

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

Date: 2/8/21

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 2/8/21 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.

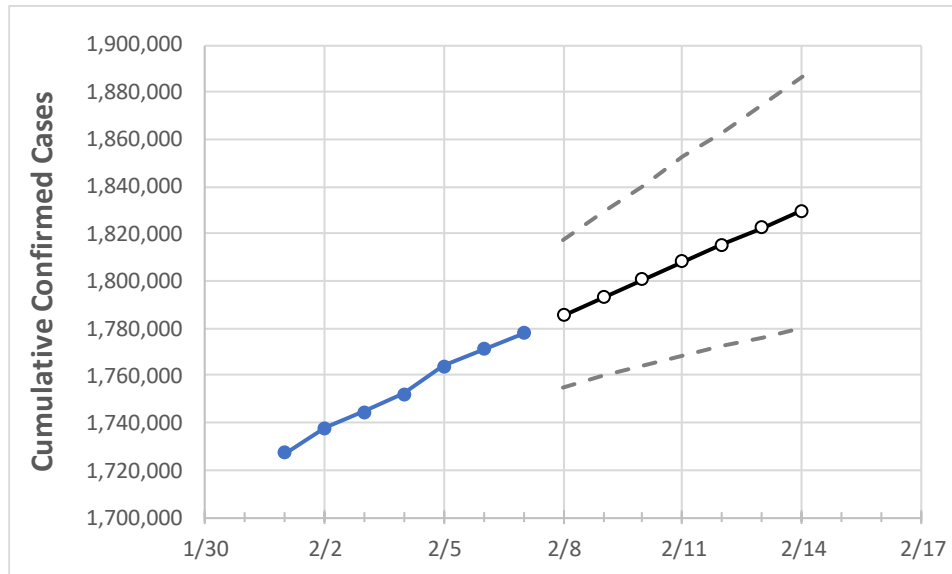
IEM's Modeling Lead

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:							
	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	
Florida	1,752,330	1,763,873	1,771,359	1,777,983	1,785,608	1,793,163	1,800,771	1,808,250	1,815,390	1,822,766	1,829,849	

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:							
	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	
Alachua	21,055	21,197	21,302	21,353	21,453	21,552	21,649	21,751	21,846	21,934	22,026	
Broward	176,144	177,319	178,116	178,948	179,778	180,620	181,440	182,248	183,039	183,821	184,571	
Charlotte	9,890	9,934	9,976	10,005	10,044	10,082	10,121	10,158	10,196	10,231	10,265	
Collier	28,224	28,361	28,454	28,524	28,624	28,719	28,811	28,905	28,995	29,083	29,171	
Duval	83,166	83,525	83,875	84,201	84,542	84,880	85,208	85,534	85,860	86,181	86,480	
Hillsborough	102,337	102,944	103,297	103,599	103,974	104,348	104,707	105,050	105,390	105,734	106,075	
Lake	22,311	22,500	22,618	22,728	22,852	22,975	23,094	23,211	23,326	23,439	23,546	
Lee	53,549	53,786	54,020	54,234	54,439	54,637	54,833	55,024	55,207	55,389	55,567	
Manatee	29,041	29,230	29,323	29,466	29,598	29,731	29,858	29,983	30,109	30,236	30,359	
Miami-Dade	377,999	380,716	382,186	383,601	385,142	386,642	388,139	389,613	391,049	392,491	393,874	
Okaloosa	17,190	17,364	17,448	17,486	17,597	17,712	17,825	17,937	18,047	18,162	18,272	
Orange	104,989	105,725	106,119	106,450	106,877	107,301	107,699	108,095	108,476	108,841	109,198	
Osceola	34,099	34,315	34,413	34,543	34,667	34,788	34,901	35,012	35,119	35,224	35,326	
Palm Beach	109,219	110,108	110,639	111,024	111,565	112,098	112,640	113,163	113,684	114,180	114,674	
Pasco	30,214	30,396	30,536	30,641	30,783	30,921	31,058	31,191	31,318	31,444	31,571	
Pinellas	60,623	61,001	61,344	61,546	61,851	62,147	62,450	62,747	63,042	63,327	63,614	
Polk	51,630	52,029	52,275	52,533	52,822	53,106	53,388	53,663	53,935	54,203	54,465	
Sarasota	25,158	25,251	25,363	25,449	25,551	25,652	25,747	25,839	25,924	26,007	26,091	
Seminole	24,635	24,764	24,886	24,999	25,113	25,225	25,336	25,442	25,551	25,654	25,757	
St. Johns	18,743	18,855	18,948	19,023	19,116	19,211	19,302	19,390	19,478	19,565	19,653	
Sumter	7,281	7,323	7,352	7,380	7,421	7,462	7,501	7,540	7,579	7,617	7,656	
Volusia	31,676	31,863	32,056	32,183	32,371	32,551	32,733	32,913	33,087	33,258	33,426	

