IEM's AI Modeling: Short-term COVID-19 Projections
Date: 1/10/22

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 1/10/22 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
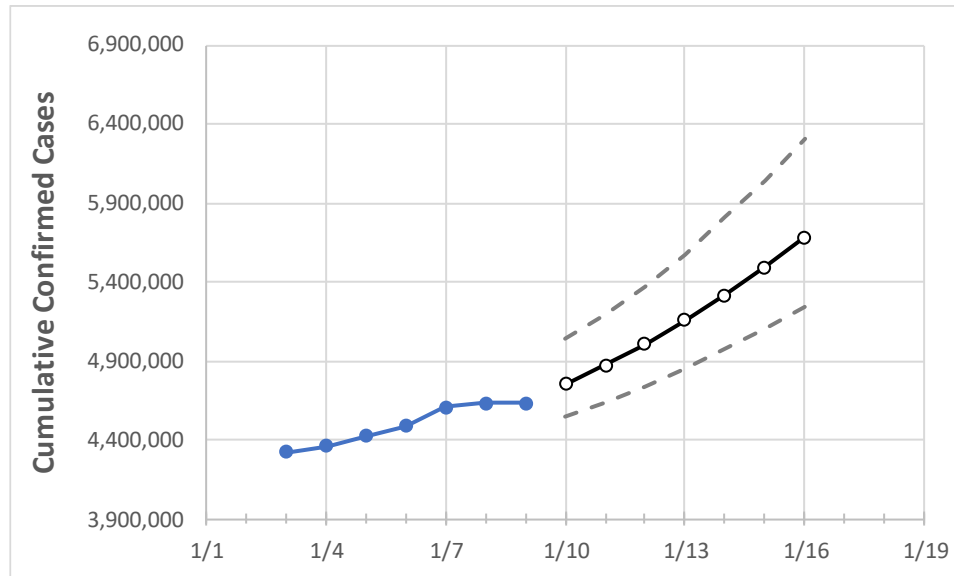
	Actual Confirmed Cases On:				Projected Cases For:						
	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16
Florida	4,486,276	4,606,489	4,633,077	4,633,077	4,749,854	4,871,948	5,005,531	5,154,544	5,317,204	5,494,038	5,683,562

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:						
	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16
Alachua	46,833	47,373	47,373	47,373	48,335	49,377	50,512	51,753	53,104	54,568	56,179
Broward	486,052	493,231	493,231	493,231	505,038	517,361	530,177	543,545	557,497	572,468	588,083
Charlotte	26,367	26,596	26,596	26,596	26,959	27,351	27,777	28,243	28,750	29,292	29,896
Collier	67,687	68,382	68,382	68,382	69,586	70,877	72,277	73,809	75,459	77,280	79,244
Duval	190,797	192,849	192,849	192,849	197,530	202,775	208,518	214,797	221,846	229,648	238,151
Hillsborough	288,683	291,842	291,842	291,842	298,212	304,852	312,201	320,082	328,629	337,999	348,103
Lake	63,658	64,245	64,245	64,245	65,463	66,756	68,158	69,721	71,395	73,268	75,255
Lee	146,793	148,309	148,309	148,309	151,156	154,278	157,653	161,366	165,467	169,998	174,927
Manatee	74,503	75,155	75,155	75,155	76,488	77,930	79,507	81,259	83,122	85,232	87,506
Miami-Dade	949,334	965,111	965,111	965,111	990,500	#######	#######	#######	#######	#######	#######
Okaloosa	38,039	38,313	38,313	38,313	38,789	39,312	39,889	40,518	41,208	41,970	42,800
Orange	287,366	291,356	291,356	291,356	300,329	309,842	320,314	331,423	343,683	356,844	370,992
Osceola	88,889	90,045	90,045	90,045	92,525	95,215	98,130	101,253	104,657	108,328	112,357
Palm Beach	295,898	300,062	300,062	300,062	307,719	315,642	324,208	332,998	342,506	352,619	363,431
Pasco	90,945	91,837	91,837	91,837	93,425	95,145	97,014	99,083	101,329	103,781	106,479
Pinellas	157,475	159,079	159,079	159,079	162,319	165,823	169,641	173,857	178,488	183,593	189,086
Polk	151,630	153,418	153,418	153,418	157,601	162,198	167,212	172,705	178,740	185,392	192,658
Sarasota	66,320	67,036	67,036	67,036	68,273	69,617	71,081	72,678	74,423	76,320	78,381
Seminole	77,380	78,398	78,398	78,398	80,646	83,055	85,709	88,565	91,653	95,031	98,662
St. Johns	47,005	47,452	47,452	47,452	48,312	49,244	50,245	51,354	52,563	53,908	55,370
Sumter	16,221	16,339	16,339	16,339	16,544	16,767	17,010	17,278	17,572	17,894	18,250
Volusia	89,258	90,179	90,179	90,179	92,071	94,126	96,399	98,881	101,616	104,649	107,961

