

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/22/21**

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 11/22/21 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.

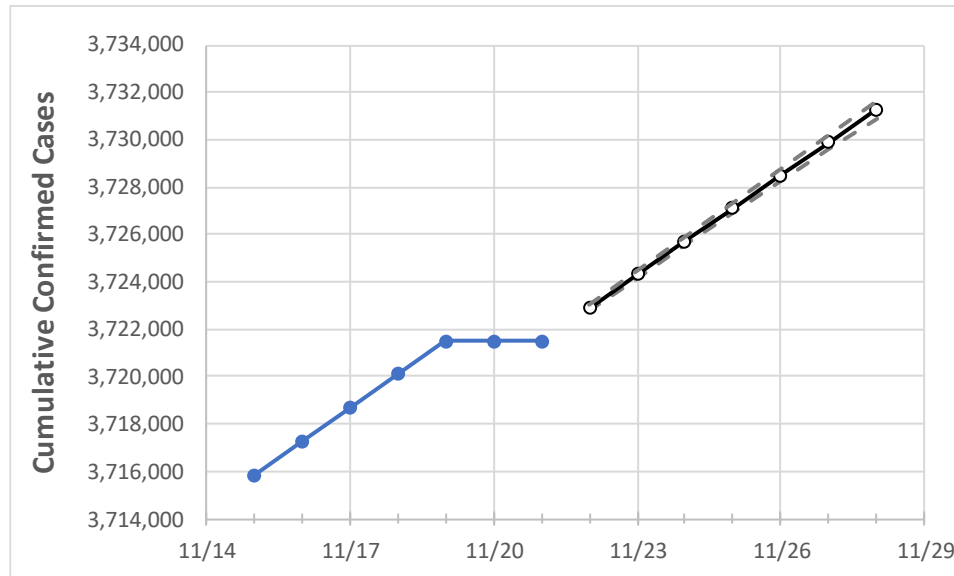
IEM's Modeling Lead

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:					
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29
Florida	3,720,090	3,721,503	3,721,503	3,721,503	3,722,906	3,724,311	3,725,713	3,727,112	3,728,505	3,729,899	3,731,284	3,732,678

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:						
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28
Alachua	40,235	40,253	40,253	40,253	40,272	40,290	40,308	40,326	40,344	40,362	40,380
Broward	362,587	362,721	362,721	362,721	362,854	362,987	363,119	363,251	363,382	363,512	363,642
Charlotte	23,683	23,696	23,696	23,696	23,711	23,726	23,742	23,758	23,775	23,792	23,809
Collier	58,613	58,636	58,636	58,636	58,660	58,684	58,708	58,732	58,757	58,782	58,807
Duval	166,864	166,899	166,899	166,899	166,934	166,969	167,004	167,038	167,073	167,107	167,141
Hillsborough	245,515	245,680	245,680	245,680	245,865	246,054	246,247	246,445	246,646	246,852	247,058
Lake	55,705	55,740	55,740	55,740	55,778	55,815	55,854	55,892	55,931	55,970	56,009
Lee	128,206	128,243	128,243	128,243	128,280	128,316	128,350	128,386	128,420	128,455	128,488
Manatee	66,163	66,185	66,185	66,185	66,206	66,227	66,248	66,269	66,290	66,310	66,331
Miami-Dade	684,247	684,494	684,494	684,494	684,727	684,957	685,184	685,409	685,634	685,858	686,083
Okaloosa	34,937	34,948	34,948	34,948	34,958	34,969	34,978	34,988	34,998	35,007	35,017
Orange	231,913	231,968	231,968	231,968	232,016	232,063	232,108	232,152	232,195	232,238	232,278
Osceola	73,110	73,149	73,149	73,149	73,189	73,229	73,270	73,312	73,354	73,396	73,439
Palm Beach	229,671	229,772	229,772	229,772	229,879	229,987	230,097	230,207	230,318	230,429	230,541
Pasco	80,097	80,128	80,128	80,128	80,161	80,194	80,228	80,262	80,297	80,332	80,367
Pinellas	137,366	137,413	137,413	137,413	137,460	137,508	137,555	137,602	137,650	137,697	137,744
Polk	129,961	130,013	130,013	130,013	130,063	130,113	130,162	130,211	130,260	130,308	130,357
Sarasota	57,292	57,318	57,318	57,318	57,346	57,375	57,404	57,434	57,463	57,494	57,524
Seminole	63,145	63,187	63,187	63,187	63,228	63,269	63,309	63,350	63,391	63,432	63,473
St. Johns	41,400	41,421	41,421	41,421	41,443	41,465	41,488	41,510	41,533	41,556	41,579
Sumter	14,807	14,814	14,814	14,814	14,822	14,829	14,837	14,844	14,852	14,860	14,868
Volusia	77,521	77,571	77,571	77,571	77,622	77,674	77,726	77,778	77,830	77,881	77,933