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:											
	2/4	2/5	2/6	2/7	2/9				2/11				2/13			
Alachua	21,055	21,197	21,302	21,353	21,552	(4,310)	[1,034]	{517}	21,751	(4,350)	[1,044]	{522}	21,934	(4,387)	[1,053]	{526}
Broward	176,144	177,319	178,116	178,948	180,620	(36,124)	[8,670]	{4,335}	182,248	(36,450)	[8,748]	{4,374}	183,821	(36,764)	[8,823]	{4,412}
Charlotte	9,890	9,934	9,976	10,005	10,082	(2,016)	[484]	{242}	10,158	(2,032)	[488]	{244}	10,231	(2,046)	[491]	{246}
Collier	28,224	28,361	28,454	28,524	28,719	(5,744)	[1,379]	{689}	28,905	(5,781)	[1,387]	{694}	29,083	(5,817)	[1,396]	{698}
Duval	83,166	83,525	83,875	84,201	84,880	(16,976)	[4,074]	{2,037}	85,534	(17,107)	[4,106]	{2,053}	86,181	(17,236)	[4,137]	{2,068}
Hillsborough	102,337	102,944	103,297	103,599	104,348	(20,870)	[5,009]	{2,504}	105,050	(21,010)	[5,042]	{2,521}	105,734	(21,147)	[5,075]	{2,538}
Lake	22,311	22,500	22,618	22,728	22,975	(4,595)	[1,103]	{551}	23,211	(4,642)	[1,114]	{557}	23,439	(4,688)	[1,125]	{563}
Lee	53,549	53,786	54,020	54,234	54,637	(10,927)	[2,623]	{1,311}	55,024	(11,005)	[2,641]	{1,321}	55,389	(11,078)	[2,659]	{1,329}
Manatee	29,041	29,230	29,323	29,466	29,731	(5,946)	[1,427]	{714}	29,983	(5,997)	[1,439]	{720}	30,236	(6,047)	[1,451]	{726}
Miami-Dade	377,999	380,716	382,186	383,601	386,642	(77,328)	[18,559]	{9,279}	389,613	(77,923)	[18,701]	{9,351}	392,491	(78,498)	[18,840]	{9,420}
Okaloosa	17,190	17,364	17,448	17,486	17,712	(3,542)	[850]	{425}	17,937	(3,587)	[861]	{430}	18,162	(3,632)	[872]	{436}
Orange	104,989	105,725	106,119	106,450	107,301	(21,460)	[5,150]	{2,575}	108,095	(21,619)	[5,189]	{2,594}	108,841	(21,768)	[5,224]	{2,612}
Osceola	34,099	34,315	34,413	34,543	34,788	(6,958)	[1,670]	{835}	35,012	(7,002)	[1,681]	{840}	35,224	(7,045)	[1,691]	{845}
Palm Beach	109,219	110,108	110,639	111,024	112,098	(22,420)	[5,381]	{2,690}	113,163	(22,633)	[5,432]	{2,716}	114,180	(22,836)	[5,481]	{2,740}
Pasco	30,214	30,396	30,536	30,641	30,921	(6,184)	[1,484]	{742}	31,191	(6,238)	[1,497]	{749}	31,444	(6,289)	[1,509]	{755}
Pinellas	60,623	61,001	61,344	61,546	62,147	(12,429)	[2,983]	{1,492}	62,747	(12,549)	[3,012]	{1,506}	63,327	(12,665)	[3,040]	{1,520}
Polk	51,630	52,029	52,275	52,533	53,106	(10,621)	[2,549]	{1,275}	53,663	(10,733)	[2,576]	{1,288}	54,203	(10,841)	[2,602]	{1,301}
Sarasota	25,158	25,251	25,363	25,449	25,652	(5,130)	[1,231]	{616}	25,839	(5,168)	[1,240]	{620}	26,007	(5,201)	[1,248]	{624}
Seminole	24,635	24,764	24,886	24,999	25,225	(5,045)	[1,211]	{605}	25,442	(5,088)	[1,221]	{611}	25,654	(5,131)	[1,231]	{616}
St. Johns	18,743	18,855	18,948	19,023	19,211	(3,842)	[922]	{461}	19,390	(3,878)	[931]	{465}	19,565	(3,913)	[939]	{470}
Sumter	7,281	7,323	7,352	7,380	7,462	(1,492)	[358]	{179}	7,540	(1,508)	[362]	{181}	7,617	(1,523)	[366]	{183}
Volusia	31,676	31,863	32,056	32,183	32,551	(6,510)	[1,562]	{781}	32,913	(6,583)	[1,580]	{790}	33,258	(6,652)	[1,596]	{798}

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.