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:		
	1/6	1/7	1/8	1/9	1/11	1/13	1/15
Alachua	46,833	47,373	47,373	47,373	49,377 (9,875) [2,370] {1,185}	51,753 (10,351) [2,484] {1,242}	54,568 (10,914) [2,619] {1,310}
Broward	486,052	493,231	493,231	493,231	517,361 (103,472) [24,833] {12,417}	543,545 (108,709) [26,090] {13,045}	572,468 (114,494) [27,478] {13,739}
Charlotte	26,367	26,596	26,596	26,596	27,351 (5,470) [1,313] {656}	28,243 (5,649) [1,356] {678}	29,292 (5,858) [1,406] {703}
Collier	67,687	68,382	68,382	68,382	70,877 (14,175) [3,402] {1,701}	73,809 (14,762) [3,543] {1,771}	77,280 (15,456) [3,709] {1,855}
Duval	190,797	192,849	192,849	192,849	202,775 (40,555) [9,733] {4,867}	214,797 (42,959) [10,310] {5,155}	229,648 (45,930) [11,023] {5,512}
Hillsborough	288,683	291,842	291,842	291,842	304,852 (60,970) [14,633] {7,316}	320,082 (64,016) [15,364] {7,682}	337,999 (67,600) [16,224] {8,112}
Lake	63,658	64,245	64,245	64,245	66,756 (13,351) [3,204] {1,602}	69,721 (13,944) [3,347] {1,673}	73,268 (14,654) [3,517] {1,758}
Lee	146,793	148,309	148,309	148,309	154,278 (30,856) [7,405] {3,703}	161,366 (32,273) [7,746] {3,873}	169,998 (34,000) [8,160] {4,080}
Manatee	74,503	75,155	75,155	75,155	77,930 (15,586) [3,741] {1,870}	81,259 (16,252) [3,900] {1,950}	85,232 (17,046) [4,091] {2,046}
Miami-Dade	949,334	965,111	965,111	965,111	1,016,932 (203,386) [48,813] {24,406}	1,072,358 (214,472) [51,473] {25,737}	1,132,361 (226,472) [54,353] {27,177}
Okaloosa	38,039	38,313	38,313	38,313	39,312 (7,862) [1,887] {943}	40,518 (8,104) [1,945] {972}	41,970 (8,394) [2,015] {1,007}
Orange	287,366	291,356	291,356	291,356	309,842 (61,968) [14,872] {7,436}	331,423 (66,285) [15,908] {7,954}	356,844 (71,369) [17,129] {8,564}
Osceola	88,889	90,045	90,045	90,045	95,215 (19,043) [4,570] {2,285}	101,253 (20,251) [4,860] {2,430}	108,328 (21,666) [5,200] {2,600}
Palm Beach	295,898	300,062	300,062	300,062	315,642 (63,128) [15,151] {7,575}	332,998 (66,600) [15,984] {7,992}	352,619 (70,524) [16,926] {8,463}
Pasco	90,945	91,837	91,837	91,837	95,145 (19,029) [4,567] {2,283}	99,083 (19,817) [4,756] {2,378}	103,781 (20,756) [4,981] {2,491}
Pinellas	157,475	159,079	159,079	159,079	165,823 (33,165) [7,960] {3,980}	173,857 (34,771) [8,345] {4,173}	183,593 (36,719) [8,812] {4,406}
Polk	151,630	153,418	153,418	153,418	162,198 (32,440) [7,785] {3,893}	172,705 (34,541) [8,290] {4,145}	185,392 (37,078) [8,899] {4,449}
Sarasota	66,320	67,036	67,036	67,036	69,617 (13,923) [3,342] {1,671}	72,678 (14,536) [3,489] {1,744}	76,320 (15,264) [3,663] {1,832}
Seminole	77,380	78,398	78,398	78,398	83,055 (16,611) [3,987] {1,993}	88,565 (17,713) [4,251] {2,126}	95,031 (19,006) [4,561] {2,281}
St. Johns	47,005	47,452	47,452	47,452	49,244 (9,849) [2,364] {1,182}	51,354 (10,271) [2,465] {1,232}	53,908 (10,782) [2,588] {1,294}
Sumter	16,221	16,339	16,339	16,339	16,767 (3,353) [805] {402}	17,278 (3,456) [829] {415}	17,894 (3,579) [859] {429}
Volusia	89,258	90,179	90,179	90,179	94,126 (18,825) [4,518] {2,259}	98,881 (19,776) [4,746] {2,373}	104,649 (20,930) [5,023] {2,512}

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.