

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 1/22/21**

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 1/22/21 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.**

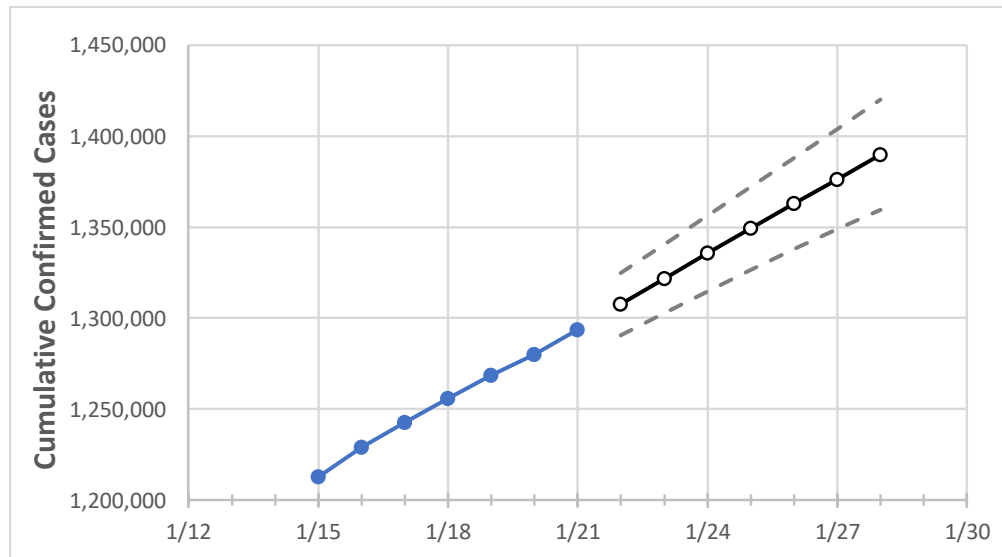
**IEM's Modeling Lead**

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:							
	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	
New York	1,255,971	1,268,692	1,279,811	1,293,719	1,307,788	1,321,858	1,335,691	1,349,359	1,362,973	1,376,334	1,389,685	

*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:						
	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28
Albany	16,168	16,343	16,521	16,788	17,015	17,237	17,458	17,680	17,897	18,113	18,326
Bronx	105,175	106,253	106,955	107,879	109,095	110,315	111,550	112,804	114,043	115,317	116,610
Dutchess	16,541	16,757	16,963	17,182	17,419	17,651	17,885	18,113	18,341	18,568	18,788
Erie	51,718	52,228	52,473	53,064	53,620	54,162	54,716	55,275	55,824	56,367	56,935
Kings	153,838	155,509	156,873	158,534	160,413	162,298	164,197	166,128	168,026	169,957	171,905
Monroe	44,007	44,318	44,631	45,002	45,397	45,779	46,148	46,509	46,858	47,207	47,536
Nassau	113,812	114,969	116,065	117,371	118,627	119,865	121,066	122,261	123,442	124,598	125,742
New York	75,319	75,965	76,546	77,267	78,142	79,018	79,901	80,800	81,706	82,598	83,502
Niagara	11,933	12,143	12,229	12,410	12,576	12,750	12,922	13,098	13,266	13,443	13,610
Onondaga	27,492	27,755	27,948	28,226	28,508	28,775	29,048	29,315	29,578	29,841	30,089
Orange	28,574	28,848	29,078	29,406	29,711	30,016	30,323	30,624	30,929	31,235	31,546
Putnam	6,447	6,521	6,576	6,670	6,754	6,838	6,922	7,006	7,089	7,172	7,255
Queens	156,940	158,683	160,018	161,507	163,301	165,119	166,906	168,697	170,493	172,288	174,074
Rensselaer	6,772	6,874	6,965	7,112	7,241	7,369	7,497	7,626	7,751	7,877	8,002
Richmond	44,737	45,156	45,516	45,939	46,416	46,889	47,350	47,809	48,262	48,712	49,157
Rockland	31,668	31,884	32,137	32,407	32,647	32,889	33,132	33,380	33,622	33,866	34,109
Saratoga	9,140	9,267	9,375	9,527	9,673	9,815	9,958	10,094	10,227	10,359	10,488
Schenectady	8,587	8,660	8,770	8,869	8,988	9,106	9,221	9,335	9,447	9,557	9,662
Suffolk	127,287	128,580	129,804	131,309	132,815	134,320	135,792	137,233	138,658	140,048	141,440
Sullivan	3,798	3,841	3,887	3,923	3,963	4,003	4,044	4,084	4,125	4,166	4,207
Tompkins	2,641	2,657	2,707	2,752	2,789	2,827	2,866	2,904	2,944	2,984	3,026
Ulster	7,642	7,745	7,822	7,901	8,007	8,115	8,223	8,333	8,439	8,548	8,657
Westchester	84,420	85,020	85,723	86,646	87,480	88,309	89,144	89,982	90,819	91,664	92,510

