

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

Date: 7/1/21

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 7/1/21 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.**

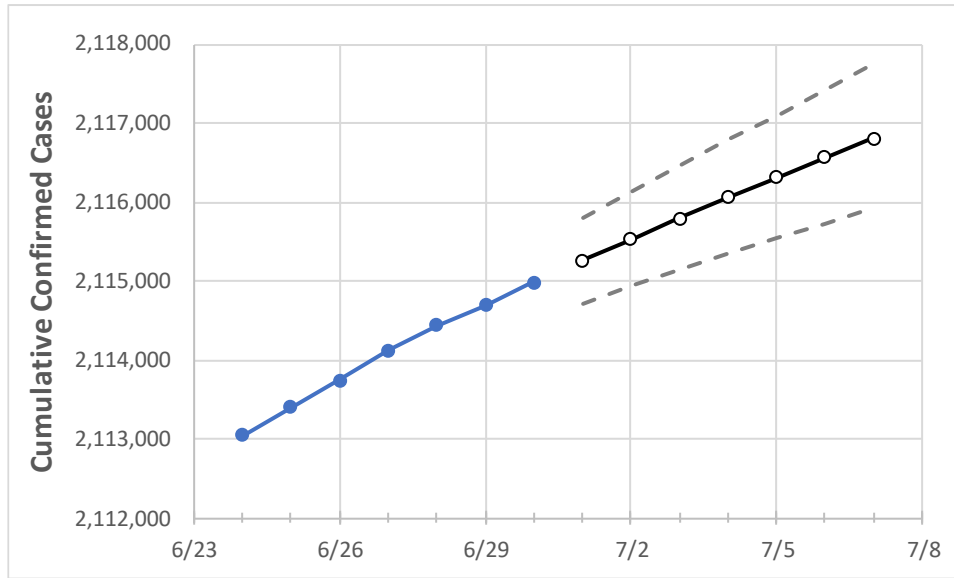
### IEM's Modeling Lead

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:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7

New York	2,114,123	2,114,434	2,114,686	2,114,986	2,115,261	2,115,533	2,115,799	2,116,056	2,116,309	2,116,561	2,116,809
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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:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7
Albany	24,729	24,733	24,734	24,734	24,736	24,737	24,739	24,740	24,741	24,743	24,744
Bronx	183,917	183,936	183,952	183,969	183,988	184,006	184,023	184,040	184,056	184,072	184,086
Dutchess	29,504	29,507	29,508	29,512	29,514	29,516	29,517	29,519	29,520	29,522	29,523
Erie	89,651	89,660	89,665	89,668	89,671	89,674	89,676	89,679	89,681	89,683	89,685
Kings	281,225	281,282	281,332	281,368	281,418	281,467	281,516	281,565	281,614	281,663	281,711
Monroe	69,130	69,146	69,152	69,163	69,170	69,176	69,181	69,187	69,192	69,196	69,201
Nassau	183,926	183,948	183,963	183,980	183,998	184,016	184,033	184,050	184,067	184,084	184,100
New York	138,649	138,674	138,698	138,742	138,772	138,801	138,830	138,858	138,887	138,916	138,944
Niagara	20,056	20,057	20,058	20,059	20,060	20,061	20,062	20,062	20,063	20,064	20,065
Onondaga	39,020	39,024	39,030	39,035	39,039	39,043	39,047	39,050	39,053	39,056	39,059
Orange	48,398	48,405	48,409	48,417	48,423	48,429	48,434	48,440	48,446	48,451	48,456
Putnam	10,626	10,628	10,629	10,630	10,631	10,632	10,633	10,634	10,635	10,636	10,637
Queens	277,863	277,911	277,942	277,974	278,015	278,054	278,093	278,131	278,170	278,207	278,243
Rensselaer	11,247	11,248	11,248	11,249	11,250	11,251	11,252	11,253	11,254	11,255	11,256
Richmond	75,271	75,298	75,326	75,364	75,396	75,429	75,463	75,497	75,534	75,570	75,607
Rockland	47,011	47,014	47,017	47,022	47,027	47,032	47,036	47,041	47,046	47,051	47,055
Saratoga	15,403	15,404	15,409	15,412	15,414	15,416	15,418	15,420	15,422	15,423	15,425
Schenectady	13,217	13,217	13,217	13,217	13,218	13,219	13,220	13,221	13,221	13,222	13,223
Suffolk	201,368	201,398	201,418	201,431	201,452	201,472	201,492	201,511	201,530	201,549	201,567
Sullivan	6,691	6,691	6,692	6,692	6,693	6,694	6,695	6,696	6,697	6,697	6,698
Tompkins	4,358	4,358	4,358	4,358	4,359	4,360	4,361	4,362	4,363	4,364	4,365
Ulster	13,926	13,927	13,927	13,927	13,928	13,929	13,930	13,931	13,931	13,932	13,933
Westchester	129,830	129,835	129,849	129,866	129,876	129,886	129,896	129,907	129,916	129,925	129,934

