,750	131,829	131,911	131,993	132,077
Sarasota	58,328	58,328	58,328	58,328	58,372	58,418	58,463	58,509	58,556	58,603	58,652
Seminole	64,337	64,337	64,337	64,337	64,403	64,471	64,540	64,611	64,683	64,758	64,833
St. Johns	42,016	42,016	42,016	42,016	42,037	42,059	42,081	42,103	42,125	42,148	42,171
Sumter	15,030	15,030	15,030	15,030	15,038	15,046	15,054	15,062	15,070	15,078	15,086
Volusia	78,783	78,783	78,783	78,783	78,822	78,861	78,899	78,937	78,975	79,012	79,048

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:											
	12/18	12/19	12/20	12/21	12/23				12/25				12/27			
Alachua	40,831	40,831	40,831	40,831	40,894	(8,179)	[1,963]	{981}	40,959	(8,192)	[1,966]	{983}	41,027	(8,205)	[1,969]	{985}
Broward	370,708	370,708	370,708	370,708	372,720	(74,544)	[17,891]	{8,945}	375,029	(75,006)	[18,001]	{9,001}	377,581	(75,516)	[18,124]	{9,062}
Charlotte	24,121	24,121	24,121	24,121	24,168	(4,834)	[1,160]	{580}	24,217	(4,843)	[1,162]	{581}	24,268	(4,854)	[1,165]	{582}
Collier	59,523	59,523	59,523	59,523	59,617	(11,923)	[2,862]	{1,431}	59,716	(11,943)	[2,866]	{1,433}	59,818	(11,964)	[2,871]	{1,436}
Duval	168,360	168,360	168,360	168,360	168,565	(33,713)	[8,091]	{4,046}	168,784	(33,757)	[8,102]	{4,051}	169,017	(33,803)	[8,113]	{4,056}
Hillsborough	249,341	249,341	249,341	249,341	249,784	(49,957)	[11,990]	{5,995}	250,251	(50,050)	[12,012]	{6,006}	250,740	(50,148)	[12,036]	{6,018}
Lake	56,596	56,596	56,596	56,596	56,688	(11,338)	[2,721]	{1,361}	56,784	(11,357)	[2,726]	{1,363}	56,883	(11,377)	[2,730]	{1,365}
Lee	129,865	129,865	129,865	129,865	130,034	(26,007)	[6,242]	{3,121}	130,209	(26,042)	[6,250]	{3,125}	130,391	(26,078)	[6,259]	{3,129}
Manatee	66,931	66,931	66,931	66,931	67,002	(13,400)	[3,216]	{1,608}	67,074	(13,415)	[3,220]	{1,610}	67,148	(13,430)	[3,223]	{1,612}
Miami-Dade	702,309	702,309	702,309	702,309	707,512	(141,502)	[33,961]	{16,980}	713,539	(142,708)	[34,250]	{17,125}	720,436	(144,087)	[34,581]	{17,290}
Okaloosa	35,319	35,319	35,319	35,319	35,355	(7,071)	[1,697]	{849}	35,392	(7,078)	[1,699]	{849}	35,431	(7,086)	[1,701]	{850}
Orange	235,706	235,706	235,706	235,706	236,194	(47,239)	[11,337]	{5,669}	236,704	(47,341)	[11,362]	{5,681}	237,246	(47,449)	[11,388]	{5,694}
Osceola	74,249	74,249	74,249	74,249	74,355	(14,871)	[3,569]	{1,785}	74,464	(14,893)	[3,574]	{1,787}	74,577	(14,915)	[3,580]	{1,790}
Palm Beach	234,311	234,311	234,311	234,311	235,265	(47,053)	[11,293]	{5,646}	236,317	(47,263)	[11,343]	{5,672}	237,476	(47,495)	[11,399]	{5,699}
Pasco	81,220	81,220	81,220	81,220	81,353	(16,271)	[3,905]	{1,952}	81,493	(16,299)	[3,912]	{1,956}	81,641	(16,328)	[3,919]	{1,959}
Pinellas	139,237	139,237	139,237	139,237	139,401	(27,880)	[6,691]	{3,346}	139,568	(27,914)	[6,699]	{3,350}	139,739	(27,948)	[6,707]	{3,354}
Polk	131,518	131,518	131,518	131,518	131,671	(26,334)	[6,320]	{3,160}	131,829	(26,366)	[6,328]	{3,164}	131,993	(26,399)	[6,336]	{3,168}
Sarasota	58,328	58,328	58,328	58,328	58,418	(11,684)	[2,804]	{1,402}	58,509	(11,702)	[2,808]	{1,404}	58,603	(11,721)	[2,813]	{1,406}
Seminole	64,337	64,337	64,337	64,337	64,471	(12,894)	[3,095]	{1,547}	64,611	(12,922)	[3,101]	{1,551}	64,758	(12,952)	[3,108]	{1,554}
St. Johns	42,016	42,016	42,016	42,016	42,059	(8,412)	[2,019]	{1,009}	42,103	(8,421)	[2,021]	{1,010}	42,148	(8,430)	[2,023]	{1,012}
Sumter	15,030	15,030	15,030	15,030	15,046	(3,009)	[722]	{361}	15,062	(3,012)	[723]	{361}	15,078	(3,016)	[724]	{362}
Volusia	78,783	78,783	78,783	78,783	78,861	(15,772)	[3,785]	{1,893}	78,937	(15,787)	[3,789]	{1,894}	79,012	(15,802)	[3,793]	{1,896}

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.