IEM's AI Modeling: Short-term COVID-19 Projections
Date: 11/13/20

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 <u>not</u> 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 11/13/20 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
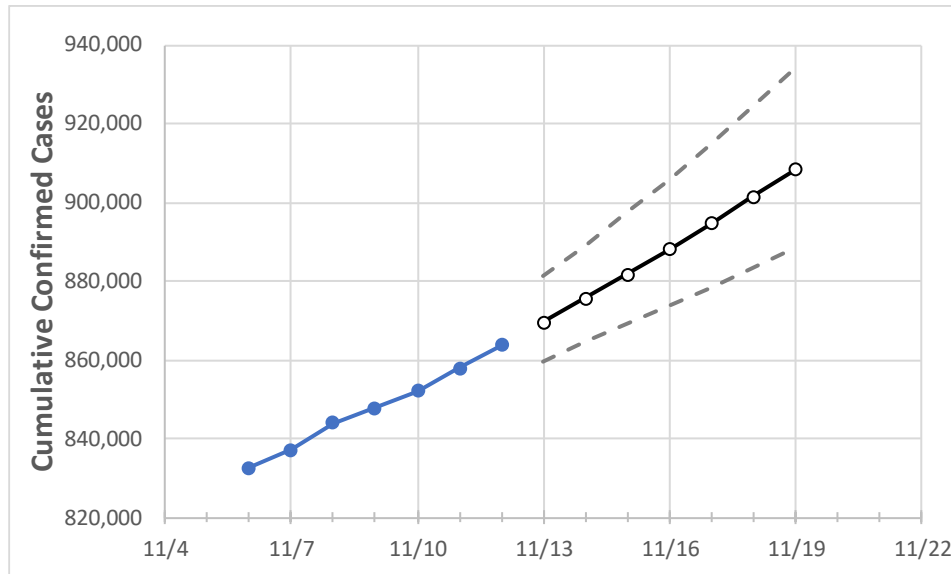
	Actual Confirmed Cases On:				Projected Cases For:						
	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18	11/19
Florida	847,821	852,174	858,012	863,619	869,484	875,515	881,716	888,094	894,651	901,394	908,327

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 20%, and are often within 10%, of actual confirmed cases.

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Florida Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18	11/19
Alachua	11,261	11,347	11,450	11,554	11,629	11,705	11,781	11,858	11,935	12,012	12,090
Broward	91,441	91,704	92,148	92,657	93,215	93,785	94,367	94,961	95,568	96,188	96,821
Charlotte	4,031	4,069	4,107	4,152	4,196	4,242	4,289	4,338	4,388	4,439	4,492
Collier	15,314	15,441	15,566	15,611	15,699	15,788	15,878	15,970	16,064	16,159	16,255
Duval	36,847	37,032	37,494	37,657	37,834	38,013	38,195	38,380	38,568	38,758	38,950
Hillsborough	51,055	51,296	51,635	52,014	52,374	52,746	53,129	53,523	53,930	54,350	54,782
Lake	9,246	9,312	9,360	9,424	9,485	9,548	9,613	9,679	9,747	9,817	9,889
Lee	24,929	25,067	25,316	25,457	25,620	25,787	25,956	26,129	26,305	26,485	26,667
Manatee	14,186	14,281	14,400	14,480	14,569	14,660	14,753	14,847	14,942	15,040	15,139
Miami-Dade	194,879	195,273	195,991	197,196	198,167	199,168	200,199	201,261	202,355	203,483	204,644
Okaloosa	7,109	7,195	7,280	7,353	7,433	7,516	7,601	7,688	7,778	7,870	7,965
Orange	49,029	49,422	49,752	50,135	50,420	50,713	51,014	51,323	51,640	51,965	52,299
Osceola	15,213	15,302	15,441	15,555	15,671	15,792	15,918	16,048	16,182	16,322	16,467
Palm Beach	55,816	56,145	56,509	56,907	57,345	57,794	58,254	58,727	59,212	59,709	60,219
Pasco	11,863	11,969	12,088	12,199	12,329	12,465	12,606	12,755	12,909	13,071	13,240
Pinellas	27,849	28,032	28,242	28,486	28,725	28,972	29,228	29,492	29,766	30,050	30,343
Polk	24,227	24,440	24,661	24,829	24,982	25,139	25,300	25,466	25,637	25,812	25,992
Sarasota	10,478	10,529	10,812	10,857	10,941	11,026	11,114	11,204	11,296	11,390	11,487
Seminole	11,004	11,080	11,145	11,234	11,317	11,402	11,490	11,580	11,672	11,767	11,865
St. Johns	7,084	7,165	7,219	7,304	7,366	7,428	7,492	7,557	7,624	7,691	7,760
Sumter	3,087	3,096	3,108	3,114	3,123	3,132	3,141	3,150	3,158	3,167	3,175
Volusia	13,748	13,828	13,937	13,986	14,079	14,173	14,268	14,366	14,464	14,565	14,666

