IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/13/21

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 8/13/21 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.

New York State Projections
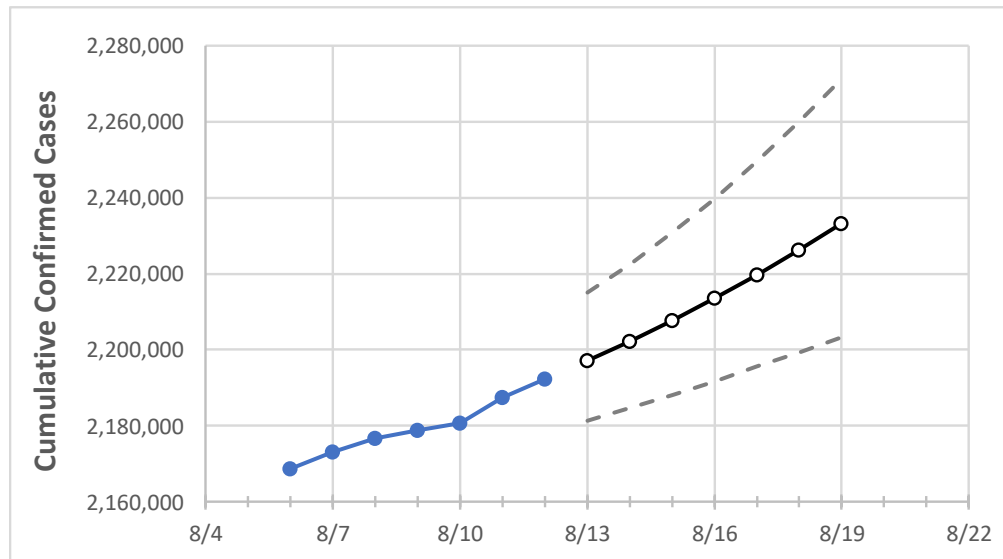
	Actual Confirmed Cases On:				Projected Cases For:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
New York	2,178,724	2,180,696	2,187,349	2,192,224	2,197,052	2,202,187	2,207,673	2,213,502	2,219,633	2,226,236	2,233,276

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.

New York Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Albany	25,468	25,510	25,565	25,607	25,675	25,749	25,828	25,912	26,003	26,101	26,204
Bronx	189,003	189,251	189,498	189,875	190,223	190,584	190,958	191,347	191,759	192,189	192,638
Dutchess	30,328	30,379	30,469	30,557	30,647	30,745	30,849	30,962	31,085	31,218	31,363
Erie	91,476	91,576	91,690	91,826	91,966	92,115	92,270	92,437	92,615	92,800	92,993
Kings	292,743	293,290	293,838	294,568	295,290	296,035	296,826	297,646	298,501	299,382	300,291
Monroe	70,786	70,907	71,041	71,218	71,394	71,582	71,787	72,010	72,251	72,514	72,800
Nassau	190,038	190,306	190,674	191,088	191,538	192,013	192,515	193,041	193,595	194,175	194,786
New York	146,069	146,319	146,658	147,073	147,507	147,951	148,419	148,895	149,390	149,907	150,435
Niagara	20,436	20,454	20,475	20,506	20,534	20,564	20,595	20,629	20,663	20,700	20,739
Onondaga	40,076	40,136	40,200	40,301	40,404	40,515	40,636	40,765	40,904	41,056	41,220
Orange	49,747	49,848	49,971	50,098	50,238	50,388	50,552	50,728	50,915	51,121	51,341
Putnam	10,868	10,879	10,894	10,920	10,941	10,963	10,987	11,013	11,039	11,068	11,099
Queens	286,331	286,780	287,229	287,828	288,416	289,028	289,674	290,348	291,049	291,788	292,558
Rensselaer	11,639	11,662	11,687	11,720	11,755	11,792	11,832	11,874	11,920	11,968	12,020
Richmond	78,516	78,643	78,771	79,082	79,296	79,521	79,758	80,004	80,264	80,539	80,833
Rockland	47,974	48,030	48,101	48,188	48,279	48,377	48,480	48,595	48,717	48,850	48,992
Saratoga	16,100	16,137	16,179	16,218	16,277	16,338	16,404	16,475	16,549	16,628	16,713
Schenectady	13,587	13,622	13,659	13,695	13,737	13,783	13,833	13,887	13,946	14,010	14,079
Suffolk	207,046	207,305	207,685	208,020	208,468	208,943	209,437	209,964	210,516	211,096	211,718
Sullivan	6,900	6,914	6,935	6,947	6,968	6,991	7,015	7,042	7,070	7,101	7,133
Tompkins	4,542	4,551	4,561	4,590	4,609	4,631	4,653	4,678	4,705	4,735	4,768
Ulster	14,330	14,360	14,397	14,438	14,478	14,522	14,569	14,619	14,674	14,733	14,797
Westchester	132,821	132,982	133,197	133,425	133,663	133,915	134,187	134,470	134,771	135,089	135,430

