

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

Date: 7/26/21

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 7/26/21 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.**

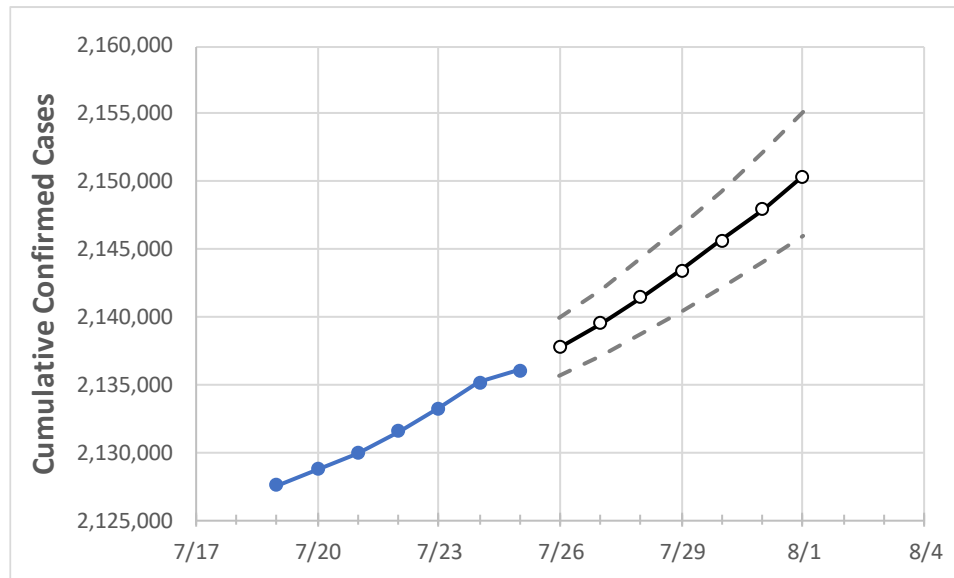
### IEM's Modeling Lead

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:					
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
New York	2,131,535	2,133,264	2,135,161	2,136,032	2,137,717	2,139,501	2,141,409	2,143,437	2,145,617	2,147,923	2,150,348

*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:						
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
Albany	24,859	24,881	24,893	24,893	24,910	24,929	24,950	24,973	24,997	25,023	25,052
Bronx	185,332	185,478	185,633	185,777	185,920	186,073	186,235	186,407	186,595	186,790	186,999
Dutchess	29,675	29,700	29,728	29,728	29,750	29,774	29,799	29,827	29,857	29,891	29,928
Erie	90,090	90,144	90,185	90,185	90,230	90,278	90,329	90,385	90,444	90,506	90,574
Kings	284,460	284,750	285,144	285,507	285,906	286,333	286,798	287,295	287,834	288,420	289,048
Monroe	69,534	69,566	69,599	69,599	69,627	69,656	69,687	69,717	69,749	69,782	69,817
Nassau	185,525	185,692	185,866	185,866	186,061	186,274	186,504	186,752	187,023	187,317	187,630
New York	140,855	141,088	141,367	141,367	141,634	141,926	142,248	142,591	142,959	143,360	143,787
Niagara	20,154	20,159	20,168	20,168	20,177	20,187	20,198	20,209	20,221	20,234	20,247
Onondaga	39,253	39,271	39,280	39,280	39,292	39,304	39,317	39,331	39,345	39,358	39,372
Orange	48,705	48,733	48,768	48,768	48,801	48,836	48,875	48,915	48,958	49,005	49,056
Putnam	10,667	10,677	10,682	10,682	10,688	10,694	10,701	10,709	10,717	10,725	10,735
Queens	280,204	280,401	280,641	280,889	281,123	281,374	281,642	281,933	282,244	282,574	282,922
Rensselaer	11,320	11,329	11,333	11,333	11,340	11,349	11,357	11,366	11,376	11,386	11,398
Richmond	76,314	76,404	76,490	76,606	76,699	76,795	76,898	77,007	77,120	77,241	77,371
Rockland	47,269	47,288	47,307	47,307	47,321	47,336	47,351	47,365	47,381	47,397	47,414
Saratoga	15,524	15,543	15,563	15,563	15,579	15,597	15,616	15,638	15,662	15,686	15,714
Schenectady	13,263	13,281	13,291	13,291	13,301	13,312	13,324	13,337	13,352	13,368	13,386
Suffolk	202,711	202,863	203,027	203,027	203,201	203,390	203,598	203,823	204,069	204,336	204,629
Sullivan	6,728	6,732	6,735	6,735	6,738	6,741	6,743	6,747	6,750	6,753	6,756
Tompkins	4,380	4,384	4,391	4,391	4,393	4,396	4,398	4,401	4,404	4,407	4,410
Ulster	14,020	14,031	14,043	14,043	14,053	14,063	14,074	14,085	14,098	14,112	14,127
Westchester	130,591	130,667	130,752	130,752	130,833	130,921	131,015	131,115	131,223	131,338	131,462

