

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 1/26/21**

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 1/26/21 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.**

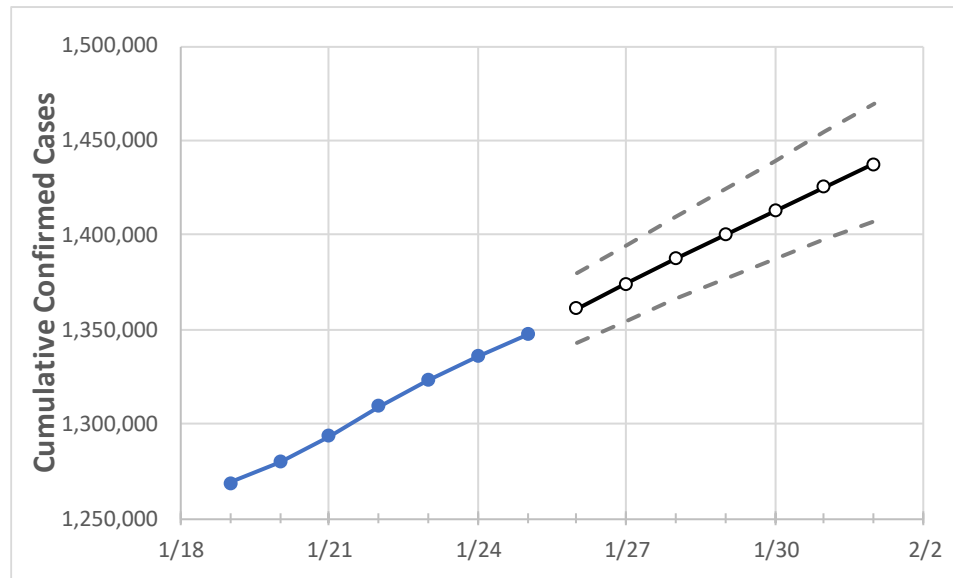
**IEM's Modeling Lead**

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:					
	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	
New York	1,309,403	1,323,312	1,335,695	1,347,667	1,361,026	1,374,258	1,387,349	1,400,224	1,412,859	1,425,587	1,437,826	

*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:						
	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1
Albany	17,045	17,287	17,485	17,620	17,830	18,036	18,236	18,432	18,628	18,821	19,011
Bronx	109,290	110,594	111,672	112,912	114,151	115,416	116,677	117,967	119,258	120,561	121,889
Dutchess	17,424	17,623	17,813	18,004	18,214	18,420	18,622	18,821	19,016	19,209	19,396
Erie	53,605	54,097	54,502	54,873	55,356	55,831	56,298	56,762	57,228	57,686	58,128
Kings	160,572	162,202	163,707	165,264	167,062	168,860	170,665	172,520	174,365	176,214	178,039
Monroe	45,400	45,706	46,064	46,265	46,564	46,850	47,124	47,386	47,640	47,881	48,113
Nassau	118,735	119,933	121,002	122,200	123,393	124,569	125,724	126,858	127,970	129,063	130,149
New York	78,198	79,105	79,916	80,797	81,666	82,541	83,426	84,313	85,213	86,122	87,035
Niagara	12,602	12,718	12,843	12,933	13,073	13,212	13,347	13,483	13,616	13,748	13,874
Onondaga	28,476	28,797	29,039	29,147	29,384	29,614	29,845	30,067	30,285	30,494	30,705
Orange	29,753	30,012	30,288	30,545	30,831	31,122	31,411	31,702	31,995	32,286	32,570
Putnam	6,748	6,824	6,927	7,004	7,086	7,168	7,250	7,333	7,415	7,494	7,577
Queens	163,464	165,178	166,808	168,404	170,172	171,918	173,682	175,458	177,210	178,971	180,739
Rensselaer	7,262	7,349	7,450	7,502	7,611	7,716	7,821	7,925	8,027	8,127	8,228
Richmond	46,442	46,861	47,253	47,641	48,064	48,486	48,901	49,316	49,718	50,118	50,508
Rockland	32,660	32,948	33,124	33,327	33,561	33,796	34,031	34,266	34,501	34,731	34,960
Saratoga	9,689	9,842	9,951	10,020	10,146	10,268	10,387	10,505	10,618	10,725	10,831
Schenectady	9,021	9,131	9,231	9,299	9,413	9,524	9,629	9,735	9,838	9,940	10,038
Suffolk	132,748	134,057	135,174	136,593	137,908	139,205	140,470	141,724	142,935	144,127	145,274
Sullivan	3,954	3,994	4,015	4,038	4,072	4,106	4,139	4,172	4,204	4,237	4,270
Tompkins	2,779	2,811	2,831	2,845	2,877	2,907	2,938	2,970	3,001	3,031	3,062
Ulster	8,017	8,129	8,227	8,301	8,398	8,492	8,588	8,685	8,780	8,873	8,969
Westchester	87,570	88,404	89,225	90,029	90,869	91,714	92,567	93,425	94,282	95,125	95,992

