

IEM's AI Modeling: Short-term COVID-19 Projections

Date: 8/10/20

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

The projections shown in this document are based on data pulled in as of 8/10/20 12 p.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.

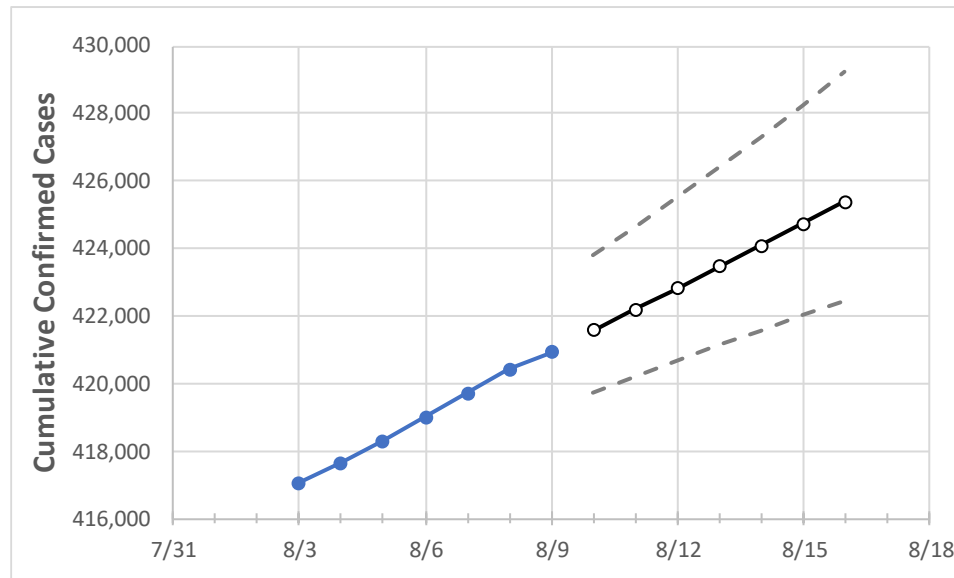
IEM's Modeling Lead

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:						
	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16
New York	418,997	419,711	420,414	420,929	421,561	422,193	422,827	423,462	424,097	424,734	425,372

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.

New York Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16
Albany	2,565	2,573	2,581	2,595	2,604	2,614	2,623	2,633	2,643	2,652	2,662
Bronx	49,980	50,057	50,120	50,188	50,246	50,304	50,362	50,421	50,480	50,540	50,600
Dutchess	4,582	4,589	4,600	4,607	4,621	4,635	4,650	4,666	4,682	4,699	4,716
Erie	8,737	8,791	8,850	8,904	8,947	8,991	9,036	9,081	9,128	9,175	9,223
Kings	62,890	62,999	63,086	63,155	63,232	63,308	63,385	63,463	63,540	63,618	63,696
Monroe	4,868	4,901	4,922	4,956	4,980	5,003	5,027	5,051	5,074	5,098	5,122
Nassau	43,534	43,580	43,628	43,655	43,699	43,742	43,786	43,830	43,874	43,918	43,963
New York	30,799	30,859	30,921	30,964	31,013	31,062	31,111	31,160	31,209	31,258	31,306
Niagara	1,470	1,491	1,494	1,498	1,502	1,506	1,510	1,514	1,519	1,523	1,527
Onondaga	3,535	3,556	3,565	3,576	3,585	3,594	3,603	3,611	3,620	3,628	3,636
Orange	11,127	11,129	11,156	11,159	11,166	11,172	11,178	11,185	11,191	11,197	11,203
Putnam	1,444	1,446	1,447	1,449	1,452	1,454	1,457	1,460	1,463	1,466	1,469
Queens	68,368	68,452	68,548	68,604	68,670	68,737	68,803	68,870	68,936	69,003	69,069
Rensselaer	758	759	761	765	769	772	776	780	783	787	791
Richmond	14,877	14,891	14,909	14,921	14,938	14,955	14,971	14,988	15,004	15,021	15,037
Rockland	13,918	13,925	13,936	13,942	13,948	13,954	13,960	13,966	13,972	13,978	13,984
Saratoga	747	752	755	757	761	765	769	773	777	781	785
Schenectady	1,050	1,055	1,058	1,058	1,062	1,066	1,070	1,074	1,078	1,082	1,086
Suffolk	43,630	43,681	43,749	43,786	43,846	43,907	43,968	44,030	44,092	44,155	44,218
Sullivan	1,487	1,488	1,489	1,489	1,490	1,490	1,491	1,492	1,492	1,493	1,494
Tompkins	232	233	234	234	235	235	236	236	237	237	238
Ulster	2,045	2,049	2,057	2,062	2,068	2,074	2,080	2,086	2,093	2,099	2,106
Westchester	36,107	36,136	36,180	36,205	36,233	36,261	36,289	36,317	36,345	36,373	36,401