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:											
	6/27	6/28	6/29	6/30	7/2				7/4				7/6			
Albany	24,729	24,733	24,734	24,734	24,737	(4,947)	[1,187]	{594}	24,740	(4,948)	[1,188]	{594}	24,743	(4,949)	[1,188]	{594}
Bronx	183,917	183,936	183,952	183,969	184,006	(36,801)	[8,832]	{4,416}	184,040	(36,808)	[8,834]	{4,417}	184,072	(36,814)	[8,835]	{4,418}
Dutchess	29,504	29,507	29,508	29,512	29,516	(5,903)	[1,417]	{708}	29,519	(5,904)	[1,417]	{708}	29,522	(5,904)	[1,417]	{709}
Erie	89,651	89,660	89,665	89,668	89,674	(17,935)	[4,304]	{2,152}	89,679	(17,936)	[4,305]	{2,152}	89,683	(17,937)	[4,305]	{2,152}
Kings	281,225	281,282	281,332	281,368	281,467	(56,293)	[13,510]	{6,755}	281,565	(56,313)	[13,515]	{6,758}	281,663	(56,333)	[13,520]	{6,760}
Monroe	69,130	69,146	69,152	69,163	69,176	(13,835)	[3,320]	{1,660}	69,187	(13,837)	[3,321]	{1,660}	69,196	(13,839)	[3,321]	{1,661}
Nassau	183,926	183,948	183,963	183,980	184,016	(36,803)	[8,833]	{4,416}	184,050	(36,810)	[8,834]	{4,417}	184,084	(36,817)	[8,836]	{4,418}
New York	138,649	138,674	138,698	138,742	138,801	(27,760)	[6,662]	{3,331}	138,858	(27,772)	[6,665]	{3,333}	138,916	(27,783)	[6,668]	{3,334}
Niagara	20,056	20,057	20,058	20,059	20,061	(4,012)	[963]	{481}	20,062	(4,012)	[963]	{481}	20,064	(4,013)	[963]	{482}
Onondaga	39,020	39,024	39,030	39,035	39,043	(7,809)	[1,874]	{937}	39,050	(7,810)	[1,874]	{937}	39,056	(7,811)	[1,875]	{937}
Orange	48,398	48,405	48,409	48,417	48,429	(9,686)	[2,325]	{1,162}	48,440	(9,688)	[2,325]	{1,163}	48,451	(9,690)	[2,326]	{1,163}
Putnam	10,626	10,628	10,629	10,630	10,632	(2,126)	[510]	{255}	10,634	(2,127)	[510]	{255}	10,636	(2,127)	[511]	{255}
Queens	277,863	277,911	277,942	277,974	278,054	(55,611)	[13,347]	{6,673}	278,131	(55,626)	[13,350]	{6,675}	278,207	(55,641)	[13,354]	{6,677}
Rensselaer	11,247	11,248	11,248	11,249	11,251	(2,250)	[540]	{270}	11,253	(2,251)	[540]	{270}	11,255	(2,251)	[540]	{270}
Richmond	75,271	75,298	75,326	75,364	75,429	(15,086)	[3,621]	{1,810}	75,497	(15,099)	[3,624]	{1,812}	75,570	(15,114)	[3,627]	{1,814}
Rockland	47,011	47,014	47,017	47,022	47,032	(9,406)	[2,258]	{1,129}	47,041	(9,408)	[2,258]	{1,129}	47,051	(9,410)	[2,258]	{1,129}
Saratoga	15,403	15,404	15,409	15,412	15,416	(3,083)	[740]	{370}	15,420	(3,084)	[740]	{370}	15,423	(3,085)	[740]	{370}
Schenectady	13,217	13,217	13,217	13,217	13,219	(2,644)	[635]	{317}	13,221	(2,644)	[635]	{317}	13,222	(2,644)	[635]	{317}
Suffolk	201,368	201,398	201,418	201,431	201,472	(40,294)	[9,671]	{4,835}	201,511	(40,302)	[9,673]	{4,836}	201,549	(40,310)	[9,674]	{4,837}
Sullivan	6,691	6,691	6,692	6,692	6,694	(1,339)	[321]	{161}	6,696	(1,339)	[321]	{161}	6,697	(1,339)	[321]	{161}
Tompkins	4,358	4,358	4,358	4,358	4,360	(872)	[209]	{105}	4,362	(872)	[209]	{105}	4,364	(873)	[209]	{105}
Ulster	13,926	13,927	13,927	13,927	13,929	(2,786)	[669]	{334}	13,931	(2,786)	[669]	{334}	13,932	(2,786)	[669]	{334}
Westchester	129,830	129,835	129,849	129,866	129,886	(25,977)	[6,235]	{3,117}	129,907	(25,981)	[6,236]	{3,118}	129,925	(25,985)	[6,236]	{3,118}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.