

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

**Date: 11/20/20**

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 11/20/20 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.**

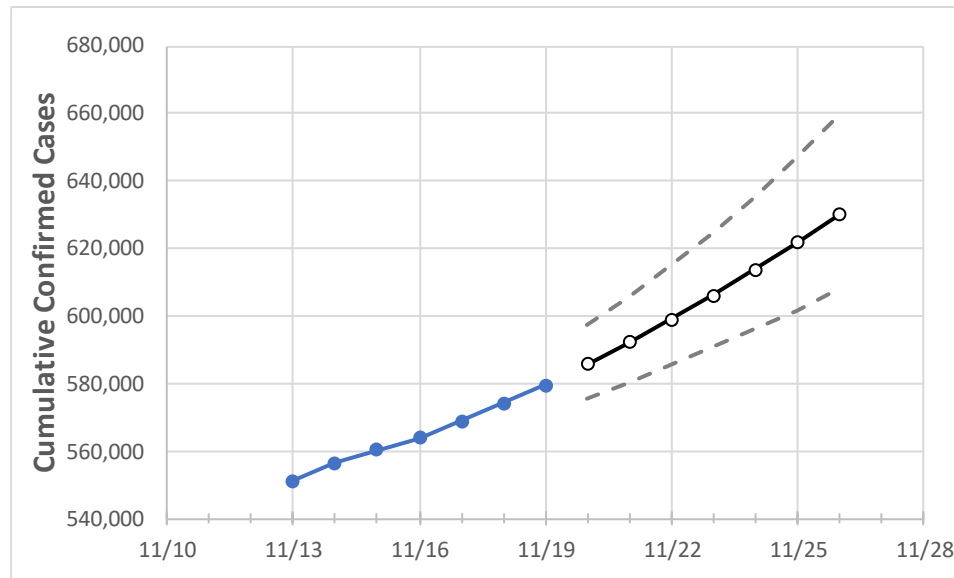
### **IEM's Modeling Lead**

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:					
	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26
New York	563,690	568,778	574,072	579,382	585,582	592,103	598,961	606,176	613,764	621,746	630,140

*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 20%, and are often within 10%, of actual confirmed cases.*

## New York Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26
Albany	4,572	4,653	4,730	4,822	4,902	4,987	5,075	5,168	5,266	5,368	5,476
Bronx	58,905	59,265	59,548	59,856	60,191	60,542	60,910	61,296	61,701	62,125	62,570
Dutchess	6,224	6,308	6,386	6,439	6,527	6,622	6,724	6,834	6,951	7,077	7,213
Erie	18,018	18,410	18,983	19,473	20,090	20,755	21,470	22,240	23,069	23,961	24,922
Kings	81,686	82,090	82,543	83,083	83,585	84,102	84,634	85,183	85,748	86,330	86,929
Monroe	10,680	10,891	11,148	11,444	11,759	12,091	12,439	12,806	13,192	13,597	14,023
Nassau	54,309	54,715	55,112	55,486	55,976	56,495	57,045	57,628	58,247	58,903	59,598
New York	40,226	40,587	40,908	41,263	41,683	42,127	42,596	43,092	43,617	44,171	44,758
Niagara	2,753	2,798	2,869	2,934	3,008	3,087	3,171	3,260	3,356	3,457	3,566
Onondaga	7,892	8,084	8,301	8,494	8,735	8,990	9,260	9,546	9,849	10,171	10,511
Orange	15,182	15,283	15,412	15,566	15,694	15,827	15,965	16,108	16,257	16,411	16,571
Putnam	2,186	2,243	2,269	2,306	2,354	2,407	2,463	2,525	2,592	2,664	2,743
Queens	82,775	83,311	83,809	84,269	84,876	85,517	86,193	86,906	87,658	88,452	89,288
Rensselaer	1,333	1,364	1,389	1,411	1,440	1,470	1,503	1,538	1,576	1,617	1,661
Richmond	19,749	20,022	20,214	20,398	20,626	20,864	21,113	21,373	21,645	21,928	22,225
Rockland	19,904	20,044	20,176	20,263	20,392	20,523	20,658	20,795	20,936	21,079	21,226
Saratoga	1,694	1,741	1,769	1,804	1,830	1,858	1,886	1,916	1,946	1,977	2,010
Schenectady	1,890	1,920	1,950	1,983	2,015	2,049	2,085	2,124	2,164	2,207	2,252
Suffolk	53,653	54,055	54,485	54,916	55,530	56,196	56,916	57,696	58,540	59,455	60,445
Sullivan	1,981	1,993	2,008	2,031	2,041	2,050	2,060	2,070	2,080	2,090	2,100
Tompkins	811	820	828	840	852	864	876	890	903	917	932
Ulster	2,800	2,835	2,865	2,937	2,979	3,024	3,074	3,128	3,187	3,251	3,322
Westchester	44,576	44,975	45,335	45,672	46,120	46,596	47,100	47,636	48,205	48,808	49,448