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:											
	8/6	8/7	8/8	8/9	8/11				8/13				8/15			
Albany	2,565	2,573	2,581	2,595	2,614	(523)	[125]	{63}	2,633	(527)	[126]	{63}	2,652	(530)	[127]	{64}
Bronx	49,980	50,057	50,120	50,188	50,304	(10,061)	[2,415]	{1,207}	50,421	(10,084)	[2,420]	{1,210}	50,540	(10,108)	[2,426]	{1,213}
Dutchess	4,582	4,589	4,600	4,607	4,635	(927)	[222]	{111}	4,666	(933)	[224]	{112}	4,699	(940)	[226]	{113}
Erie	8,737	8,791	8,850	8,904	8,991	(1,798)	[432]	{216}	9,081	(1,816)	[436]	{218}	9,175	(1,835)	[440]	{220}
Kings	62,890	62,999	63,086	63,155	63,308	(12,662)	[3,039]	{1,519}	63,463	(12,693)	[3,046]	{1,523}	63,618	(12,724)	[3,054]	{1,527}
Monroe	4,868	4,901	4,922	4,956	5,003	(1,001)	[240]	{120}	5,051	(1,010)	[242]	{121}	5,098	(1,020)	[245]	{122}
Nassau	43,534	43,580	43,628	43,655	43,742	(8,748)	[2,100]	{1,050}	43,830	(8,766)	[2,104]	{1,052}	43,918	(8,784)	[2,108]	{1,054}
New York	30,799	30,859	30,921	30,964	31,062	(6,212)	[1,491]	{745}	31,160	(6,232)	[1,496]	{748}	31,258	(6,252)	[1,500]	{750}
Niagara	1,470	1,491	1,494	1,498	1,506	(301)	[72]	{36}	1,514	(303)	[73]	{36}	1,523	(305)	[73]	{37}
Onondaga	3,535	3,556	3,565	3,576	3,594	(719)	[173]	{86}	3,611	(722)	[173]	{87}	3,628	(726)	[174]	{87}
Orange	11,127	11,129	11,156	11,159	11,172	(2,234)	[536]	{268}	11,185	(2,237)	[537]	{268}	11,197	(2,239)	[537]	{269}
Putnam	1,444	1,446	1,447	1,449	1,454	(291)	[70]	{35}	1,460	(292)	[70]	{35}	1,466	(293)	[70]	{35}
Queens	68,368	68,452	68,548	68,604	68,737	(13,747)	[3,299]	{1,650}	68,870	(13,774)	[3,306]	{1,653}	69,003	(13,801)	[3,312]	{1,656}
Rensselaer	758	759	761	765	772	(154)	[37]	{19}	780	(156)	[37]	{19}	787	(157)	[38]	{19}
Richmond	14,877	14,891	14,909	14,921	14,955	(2,991)	[718]	{359}	14,988	(2,998)	[719]	{360}	15,021	(3,004)	[721]	{361}
Rockland	13,918	13,925	13,936	13,942	13,954	(2,791)	[670]	{335}	13,966	(2,793)	[670]	{335}	13,978	(2,796)	[671]	{335}
Saratoga	747	752	755	757	765	(153)	[37]	{18}	773	(155)	[37]	{19}	781	(156)	[37]	{19}
Schenectady	1,050	1,055	1,058	1,058	1,066	(213)	[51]	{26}	1,074	(215)	[52]	{26}	1,082	(216)	[52]	{26}
Suffolk	43,630	43,681	43,749	43,786	43,907	(8,781)	[2,108]	{1,054}	44,030	(8,806)	[2,113]	{1,057}	44,155	(8,831)	[2,119]	{1,060}
Sullivan	1,487	1,488	1,489	1,489	1,490	(298)	[72]	{36}	1,492	(298)	[72]	{36}	1,493	(299)	[72]	{36}
Tompkins	232	233	234	234	235	(47)	[11]	{6}	236	(47)	[11]	{6}	237	(47)	[11]	{6}
Ulster	2,045	2,049	2,057	2,062	2,074	(415)	[100]	{50}	2,086	(417)	[100]	{50}	2,099	(420)	[101]	{50}
Westchester	36,107	36,136	36,180	36,205	36,261	(7,252)	[1,741]	{870}	36,317	(7,263)	[1,743]	{872}	36,373	(7,275)	[1,746]	{873}

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.