

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

**Date: 3/8/21**

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 3/8/21 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.**

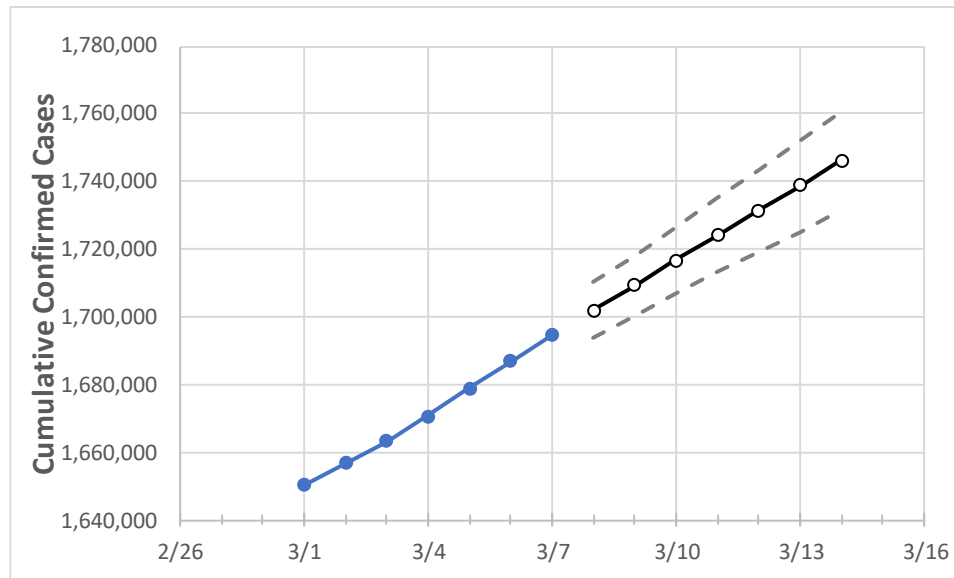
### **IEM's Modeling Lead**

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:							
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	
New York	1,670,716	1,678,867	1,686,993	1,694,651	1,701,986	1,709,367	1,716,647	1,723,967	1,731,446	1,738,818	1,746,320	

*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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Albany	21,030	21,114	21,180	21,239	21,290	21,340	21,390	21,439	21,488	21,537	21,584
Bronx	146,559	147,276	148,210	149,072	149,839	150,595	151,360	152,109	152,871	153,618	154,352
Dutchess	22,678	22,794	22,900	23,006	23,108	23,210	23,311	23,414	23,515	23,617	23,718
Erie	66,059	66,344	66,604	66,818	67,040	67,263	67,481	67,700	67,920	68,133	68,353
Kings	214,366	215,613	216,963	218,245	219,475	220,716	221,942	223,172	224,420	225,678	226,935
Monroe	52,990	53,167	53,274	53,391	53,505	53,617	53,725	53,834	53,946	54,053	54,159
Nassau	150,538	151,327	151,970	152,646	153,285	153,933	154,576	155,224	155,864	156,514	157,150
New York	105,491	106,144	106,864	107,585	108,222	108,861	109,493	110,126	110,761	111,397	112,033
Niagara	15,404	15,462	15,508	15,554	15,588	15,622	15,656	15,688	15,721	15,755	15,787
Onondaga	32,606	32,681	32,733	32,798	32,850	32,901	32,953	33,003	33,055	33,104	33,152
Orange	37,631	37,847	38,029	38,194	38,378	38,563	38,749	38,935	39,125	39,312	39,505
Putnam	8,460	8,503	8,539	8,565	8,596	8,627	8,657	8,688	8,718	8,748	8,778
Queens	214,905	216,033	217,265	218,410	219,516	220,628	221,739	222,851	223,972	225,081	226,194
Rensselaer	9,124	9,160	9,205	9,233	9,262	9,291	9,320	9,348	9,376	9,404	9,433
Richmond	57,895	58,212	58,545	58,910	59,188	59,467	59,748	60,026	60,310	60,593	60,880
Rockland	39,149	39,324	39,546	39,673	39,820	39,970	40,123	40,275	40,424	40,579	40,736
Saratoga	12,095	12,146	12,190	12,245	12,289	12,334	12,379	12,424	12,469	12,515	12,559
Schenectady	10,946	10,978	11,010	11,039	11,065	11,090	11,116	11,142	11,167	11,192	11,216
Suffolk	164,539	165,289	165,879	166,497	167,067	167,626	168,186	168,755	169,318	169,873	170,429
Sullivan	4,822	4,845	4,863	4,891	4,912	4,934	4,955	4,977	5,000	5,022	5,046
Tompkins	3,489	3,500	3,509	3,523	3,531	3,539	3,546	3,554	3,562	3,569	3,576
Ulster	10,206	10,238	10,279	10,331	10,372	10,413	10,454	10,495	10,536	10,577	10,619
Westchester	109,038	109,516	109,951	110,330	110,735	111,142	111,545	111,951	112,357	112,753	113,144