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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:		
	11/9	11/10	11/11	11/12	11/14	11/16	11/18
Alachua	11,261	11,347	11,450	11,554	11,705 (2,341) [562] {281}	11,858 (2,372) [569] {285}	12,012 (2,402) [577] {288}
Broward	91,441	91,704	92,148	92,657	93,785 (18,757) [4,502] {2,251}	94,961 (18,992) [4,558] {2,279}	96,188 (19,238) [4,617] {2,309}
Charlotte	4,031	4,069	4,107	4,152	4,242 (848) [204] {102}	4,338 (868) [208] {104}	4,439 (888) [213] {107}
Collier	15,314	15,441	15,566	15,611	15,788 (3,158) [758] {379}	15,970 (3,194) [767] {383}	16,159 (3,232) [776] {388}
Duval	36,847	37,032	37,494	37,657	38,013 (7,603) [1,825] {912}	38,380 (7,676) [1,842] {921}	38,758 (7,752) [1,860] {930}
Hillsborough	51,055	51,296	51,635	52,014	52,746 (10,549) [2,532] {1,266}	53,523 (10,705) [2,569] {1,285}	54,350 (10,870) [2,609] {1,304}
Lake	9,246	9,312	9,360	9,424	9,548 (1,910) [458] {229}	9,679 (1,936) [465] {232}	9,817 (1,963) [471] {236}
Lee	24,929	25,067	25,316	25,457	25,787 (5,157) [1,238] {619}	26,129 (5,226) [1,254] {627}	26,485 (5,297) [1,271] {636}
Manatee	14,186	14,281	14,400	14,480	14,660 (2,932) [704] {352}	14,847 (2,969) [713] {356}	15,040 (3,008) [722] {361}
Miami-Dade	194,879	195,273	195,991	197,196	199,168 (39,834) [9,560] {4,780}	201,261 (40,252) [9,661] {4,830}	203,483 (40,697) [9,767] {4,884}
Okaloosa	7,109	7,195	7,280	7,353	7,516 (1,503) [361] {180}	7,688 (1,538) [369] {185}	7,870 (1,574) [378] {189}
Orange	49,029	49,422	49,752	50,135	50,713 (10,143) [2,434] {1,217}	51,323 (10,265) [2,463] {1,232}	51,965 (10,393) [2,494] {1,247}
Osceola	15,213	15,302	15,441	15,555	15,792 (3,158) [758] {379}	16,048 (3,210) [770] {385}	16,322 (3,264) [783] {392}
Palm Beach	55,816	56,145	56,509	56,907	57,794 (11,559) [2,774] {1,387}	58,727 (11,745) [2,819] {1,409}	59,709 (11,942) [2,866] {1,433}
Pasco	11,863	11,969	12,088	12,199	12,465 (2,493) [598] {299}	12,755 (2,551) [612] {306}	13,071 (2,614) [627] {314}
Pinellas	27,849	28,032	28,242	28,486	28,972 (5,794) [1,391] {695}	29,492 (5,898) [1,416] {708}	30,050 (6,010) [1,442] {721}
Polk	24,227	24,440	24,661	24,829	25,139 (5,028) [1,207] {603}	25,466 (5,093) [1,222] {611}	25,812 (5,162) [1,239] {619}
Sarasota	10,478	10,529	10,812	10,857	11,026 (2,205) [529] {265}	11,204 (2,241) [538] {269}	11,390 (2,278) [547] {273}
Seminole	11,004	11,080	11,145	11,234	11,402 (2,280) [547] {274}	11,580 (2,316) [556] {278}	11,767 (2,353) [565] {282}
St. Johns	7,084	7,165	7,219	7,304	7,428 (1,486) [357] {178}	7,557 (1,511) [363] {181}	7,691 (1,538) [369] {185}
Sumter	3,087	3,096	3,108	3,114	3,132 (626) [150] {75}	3,150 (630) [151] {76}	3,167 (633) [152] {76}
Volusia	13,748	13,828	13,937	13,986	14,173 (2,835) [680] {340}	14,366 (2,873) [690] {345}	14,565 (2,913) [699] {350}

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.