IEM's AI Modeling: Short-term COVID-19 Projections
Date: 2/5/21

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 2/5/21 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
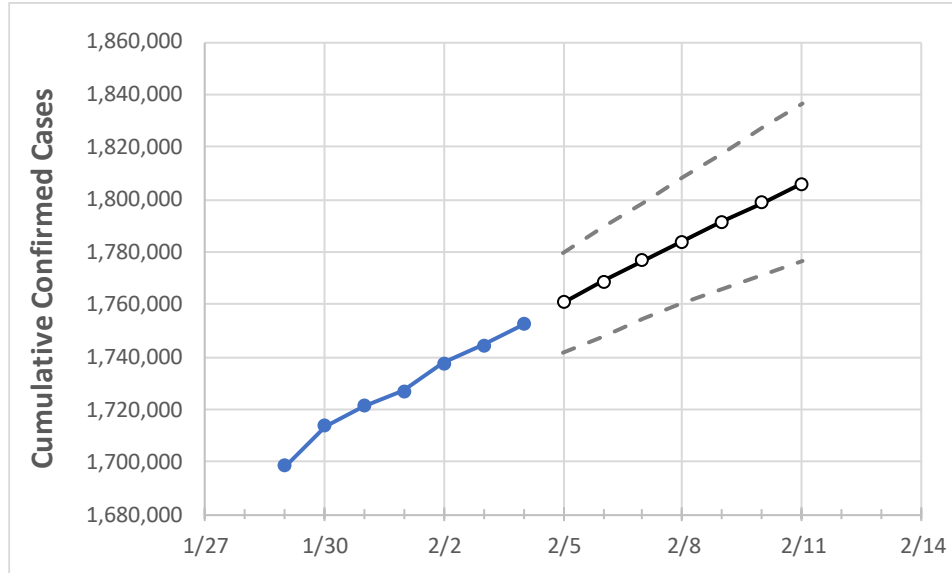
	Actual Confirmed Cases On:				Projected Cases For:						
	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11
Florida	1,727,107	1,737,640	1,744,619	1,752,330	1,760,662	1,768,758	1,776,661	1,783,962	1,791,371	1,798,649	1,806,008

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:						
	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11
Alachua	20,692	20,817	20,922	21,055	21,165	21,269	21,372	21,471	21,573	21,674	21,772
Broward	173,652	174,679	175,306	176,144	176,973	177,802	178,596	179,373	180,136	180,905	181,653
Charlotte	9,745	9,801	9,848	9,890	9,929	9,967	10,004	10,040	10,075	10,108	10,141
Collier	27,867	28,019	28,139	28,224	28,337	28,447	28,556	28,661	28,762	28,864	28,962
Duval	82,216	82,738	82,963	83,166	83,513	83,849	84,180	84,522	84,845	85,163	85,470
Hillsborough	100,990	101,551	101,910	102,337	102,778	103,199	103,606	104,004	104,391	104,769	105,131
Lake	21,864	22,058	22,180	22,311	22,445	22,574	22,702	22,828	22,948	23,065	23,182
Lee	52,820	53,081	53,332	53,549	53,772	53,991	54,204	54,411	54,616	54,807	54,995
Manatee	28,702	28,914	28,948	29,041	29,179	29,314	29,446	29,581	29,711	29,840	29,968
Miami-Dade	373,423	375,322	376,552	377,999	379,501	380,975	382,417	383,813	385,183	386,505	387,760
Okaloosa	16,730	16,886	17,050	17,190	17,300	17,409	17,517	17,625	17,731	17,838	17,946
Orange	103,649	104,287	104,621	104,989	105,491	105,985	106,463	106,939	107,407	107,847	108,277
Osceola	33,722	33,890	33,993	34,099	34,243	34,381	34,513	34,640	34,762	34,882	34,999
Palm Beach	107,619	108,173	108,585	109,219	109,783	110,343	110,903	111,456	111,986	112,501	113,019
Pasco	29,693	29,917	30,049	30,214	30,362	30,511	30,656	30,795	30,928	31,057	31,186
Pinellas	59,716	60,130	60,322	60,623	60,929	61,219	61,500	61,782	62,075	62,350	62,626
Polk	50,702	51,050	51,297	51,630	51,913	52,200	52,477	52,746	53,010	53,273	53,533
Sarasota	24,833	25,015	25,064	25,158	25,258	25,365	25,474	25,577	25,679	25,781	25,877
Seminole	24,227	24,416	24,510	24,635	24,756	24,874	24,990	25,100	25,208	25,319	25,425
St. Johns	18,397	18,594	18,676	18,743	18,838	18,930	19,020	19,108	19,194	19,278	19,358
Sumter	7,119	7,180	7,245	7,281	7,326	7,370	7,415	7,458	7,500	7,543	7,584
Volusia	31,125	31,429	31,565	31,676	31,896	32,103	32,312	32,520	32,737	32,946	33,150