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:											
	3/4	3/5	3/6	3/7	3/9			3/11			3/13					
Albany	21,030	21,114	21,180	21,239	21,340	(4,268)	[1,024]	{512}	21,439	(4,288)	[1,029]	{515}	21,537	(4,307)	[1,034]	{517}
Bronx	146,559	147,276	148,210	149,072	150,595	(30,119)	[7,229]	{3,614}	152,109	(30,422)	[7,301]	{3,651}	153,618	(30,724)	[7,374]	{3,687}
Dutchess	22,678	22,794	22,900	23,006	23,210	(4,642)	[1,114]	{557}	23,414	(4,683)	[1,124]	{562}	23,617	(4,723)	[1,134]	{567}
Erie	66,059	66,344	66,604	66,818	67,263	(13,453)	[3,229]	{1,614}	67,700	(13,540)	[3,250]	{1,625}	68,133	(13,627)	[3,270]	{1,635}
Kings	214,366	215,613	216,963	218,245	220,716	(44,143)	[10,594]	{5,297}	223,172	(44,634)	[10,712]	{5,356}	225,678	(45,136)	[10,833]	{5,416}
Monroe	52,990	53,167	53,274	53,391	53,617	(10,723)	[2,574]	{1,287}	53,834	(10,767)	[2,584]	{1,292}	54,053	(10,811)	[2,595]	{1,297}
Nassau	150,538	151,327	151,970	152,646	153,933	(30,787)	[7,389]	{3,694}	155,224	(31,045)	[7,451]	{3,725}	156,514	(31,303)	[7,513]	{3,756}
New York	105,491	106,144	106,864	107,585	108,861	(21,772)	[5,225]	{2,613}	110,126	(22,025)	[5,286]	{2,643}	111,397	(22,279)	[5,347]	{2,674}
Niagara	15,404	15,462	15,508	15,554	15,622	(3,124)	[750]	{375}	15,688	(3,138)	[753]	{377}	15,755	(3,151)	[756]	{378}
Onondaga	32,606	32,681	32,733	32,798	32,901	(6,580)	[1,579]	{790}	33,003	(6,601)	[1,584]	{792}	33,104	(6,621)	[1,589]	{794}
Orange	37,631	37,847	38,029	38,194	38,563	(7,713)	[1,851]	{926}	38,935	(7,787)	[1,869]	{934}	39,312	(7,862)	[1,887]	{943}
Putnam	8,460	8,503	8,539	8,565	8,627	(1,725)	[414]	{207}	8,688	(1,738)	[417]	{209}	8,748	(1,750)	[420]	{210}
Queens	214,905	216,033	217,265	218,410	220,628	(44,126)	[10,590]	{5,295}	222,851	(44,570)	[10,697]	{5,348}	225,081	(45,016)	[10,804]	{5,402}
Rensselaer	9,124	9,160	9,205	9,233	9,291	(1,858)	[446]	{223}	9,348	(1,870)	[449]	{224}	9,404	(1,881)	[451]	{226}
Richmond	57,895	58,212	58,545	58,910	59,467	(11,893)	[2,854]	{1,427}	60,026	(12,005)	[2,881]	{1,441}	60,593	(12,119)	[2,908]	{1,454}
Rockland	39,149	39,324	39,546	39,673	39,970	(7,994)	[1,919]	{959}	40,275	(8,055)	[1,933]	{967}	40,579	(8,116)	[1,948]	{974}
Saratoga	12,095	12,146	12,190	12,245	12,334	(2,467)	[592]	{296}	12,424	(2,485)	[596]	{298}	12,515	(2,503)	[601]	{300}
Schenectady	10,946	10,978	11,010	11,039	11,090	(2,218)	[532]	{266}	11,142	(2,228)	[535]	{267}	11,192	(2,238)	[537]	{269}
Suffolk	164,539	165,289	165,879	166,497	167,626	(33,525)	[8,046]	{4,023}	168,755	(33,751)	[8,100]	{4,050}	169,873	(33,975)	[8,154]	{4,077}
Sullivan	4,822	4,845	4,863	4,891	4,934	(987)	[237]	{118}	4,977	(995)	[239]	{119}	5,022	(1,004)	[241]	{121}
Tompkins	3,489	3,500	3,509	3,523	3,539	(708)	[170]	{85}	3,554	(711)	[171]	{85}	3,569	(714)	[171]	{86}
Ulster	10,206	10,238	10,279	10,331	10,413	(2,083)	[500]	{250}	10,495	(2,099)	[504]	{252}	10,577	(2,115)	[508]	{254}
Westchester	109,038	109,516	109,951	110,330	111,142	(22,228)	[5,335]	{2,667}	111,951	(22,390)	[5,374]	{2,687}	112,753	(22,551)	[5,412]	{2,706}

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.