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.*

New York Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	8/9	8/10	8/11	8/12	8/14	8/16	8/18
Albany	25,468	25,510	25,565	25,607	25,749 (5,150) [1,236] {618}	25,912 (5,182) [1,244] {622}	26,101 (5,220) [1,253] {626}
Bronx	189,003	189,251	189,498	189,875	190,584 (38,117) [9,148] {4,574}	191,347 (38,269) [9,185] {4,592}	192,189 (38,438) [9,225] {4,613}
Dutchess	30,328	30,379	30,469	30,557	30,745 (6,149) [1,476] {738}	30,962 (6,192) [1,486] {743}	31,218 (6,244) [1,498] {749}
Erie	91,476	91,576	91,690	91,826	92,115 (18,423) [4,422] {2,211}	92,437 (18,487) [4,437] {2,218}	92,800 (18,560) [4,454] {2,227}
Kings	292,743	293,290	293,838	294,568	296,035 (59,207) [14,210] {7,105}	297,646 (59,529) [14,287] {7,144}	299,382 (59,876) [14,370] {7,185}
Monroe	70,786	70,907	71,041	71,218	71,582 (14,316) [3,436] {1,718}	72,010 (14,402) [3,456] {1,728}	72,514 (14,503) [3,481] {1,740}
Nassau	190,038	190,306	190,674	191,088	192,013 (38,403) [9,217] {4,608}	193,041 (38,608) [9,266] {4,633}	194,175 (38,835) [9,320] {4,660}
New York	146,069	146,319	146,658	147,073	147,951 (29,590) [7,102] {3,551}	148,895 (29,779) [7,147] {3,573}	149,907 (29,981) [7,196] {3,598}
Niagara	20,436	20,454	20,475	20,506	20,564 (4,113) [987] {494}	20,629 (4,126) [990] {495}	20,700 (4,140) [994] {497}
Onondaga	40,076	40,136	40,200	40,301	40,515 (8,103) [1,945] {972}	40,765 (8,153) [1,957] {978}	41,056 (8,211) [1,971] {985}
Orange	49,747	49,848	49,971	50,098	50,388 (10,078) [2,419] {1,209}	50,728 (10,146) [2,435] {1,217}	51,121 (10,224) [2,454] {1,227}
Putnam	10,868	10,879	10,894	10,920	10,963 (2,193) [526] {263}	11,013 (2,203) [529] {264}	11,068 (2,214) [531] {266}
Queens	286,331	286,780	287,229	287,828	289,028 (57,806) [13,873] {6,937}	290,348 (58,070) [13,937] {6,968}	291,788 (58,358) [14,006] {7,003}
Rensselaer	11,639	11,662	11,687	11,720	11,792 (2,358) [566] {283}	11,874 (2,375) [570] {285}	11,968 (2,394) [574] {287}
Richmond	78,516	78,643	78,771	79,082	79,521 (15,904) [3,817] {1,908}	80,004 (16,001) [3,840] {1,920}	80,539 (16,108) [3,866] {1,933}
Rockland	47,974	48,030	48,101	48,188	48,377 (9,675) [2,322] {1,161}	48,595 (9,719) [2,333] {1,166}	48,850 (9,770) [2,345] {1,172}
Saratoga	16,100	16,137	16,179	16,218	16,338 (3,268) [784] {392}	16,475 (3,295) [791] {395}	16,628 (3,326) [798] {399}
Schenectady	13,587	13,622	13,659	13,695	13,783 (2,757) [662] {331}	13,887 (2,777) [667] {333}	14,010 (2,802) [672] {336}
Suffolk	207,046	207,305	207,685	208,020	208,943 (41,789) [10,029] {5,015}	209,964 (41,993) [10,078] {5,039}	211,096 (42,219) [10,133] {5,066}
Sullivan	6,900	6,914	6,935	6,947	6,991 (1,398) [336] {168}	7,042 (1,408) [338] {169}	7,101 (1,420) [341] {170}
Tompkins	4,542	4,551	4,561	4,590	4,631 (926) [222] {111}	4,678 (936) [225] {112}	4,735 (947) [227] {114}
Ulster	14,330	14,360	14,397	14,438	14,522 (2,904) [697] {349}	14,619 (2,924) [702] {351}	14,733 (2,947) [707] {354}
Westchester	132,821	132,982	133,197	133,425	133,915 (26,783) [6,428] {3,214}	134,470 (26,894) [6,455] {3,227}	135,089 (27,018) [6,484] {3,242}

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.