IEM's AI Modeling: Short-term COVID-19 Projections
Date: 2/16/22

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 2/16/22 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 Counties
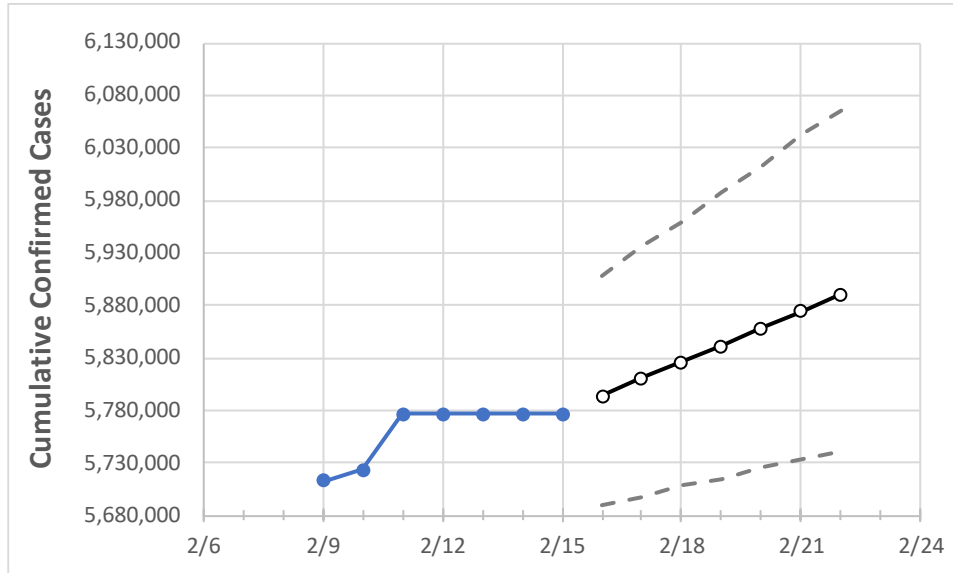
	Actual Confirmed Cases On:				Projected Cases For:						
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22
Alachua	66,308	66,308	66,308	66,308	66,474	66,636	66,791	66,941	67,083	67,224	67,359
Broward	594,384	594,384	594,384	594,384	596,284	598,283	600,369	602,484	604,715	606,961	609,279
Charlotte	34,540	34,540	34,540	34,540	34,679	34,817	34,952	35,087	35,218	35,349	35,477
Collier	83,015	83,015	83,015	83,015	83,159	83,297	83,435	83,564	83,692	83,815	83,935
Duval	249,406	249,406	249,406	249,406	249,953	250,489	251,008	251,508	251,993	252,456	252,917
Hillsborough	364,995	364,995	364,995	364,995	366,337	367,707	369,093	370,490	371,895	373,298	374,698
Lake	83,056	83,056	83,056	83,056	83,290	83,518	83,740	83,956	84,167	84,374	84,573
Lee	186,567	186,567	186,567	186,567	186,984	187,394	187,783	188,163	188,542	188,895	189,249
Manatee	93,958	93,958	93,958	93,958	94,225	94,481	94,736	94,981	95,225	95,460	95,692
Miami-Dade	1,168,806	1,168,806	1,168,806	1,168,806	1,171,355	1,173,951	1,176,527	1,178,944	1,181,441	1,183,862	1,186,279
Okaloosa	50,654	50,654	50,654	50,654	50,774	50,888	50,998	51,108	51,210	51,310	51,406
Orange	368,920	368,920	368,920	368,920	370,122	371,340	372,570	373,805	375,047	376,285	377,510
Osceola	111,522	111,522	111,522	111,522	111,713	111,898	112,078	112,252	112,423	112,587	112,745
Palm Beach	362,089	362,089	362,089	362,089	362,980	363,883	364,801	365,722	366,647	367,571	368,491
Pasco	119,371	119,371	119,371	119,371	119,728	120,077	120,414	120,747	121,072	121,387	121,695
Pinellas	204,763	204,763	204,763	204,763	205,432	206,095	206,756	207,406	208,044	208,676	209,299
Polk	196,363	196,363	196,363	196,363	196,841	197,308	197,759	198,206	198,634	199,053	199,454
Sarasota	87,976	87,976	87,976	87,976	88,258	88,529	88,789	89,047	89,299	89,548	89,780
Seminole	101,526	101,526	101,526	101,526	101,760	101,988	102,204	102,423	102,629	102,824	103,025
St. Johns	61,909	61,909	61,909	61,909	62,119	62,320	62,519	62,711	62,896	63,079	63,255
Sumter	20,907	20,907	20,907	20,907	20,976	21,045	21,111	21,176	21,240	21,303	21,363
Volusia	114,594	114,594	114,594	114,594	114,967	115,333	115,699	116,058	116,410	116,761	117,097