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:											
	11/18	11/19	11/20	11/21	11/23				11/25				11/27			
Alachua	40,235	40,253	40,253	40,253	40,290	(8,058)	[1,934]	{967}	40,326	(8,065)	[1,936]	{968}	40,362	(8,072)	[1,937]	{969}
Broward	362,587	362,721	362,721	362,721	362,987	(72,597)	[17,423]	{8,712}	363,251	(72,650)	[17,436]	{8,718}	363,512	(72,702)	[17,449]	{8,724}
Charlotte	23,683	23,696	23,696	23,696	23,726	(4,745)	[1,139]	{569}	23,758	(4,752)	[1,140]	{570}	23,792	(4,758)	[1,142]	{571}
Collier	58,613	58,636	58,636	58,636	58,684	(11,737)	[2,817]	{1,408}	58,732	(11,746)	[2,819]	{1,410}	58,782	(11,756)	[2,822]	{1,411}
Duval	166,864	166,899	166,899	166,899	166,969	(33,394)	[8,015]	{4,007}	167,038	(33,408)	[8,018]	{4,009}	167,107	(33,421)	[8,021]	{4,011}
Hillsborough	245,515	245,680	245,680	245,680	246,054	(49,211)	[11,811]	{5,905}	246,445	(49,289)	[11,829]	{5,915}	246,852	(49,370)	[11,849]	{5,924}
Lake	55,705	55,740	55,740	55,740	55,815	(11,163)	[2,679]	{1,340}	55,892	(11,178)	[2,683]	{1,341}	55,970	(11,194)	[2,687]	{1,343}
Lee	128,206	128,243	128,243	128,243	128,316	(25,663)	[6,159]	{3,080}	128,386	(25,677)	[6,163]	{3,081}	128,455	(25,691)	[6,166]	{3,083}
Manatee	66,163	66,185	66,185	66,185	66,227	(13,245)	[3,179]	{1,589}	66,269	(13,254)	[3,181]	{1,590}	66,310	(13,262)	[3,183]	{1,591}
Miami-Dade	684,247	684,494	684,494	684,494	684,957	(136,991)	[32,878]	{16,439}	685,409	(137,082)	[32,900]	{16,450}	685,858	(137,172)	[32,921]	{16,461}
Okaloosa	34,937	34,948	34,948	34,948	34,969	(6,994)	[1,678]	{839}	34,988	(6,998)	[1,679]	{840}	35,007	(7,001)	[1,680]	{840}
Orange	231,913	231,968	231,968	231,968	232,063	(46,413)	[11,139]	{5,570}	232,152	(46,430)	[11,143]	{5,572}	232,238	(46,448)	[11,147]	{5,574}
Osceola	73,110	73,149	73,149	73,149	73,229	(14,646)	[3,515]	{1,758}	73,312	(14,662)	[3,519]	{1,759}	73,396	(14,679)	[3,523]	{1,762}
Palm Beach	229,671	229,772	229,772	229,772	229,987	(45,997)	[11,039]	{5,520}	230,207	(46,041)	[11,050]	{5,525}	230,429	(46,086)	[11,061]	{5,530}
Pasco	80,097	80,128	80,128	80,128	80,194	(16,039)	[3,849]	{1,925}	80,262	(16,052)	[3,853]	{1,926}	80,332	(16,066)	[3,856]	{1,928}
Pinellas	137,366	137,413	137,413	137,413	137,508	(27,502)	[6,600]	{3,300}	137,602	(27,520)	[6,605]	{3,302}	137,697	(27,539)	[6,609]	{3,305}
Polk	129,961	130,013	130,013	130,013	130,113	(26,023)	[6,245]	{3,123}	130,211	(26,042)	[6,250]	{3,125}	130,308	(26,062)	[6,255]	{3,127}
Sarasota	57,292	57,318	57,318	57,318	57,375	(11,475)	[2,754]	{1,377}	57,434	(11,487)	[2,757]	{1,378}	57,494	(11,499)	[2,760]	{1,380}
Seminole	63,145	63,187	63,187	63,187	63,269	(12,654)	[3,037]	{1,518}	63,350	(12,670)	[3,041]	{1,520}	63,432	(12,686)	[3,045]	{1,522}
St. Johns	41,400	41,421	41,421	41,421	41,465	(8,293)	[1,990]	{995}	41,510	(8,302)	[1,992]	{996}	41,556	(8,311)	[1,995]	{997}
Sumter	14,807	14,814	14,814	14,814	14,829	(2,966)	[712]	{356}	14,844	(2,969)	[713]	{356}	14,860	(2,972)	[713]	{357}
Volusia	77,521	77,571	77,571	77,571	77,674	(15,535)	[3,728]	{1,864}	77,778	(15,556)	[3,733]	{1,867}	77,881	(15,576)	[3,738]	{1,869}

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.