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:											
	7/22	7/23	7/24	7/25	7/27				7/29				7/31			
Albany	24,859	24,881	24,893	24,893	24,929	(4,986)	[1,197]	{598}	24,973	(4,995)	[1,199]	{599}	25,023	(5,005)	[1,201]	{601}
Bronx	185,332	185,478	185,633	185,777	186,073	(37,215)	[8,932]	{4,466}	186,407	(37,281)	[8,948]	{4,474}	186,790	(37,358)	[8,966]	{4,483}
Dutchess	29,675	29,700	29,728	29,728	29,774	(5,955)	[1,429]	{715}	29,827	(5,965)	[1,432]	{716}	29,891	(5,978)	[1,435]	{717}
Erie	90,090	90,144	90,185	90,185	90,278	(18,056)	[4,333]	{2,167}	90,385	(18,077)	[4,338]	{2,169}	90,506	(18,101)	[4,344]	{2,172}
Kings	284,460	284,750	285,144	285,507	286,333	(57,267)	[13,744]	{6,872}	287,295	(57,459)	[13,790]	{6,895}	288,420	(57,684)	[13,844]	{6,922}
Monroe	69,534	69,566	69,599	69,599	69,656	(13,931)	[3,343]	{1,672}	69,717	(13,943)	[3,346]	{1,673}	69,782	(13,956)	[3,350]	{1,675}
Nassau	185,525	185,692	185,866	185,866	186,274	(37,255)	[8,941]	{4,471}	186,752	(37,350)	[8,964]	{4,482}	187,317	(37,463)	[8,991]	{4,496}
New York	140,855	141,088	141,367	141,367	141,926	(28,385)	[6,812]	{3,406}	142,591	(28,518)	[6,844]	{3,422}	143,360	(28,672)	[6,881]	{3,441}
Niagara	20,154	20,159	20,168	20,168	20,187	(4,037)	[969]	{484}	20,209	(4,042)	[970]	{485}	20,234	(4,047)	[971]	{486}
Onondaga	39,253	39,271	39,280	39,280	39,304	(7,861)	[1,887]	{943}	39,331	(7,866)	[1,888]	{944}	39,358	(7,872)	[1,889]	{945}
Orange	48,705	48,733	48,768	48,768	48,836	(9,767)	[2,344]	{1,172}	48,915	(9,783)	[2,348]	{1,174}	49,005	(9,801)	[2,352]	{1,176}
Putnam	10,667	10,677	10,682	10,682	10,694	(2,139)	[513]	{257}	10,709	(2,142)	[514]	{257}	10,725	(2,145)	[515]	{257}
Queens	280,204	280,401	280,641	280,889	281,374	(56,275)	[13,506]	{6,753}	281,933	(56,387)	[13,533]	{6,766}	282,574	(56,515)	[13,564]	{6,782}
Rensselaer	11,320	11,329	11,333	11,333	11,349	(2,270)	[545]	{272}	11,366	(2,273)	[546]	{273}	11,386	(2,277)	[547]	{273}
Richmond	76,314	76,404	76,490	76,606	76,795	(15,359)	[3,686]	{1,843}	77,007	(15,401)	[3,696]	{1,848}	77,241	(15,448)	[3,708]	{1,854}
Rockland	47,269	47,288	47,307	47,307	47,336	(9,467)	[2,272]	{1,136}	47,365	(9,473)	[2,274]	{1,137}	47,397	(9,479)	[2,275]	{1,138}
Saratoga	15,524	15,543	15,563	15,563	15,597	(3,119)	[749]	{374}	15,638	(3,128)	[751]	{375}	15,686	(3,137)	[753]	{376}
Schenectady	13,263	13,281	13,291	13,291	13,312	(2,662)	[639]	{319}	13,337	(2,667)	[640]	{320}	13,368	(2,674)	[642]	{321}
Suffolk	202,711	202,863	203,027	203,027	203,390	(40,678)	[9,763]	{4,881}	203,823	(40,765)	[9,783]	{4,892}	204,336	(40,867)	[9,808]	{4,904}
Sullivan	6,728	6,732	6,735	6,735	6,741	(1,348)	[324]	{162}	6,747	(1,349)	[324]	{162}	6,753	(1,351)	[324]	{162}
Tompkins	4,380	4,384	4,391	4,391	4,396	(879)	[211]	{105}	4,401	(880)	[211]	{106}	4,407	(881)	[212]	{106}
Ulster	14,020	14,031	14,043	14,043	14,063	(2,813)	[675]	{338}	14,085	(2,817)	[676]	{338}	14,112	(2,822)	[677]	{339}
Westchester	130,591	130,667	130,752	130,752	130,921	(26,184)	[6,284]	{3,142}	131,115	(26,223)	[6,294]	{3,147}	131,338	(26,268)	[6,304]	{3,152}

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.