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: | | |
	2/12	2/13	2/14	2/15	2/17	2/19	2/21
Alachua	66,308	66,308	66,308	66,308	66,636 (13,327) [3,199] {1,599}	66,941 (13,388) [3,213] {1,607}	67,224 (13,445) [3,227] {1,613}
Broward	594,384	594,384	594,384	594,384	598,283 (119,657) [28,718] {14,359}	602,484 (120,497) [28,919] {14,460}	606,961 (121,392) [29,134] {14,567}
Charlotte	34,540	34,540	34,540	34,540	34,817 (6,963) [1,671] {836}	35,087 (7,017) [1,684] {842}	35,349 (7,070) [1,697] {848}
Collier	83,015	83,015	83,015	83,015	83,297 (16,659) [3,998] {1,999}	83,564 (16,713) [4,011] {2,006}	83,815 (16,763) [4,023] {2,012}
Duval	249,406	249,406	249,406	249,406	250,489 (50,098) [12,023] {6,012}	251,508 (50,302) [12,072] {6,036}	252,456 (50,491) [12,118] {6,059}
Hillsborough	364,995	364,995	364,995	364,995	367,707 (73,541) [17,650] {8,825}	370,490 (74,098) [17,784] {8,892}	373,298 (74,660) [17,918] {8,959}
Lake	83,056	83,056	83,056	83,056	83,518 (16,704) [4,009] {2,004}	83,956 (16,791) [4,030] {2,015}	84,374 (16,875) [4,050] {2,025}
Lee	186,567	186,567	186,567	186,567	187,394 (37,479) [8,995] {4,497}	188,163 (37,633) [9,032] {4,516}	188,895 (37,779) [9,067] {4,533}
Manatee	93,958	93,958	93,958	93,958	94,481 (18,896) [4,535] {2,268}	94,981 (18,996) [4,559] {2,280}	95,460 (19,092) [4,582] {2,291}
Miami-Dade	1,168,806	1,168,806	1,168,806	1,168,806	1,173,951 (234,790) [56,350] {28,175}	1,178,944 (235,789) [56,589] {28,295}	1,183,862 (236,772) [56,825] {28,413}
Okaloosa	50,654	50,654	50,654	50,654	50,888 (10,178) [2,443] {1,221}	51,108 (10,222) [2,453] {1,227}	51,310 (10,262) [2,463] {1,231}
Orange	368,920	368,920	368,920	368,920	371,340 (74,268) [17,824] {8,912}	373,805 (74,761) [17,943] {8,971}	376,285 (75,257) [18,062] {9,031}
Osceola	111,522	111,522	111,522	111,522	111,898 (22,380) [5,371] {2,686}	112,252 (22,450) [5,388] {2,694}	112,587 (22,517) [5,404] {2,702}
Palm Beach	362,089	362,089	362,089	362,089	363,883 (72,777) [17,466] {8,733}	365,722 (73,144) [17,555] {8,777}	367,571 (73,514) [17,643] {8,822}
Pasco	119,371	119,371	119,371	119,371	120,077 (24,015) [5,764] {2,882}	120,747 (24,149) [5,796] {2,898}	121,387 (24,277) [5,827] {2,913}
Pinellas	204,763	204,763	204,763	204,763	206,095 (41,219) [9,893] {4,946}	207,406 (41,481) [9,955] {4,978}	208,676 (41,735) [10,016] {5,008}
Polk	196,363	196,363	196,363	196,363	197,308 (39,462) [9,471] {4,735}	198,206 (39,641) [9,514] {4,757}	199,053 (39,811) [9,555] {4,777}
Sarasota	87,976	87,976	87,976	87,976	88,529 (17,706) [4,249] {2,125}	89,047 (17,809) [4,274] {2,137}	89,548 (17,910) [4,298] {2,149}
Seminole	101,526	101,526	101,526	101,526	101,988 (20,398) [4,895] {2,448}	102,423 (20,485) [4,916] {2,458}	102,824 (20,565) [4,936] {2,468}
St. Johns	61,909	61,909	61,909	61,909	62,320 (12,464) [2,991] {1,496}	62,711 (12,542) [3,010] {1,505}	63,079 (12,616) [3,028] {1,514}
Sumter	20,907	20,907	20,907	20,907	21,045 (4,209) [1,010] {505}	21,176 (4,235) [1,016] {508}	21,303 (4,261) [1,023] {511}
Volusia	114,594	114,594	114,594	114,594	115,333 (23,067) [5,536] {2,768}	116,058 (23,212) [5,571] {2,785}	116,761 (23,352) [5,605] {2,802}

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.