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:											
	1/18	1/19	1/20	1/21	1/23				1/25				1/27			
Albany	16,168	16,343	16,521	16,788	17,237	(3,447)	[827]	{414}	17,680	(3,536)	[849]	{424}	18,113	(3,623)	[869]	{435}
Bronx	105,175	106,253	106,955	107,879	110,315	(22,063)	[5,295]	{2,648}	112,804	(22,561)	[5,415]	{2,707}	115,317	(23,063)	[5,535]	{2,768}
Dutchess	16,541	16,757	16,963	17,182	17,651	(3,530)	[847]	{424}	18,113	(3,623)	[869]	{435}	18,568	(3,714)	[891]	{446}
Erie	51,718	52,228	52,473	53,064	54,162	(10,832)	[2,600]	{1,300}	55,275	(11,055)	[2,653]	{1,327}	56,367	(11,273)	[2,706]	{1,353}
Kings	153,838	155,509	156,873	158,534	162,298	(32,460)	[7,790]	{3,895}	166,128	(33,226)	[7,974]	{3,987}	169,957	(33,991)	[8,158]	{4,079}
Monroe	44,007	44,318	44,631	45,002	45,779	(9,156)	[2,197]	{1,099}	46,509	(9,302)	[2,232]	{1,116}	47,207	(9,441)	[2,266]	{1,133}
Nassau	113,812	114,969	116,065	117,371	119,865	(23,973)	[5,754]	{2,877}	122,261	(24,452)	[5,869]	{2,934}	124,598	(24,920)	[5,981]	{2,990}
New York	75,319	75,965	76,546	77,267	79,018	(15,804)	[3,793]	{1,896}	80,800	(16,160)	[3,878]	{1,939}	82,598	(16,520)	[3,965]	{1,982}
Niagara	11,933	12,143	12,229	12,410	12,750	(2,550)	[612]	{306}	13,098	(2,620)	[629]	{314}	13,443	(2,689)	[645]	{323}
Onondaga	27,492	27,755	27,948	28,226	28,775	(5,755)	[1,381]	{691}	29,315	(5,863)	[1,407]	{704}	29,841	(5,968)	[1,432]	{716}
Orange	28,574	28,848	29,078	29,406	30,016	(6,003)	[1,441]	{720}	30,624	(6,125)	[1,470]	{735}	31,235	(6,247)	[1,499]	{750}
Putnam	6,447	6,521	6,576	6,670	6,838	(1,368)	[328]	{164}	7,006	(1,401)	[336]	{168}	7,172	(1,434)	[344]	{172}
Queens	156,940	158,683	160,018	161,507	165,119	(33,024)	[7,926]	{3,963}	168,697	(33,739)	[8,097]	{4,049}	172,288	(34,458)	[8,270]	{4,135}
Rensselaer	6,772	6,874	6,965	7,112	7,369	(1,474)	[354]	{177}	7,626	(1,525)	[366]	{183}	7,877	(1,575)	[378]	{189}
Richmond	44,737	45,156	45,516	45,939	46,889	(9,378)	[2,251]	{1,125}	47,809	(9,562)	[2,295]	{1,147}	48,712	(9,742)	[2,338]	{1,169}
Rockland	31,668	31,884	32,137	32,407	32,889	(6,578)	[1,579]	{789}	33,380	(6,676)	[1,602]	{801}	33,866	(6,773)	[1,626]	{813}
Saratoga	9,140	9,267	9,375	9,527	9,815	(1,963)	[471]	{236}	10,094	(2,019)	[485]	{242}	10,359	(2,072)	[497]	{249}
Schenectady	8,587	8,660	8,770	8,869	9,106	(1,821)	[437]	{219}	9,335	(1,867)	[448]	{224}	9,557	(1,911)	[459]	{229}
Suffolk	127,287	128,580	129,804	131,309	134,320	(26,864)	[6,447]	{3,224}	137,233	(27,447)	[6,587]	{3,294}	140,048	(28,010)	[6,722]	{3,361}
Sullivan	3,798	3,841	3,887	3,923	4,003	(801)	[192]	{96}	4,084	(817)	[196]	{98}	4,166	(833)	[200]	{100}
Tompkins	2,641	2,657	2,707	2,752	2,827	(565)	[136]	{68}	2,904	(581)	[139]	{70}	2,984	(597)	[143]	{72}
Ulster	7,642	7,745	7,822	7,901	8,115	(1,623)	[390]	{195}	8,333	(1,667)	[400]	{200}	8,548	(1,710)	[410]	{205}
Westchester	84,420	85,020	85,723	86,646	88,309	(17,662)	[4,239]	{2,119}	89,982	(17,996)	[4,319]	{2,160}	91,664	(18,333)	[4,400]	{2,200}

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.