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:											
	1/22	1/23	1/24	1/25	1/27				1/29				1/31			
Albany	17,045	17,287	17,485	17,620	18,036	(3,607)	[866]	{433}	18,432	(3,686)	[885]	{442}	18,821	(3,764)	[903]	{452}
Bronx	109,290	110,594	111,672	112,912	115,416	(23,083)	[5,540]	{2,770}	117,967	(23,593)	[5,662]	{2,831}	120,561	(24,112)	[5,787]	{2,893}
Dutchess	17,424	17,623	17,813	18,004	18,420	(3,684)	[884]	{442}	18,821	(3,764)	[903]	{452}	19,209	(3,842)	[922]	{461}
Erie	53,605	54,097	54,502	54,873	55,831	(11,166)	[2,680]	{1,340}	56,762	(11,352)	[2,725]	{1,362}	57,686	(11,537)	[2,769]	{1,384}
Kings	160,572	162,202	163,707	165,264	168,860	(33,772)	[8,105]	{4,053}	172,520	(34,504)	[8,281]	{4,140}	176,214	(35,243)	[8,458]	{4,229}
Monroe	45,400	45,706	46,064	46,265	46,850	(9,370)	[2,249]	{1,124}	47,386	(9,477)	[2,275]	{1,137}	47,881	(9,576)	[2,298]	{1,149}
Nassau	118,735	119,933	121,002	122,200	124,569	(24,914)	[5,979]	{2,990}	126,858	(25,372)	[6,089]	{3,045}	129,063	(25,813)	[6,195]	{3,098}
New York	78,198	79,105	79,916	80,797	82,541	(16,508)	[3,962]	{1,981}	84,313	(16,863)	[4,047]	{2,024}	86,122	(17,224)	[4,134]	{2,067}
Niagara	12,602	12,718	12,843	12,933	13,212	(2,642)	[634]	{317}	13,483	(2,697)	[647]	{324}	13,748	(2,750)	[660]	{330}
Onondaga	28,476	28,797	29,039	29,147	29,614	(5,923)	[1,421]	{711}	30,067	(6,013)	[1,443]	{722}	30,494	(6,099)	[1,464]	{732}
Orange	29,753	30,012	30,288	30,545	31,122	(6,224)	[1,494]	{747}	31,702	(6,340)	[1,522]	{761}	32,286	(6,457)	[1,550]	{775}
Putnam	6,748	6,824	6,927	7,004	7,168	(1,434)	[344]	{172}	7,333	(1,467)	[352]	{176}	7,494	(1,499)	[360]	{180}
Queens	163,464	165,178	166,808	168,404	171,918	(34,384)	[8,252]	{4,126}	175,458	(35,092)	[8,422]	{4,211}	178,971	(35,794)	[8,591]	{4,295}
Rensselaer	7,262	7,349	7,450	7,502	7,716	(1,543)	[370]	{185}	7,925	(1,585)	[380]	{190}	8,127	(1,625)	[390]	{195}
Richmond	46,442	46,861	47,253	47,641	48,486	(9,697)	[2,327]	{1,164}	49,316	(9,863)	[2,367]	{1,184}	50,118	(10,024)	[2,406]	{1,203}
Rockland	32,660	32,948	33,124	33,327	33,796	(6,759)	[1,622]	{811}	34,266	(6,853)	[1,645]	{822}	34,731	(6,946)	[1,667]	{834}
Saratoga	9,689	9,842	9,951	10,020	10,268	(2,054)	[493]	{246}	10,505	(2,101)	[504]	{252}	10,725	(2,145)	[515]	{257}
Schenectady	9,021	9,131	9,231	9,299	9,524	(1,905)	[457]	{229}	9,735	(1,947)	[467]	{234}	9,940	(1,988)	[477]	{239}
Suffolk	132,748	134,057	135,174	136,593	139,205	(27,841)	[6,682]	{3,341}	141,724	(28,345)	[6,803]	{3,401}	144,127	(28,825)	[6,918]	{3,459}
Sullivan	3,954	3,994	4,015	4,038	4,106	(821)	[197]	{99}	4,172	(834)	[200]	{100}	4,237	(847)	[203]	{102}
Tompkins	2,779	2,811	2,831	2,845	2,907	(581)	[140]	{70}	2,970	(594)	[143]	{71}	3,031	(606)	[146]	{73}
Ulster	8,017	8,129	8,227	8,301	8,492	(1,698)	[408]	{204}	8,685	(1,737)	[417]	{208}	8,873	(1,775)	[426]	{213}
Westchester	87,570	88,404	89,225	90,029	91,714	(18,343)	[4,402]	{2,201}	93,425	(18,685)	[4,484]	{2,242}	95,125	(19,025)	[4,566]	{2,283}

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.