

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

**Date: 8/9/21**

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 8/9/21 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.**

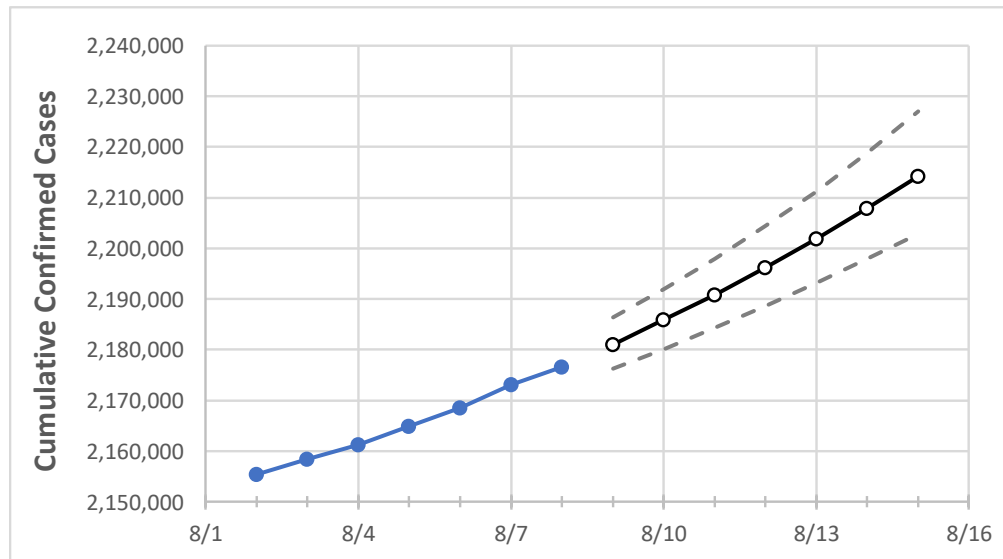
### **IEM's Modeling Lead**

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:						
	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15
New York	2,164,850	2,168,589	2,173,080	2,176,658	2,181,066	2,185,849	2,190,871	2,196,198	2,201,838	2,207,846	2,214,267

*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:							
	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	
Albany	25,237	25,297	25,376	25,410	25,474	25,545	25,622	25,705	25,795	25,895	26,005	
Bronx	187,900	188,188	188,500	188,756	189,073	189,414	189,770	190,146	190,543	190,960	191,404	
Dutchess	30,104	30,175	30,233	30,271	30,339	30,413	30,493	30,579	30,673	30,774	30,885	
Erie	91,075	91,165	91,304	91,409	91,537	91,675	91,824	91,981	92,149	92,329	92,525	
Kings	290,242	290,884	291,556	292,195	292,883	293,608	294,369	295,172	296,023	296,915	297,857	
Monroe	70,307	70,386	70,557	70,680	70,815	70,964	71,124	71,300	71,492	71,697	71,930	
Nassau	188,626	188,944	189,356	189,700	190,094	190,514	190,961	191,436	191,939	192,475	193,043	
New York	144,587	144,976	145,349	145,684	146,090	146,518	146,963	147,429	147,917	148,428	148,965	
Niagara	20,357	20,374	20,401	20,426	20,454	20,484	20,517	20,552	20,589	20,629	20,673	
Onondaga	39,797	39,850	39,964	40,030	40,130	40,242	40,363	40,499	40,650	40,820	41,007	
Orange	49,347	49,438	49,557	49,652	49,763	49,884	50,015	50,157	50,312	50,480	50,664	
Putnam	10,808	10,827	10,842	10,858	10,878	10,898	10,921	10,946	10,972	11,001	11,031	
Queens	284,471	284,948	285,440	285,882	286,418	286,986	287,592	288,242	288,919	289,640	290,402	
Rensselaer	11,530	11,557	11,604	11,625	11,660	11,697	11,738	11,783	11,831	11,883	11,940	
Richmond	77,873	78,055	78,251	78,388	78,575	78,772	78,980	79,200	79,431	79,675	79,929	
Rockland	47,721	47,809	47,869	47,914	47,987	48,065	48,150	48,243	48,343	48,452	48,570	
Saratoga	15,931	15,966	16,024	16,066	16,123	16,185	16,252	16,323	16,401	16,487	16,579	
Schenectady	13,474	13,500	13,543	13,567	13,603	13,643	13,688	13,736	13,789	13,848	13,913	
Suffolk	205,681	205,995	206,402	206,706	207,107	207,531	207,990	208,476	208,995	209,553	210,142	
Sullivan	6,841	6,857	6,873	6,894	6,917	6,942	6,970	7,001	7,036	7,074	7,118	
Tompkins	4,495	4,507	4,519	4,533	4,550	4,568	4,588	4,610	4,633	4,659	4,688	
Ulster	14,229	14,259	14,293	14,316	14,349	14,385	14,425	14,467	14,514	14,563	14,619	
Westchester	132,179	132,327	132,519	132,653	132,850	133,061	133,285	133,521	133,771	134,035	134,316	