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:		
	2/1	2/2	2/3	2/4	2/6	2/8	2/10
Alachua	20,692	20,817	20,922	21,055	21,269 (4,254) [1,021] {510}	21,471 (4,294) [1,031] {515}	21,674 (4,335) [1,040] {520}
Broward	173,652	174,679	175,306	176,144	177,802 (35,560) [8,534] {4,267}	179,373 (35,875) [8,610] {4,305}	180,905 (36,181) [8,683] {4,342}
Charlotte	9,745	9,801	9,848	9,890	9,967 (1,993) [478] {239}	10,040 (2,008) [482] {241}	10,108 (2,022) [485] {243}
Collier	27,867	28,019	28,139	28,224	28,447 (5,689) [1,365] {683}	28,661 (5,732) [1,376] {688}	28,864 (5,773) [1,385] {693}
Duval	82,216	82,738	82,963	83,166	83,849 (16,770) [4,025] {2,012}	84,522 (16,904) [4,057] {2,029}	85,163 (17,033) [4,088] {2,044}
Hillsborough	100,990	101,551	101,910	102,337	103,199 (20,640) [4,954] {2,477}	104,004 (20,801) [4,992] {2,496}	104,769 (20,954) [5,029] {2,514}
Lake	21,864	22,058	22,180	22,311	22,574 (4,515) [1,084] {542}	22,828 (4,566) [1,096] {548}	23,065 (4,613) [1,107] {554}
Lee	52,820	53,081	53,332	53,549	53,991 (10,798) [2,592] {1,296}	54,411 (10,882) [2,612] {1,306}	54,807 (10,961) [2,631] {1,315}
Manatee	28,702	28,914	28,948	29,041	29,314 (5,863) [1,407] {704}	29,581 (5,916) [1,420] {710}	29,840 (5,968) [1,432] {716}
Miami-Dade	373,423	375,322	376,552	377,999	380,975 (76,195) [18,287] {9,143}	383,813 (76,763) [18,423] {9,212}	386,505 (77,301) [18,552] {9,276}
Okaloosa	16,730	16,886	17,050	17,190	17,409 (3,482) [836] {418}	17,625 (3,525) [846] {423}	17,838 (3,568) [856] {428}
Orange	103,649	104,287	104,621	104,989	105,985 (21,197) [5,087] {2,544}	106,939 (21,388) [5,133] {2,567}	107,847 (21,569) [5,177] {2,588}
Osceola	33,722	33,890	33,993	34,099	34,381 (6,876) [1,650] {825}	34,640 (6,928) [1,663] {831}	34,882 (6,976) [1,674] {837}
Palm Beach	107,619	108,173	108,585	109,219	110,343 (22,069) [5,296] {2,648}	111,456 (22,291) [5,350] {2,675}	112,501 (22,500) [5,400] {2,700}
Pasco	29,693	29,917	30,049	30,214	30,511 (6,102) [1,465] {732}	30,795 (6,159) [1,478] {739}	31,057 (6,211) [1,491] {745}
Pinellas	59,716	60,130	60,322	60,623	61,219 (12,244) [2,938] {1,469}	61,782 (12,356) [2,966] {1,483}	62,350 (12,470) [2,993] {1,496}
Polk	50,702	51,050	51,297	51,630	52,200 (10,440) [2,506] {1,253}	52,746 (10,549) [2,532] {1,266}	53,273 (10,655) [2,557] {1,279}
Sarasota	24,833	25,015	25,064	25,158	25,365 (5,073) [1,218] {609}	25,577 (5,115) [1,228] {614}	25,781 (5,156) [1,238] {619}
Seminole	24,227	24,416	24,510	24,635	24,874 (4,975) [1,194] {597}	25,100 (5,020) [1,205] {602}	25,319 (5,064) [1,215] {608}
St. Johns	18,397	18,594	18,676	18,743	18,930 (3,786) [909] {454}	19,108 (3,822) [917] {459}	19,278 (3,856) [925] {463}
Sumter	7,119	7,180	7,245	7,281	7,370 (1,474) [354] {177}	7,458 (1,492) [358] {179}	7,543 (1,509) [362] {181}
Volusia	31,125	31,429	31,565	31,676	32,103 (6,421) [1,541] {770}	32,520 (6,504) [1,561] {780}	32,946 (6,589) [1,581] {791}

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.