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:											
	8/5	8/6	8/7	8/8	8/10				8/12				8/14			
Albany	25,237	25,297	25,376	25,410	25,545	(5,109)	[1,226]	{613}	25,705	(5,141)	[1,234]	{617}	25,895	(5,179)	[1,243]	{621}
Bronx	187,900	188,188	188,500	188,756	189,414	(37,883)	[9,092]	{4,546}	190,146	(38,029)	[9,127]	{4,564}	190,960	(38,192)	[9,166]	{4,583}
Dutchess	30,104	30,175	30,233	30,271	30,413	(6,083)	[1,460]	{730}	30,579	(6,116)	[1,468]	{734}	30,774	(6,155)	[1,477]	{739}
Erie	91,075	91,165	91,304	91,409	91,675	(18,335)	[4,400]	{2,200}	91,981	(18,396)	[4,415]	{2,208}	92,329	(18,466)	[4,432]	{2,216}
Kings	290,242	290,884	291,556	292,195	293,608	(58,722)	[14,093]	{7,047}	295,172	(59,034)	[14,168]	{7,084}	296,915	(59,383)	[14,252]	{7,126}
Monroe	70,307	70,386	70,557	70,680	70,964	(14,193)	[3,406]	{1,703}	71,300	(14,260)	[3,422]	{1,711}	71,697	(14,339)	[3,441]	{1,721}
Nassau	188,626	188,944	189,356	189,700	190,514	(38,103)	[9,145]	{4,572}	191,436	(38,287)	[9,189]	{4,594}	192,475	(38,495)	[9,239]	{4,619}
New York	144,587	144,976	145,349	145,684	146,518	(29,304)	[7,033]	{3,516}	147,429	(29,486)	[7,077]	{3,538}	148,428	(29,686)	[7,125]	{3,562}
Niagara	20,357	20,374	20,401	20,426	20,484	(4,097)	[983]	{492}	20,552	(4,110)	[986]	{493}	20,629	(4,126)	[990]	{495}
Onondaga	39,797	39,850	39,964	40,030	40,242	(8,048)	[1,932]	{966}	40,499	(8,100)	[1,944]	{972}	40,820	(8,164)	[1,959]	{980}
Orange	49,347	49,438	49,557	49,652	49,884	(9,977)	[2,394]	{1,197}	50,157	(10,031)	[2,408]	{1,204}	50,480	(10,096)	[2,423]	{1,212}
Putnam	10,808	10,827	10,842	10,858	10,898	(2,180)	[523]	{262}	10,946	(2,189)	[525]	{263}	11,001	(2,200)	[528]	{264}
Queens	284,471	284,948	285,440	285,882	286,986	(57,397)	[13,775]	{6,888}	288,242	(57,648)	[13,836]	{6,918}	289,640	(57,928)	[13,903]	{6,951}
Rensselaer	11,530	11,557	11,604	11,625	11,697	(2,339)	[561]	{281}	11,783	(2,357)	[566]	{283}	11,883	(2,377)	[570]	{285}
Richmond	77,873	78,055	78,251	78,388	78,772	(15,754)	[3,781]	{1,891}	79,200	(15,840)	[3,802]	{1,901}	79,675	(15,935)	[3,824]	{1,912}
Rockland	47,721	47,809	47,869	47,914	48,065	(9,613)	[2,307]	{1,154}	48,243	(9,649)	[2,316]	{1,158}	48,452	(9,690)	[2,326]	{1,163}
Saratoga	15,931	15,966	16,024	16,066	16,185	(3,237)	[777]	{388}	16,323	(3,265)	[784]	{392}	16,487	(3,297)	[791]	{396}
Schenectady	13,474	13,500	13,543	13,567	13,643	(2,729)	[655]	{327}	13,736	(2,747)	[659]	{330}	13,848	(2,770)	[665]	{332}
Suffolk	205,681	205,995	206,402	206,706	207,531	(41,506)	[9,961]	{4,981}	208,476	(41,695)	[10,007]	{5,003}	209,553	(41,911)	[10,059]	{5,029}
Sullivan	6,841	6,857	6,873	6,894	6,942	(1,388)	[333]	{167}	7,001	(1,400)	[336]	{168}	7,074	(1,415)	[340]	{170}
Tompkins	4,495	4,507	4,519	4,533	4,568	(914)	[219]	{110}	4,610	(922)	[221]	{111}	4,659	(932)	[224]	{112}
Ulster	14,229	14,259	14,293	14,316	14,385	(2,877)	[691]	{345}	14,467	(2,893)	[694]	{347}	14,563	(2,913)	[699]	{350}
Westchester	132,179	132,327	132,519	132,653	133,061	(26,612)	[6,387]	{3,193}	133,521	(26,704)	[6,409]	{3,205}	134,035	(26,807)	[6,434]	{3,217}

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.