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:											
	11/16	11/17	11/18	11/19	11/21				11/23				11/25			
Albany	4,572	4,653	4,730	4,822	4,987	(997)	[239]	{120}	5,168	(1,034)	[248]	{124}	5,368	(1,074)	[258]	{129}
Bronx	58,905	59,265	59,548	59,856	60,542	(12,108)	[2,906]	{1,453}	61,296	(12,259)	[2,942]	{1,471}	62,125	(12,425)	[2,982]	{1,491}
Dutchess	6,224	6,308	6,386	6,439	6,622	(1,324)	[318]	{159}	6,834	(1,367)	[328]	{164}	7,077	(1,415)	[340]	{170}
Erie	18,018	18,410	18,983	19,473	20,755	(4,151)	[996]	{498}	22,240	(4,448)	[1,068]	{534}	23,961	(4,792)	[1,150]	{575}
Kings	81,686	82,090	82,543	83,083	84,102	(16,820)	[4,037]	{2,018}	85,183	(17,037)	[4,089]	{2,044}	86,330	(17,266)	[4,144]	{2,072}
Monroe	10,680	10,891	11,148	11,444	12,091	(2,418)	[580]	{290}	12,806	(2,561)	[615]	{307}	13,597	(2,719)	[653]	{326}
Nassau	54,309	54,715	55,112	55,486	56,495	(11,299)	[2,712]	{1,356}	57,628	(11,526)	[2,766]	{1,383}	58,903	(11,781)	[2,827]	{1,414}
New York	40,226	40,587	40,908	41,263	42,127	(8,425)	[2,022]	{1,011}	43,092	(8,618)	[2,068]	{1,034}	44,171	(8,834)	[2,120]	{1,060}
Niagara	2,753	2,798	2,869	2,934	3,087	(617)	[148]	{74}	3,260	(652)	[156]	{78}	3,457	(691)	[166]	{83}
Onondaga	7,892	8,084	8,301	8,494	8,990	(1,798)	[431]	{216}	9,546	(1,909)	[458]	{229}	10,171	(2,034)	[488]	{244}
Orange	15,182	15,283	15,412	15,566	15,827	(3,165)	[760]	{380}	16,108	(3,222)	[773]	{387}	16,411	(3,282)	[788]	{394}
Putnam	2,186	2,243	2,269	2,306	2,407	(481)	[116]	{58}	2,525	(505)	[121]	{61}	2,664	(533)	[128]	{64}
Queens	82,775	83,311	83,809	84,269	85,517	(17,103)	[4,105]	{2,052}	86,906	(17,381)	[4,171]	{2,086}	88,452	(17,690)	[4,246]	{2,123}
Rensselaer	1,333	1,364	1,389	1,411	1,470	(294)	[71]	{35}	1,538	(308)	[74]	{37}	1,617	(323)	[78]	{39}
Richmond	19,749	20,022	20,214	20,398	20,864	(4,173)	[1,001]	{501}	21,373	(4,275)	[1,026]	{513}	21,928	(4,386)	[1,053]	{526}
Rockland	19,904	20,044	20,176	20,263	20,523	(4,105)	[985]	{493}	20,795	(4,159)	[998]	{499}	21,079	(4,216)	[1,012]	{506}
Saratoga	1,694	1,741	1,769	1,804	1,858	(372)	[89]	{45}	1,916	(383)	[92]	{46}	1,977	(395)	[95]	{47}
Schenectady	1,890	1,920	1,950	1,983	2,049	(410)	[98]	{49}	2,124	(425)	[102]	{51}	2,207	(441)	[106]	{53}
Suffolk	53,653	54,055	54,485	54,916	56,196	(11,239)	[2,697]	{1,349}	57,696	(11,539)	[2,769]	{1,385}	59,455	(11,891)	[2,854]	{1,427}
Sullivan	1,981	1,993	2,008	2,031	2,050	(410)	[98]	{49}	2,070	(414)	[99]	{50}	2,090	(418)	[100]	{50}
Tompkins	811	820	828	840	864	(173)	[41]	{21}	890	(178)	[43]	{21}	917	(183)	[44]	{22}
Ulster	2,800	2,835	2,865	2,937	3,024	(605)	[145]	{73}	3,128	(626)	[150]	{75}	3,251	(650)	[156]	{78}
Westchester	44,576	44,975	45,335	45,672	46,596	(9,319)	[2,237]	{1,118}	47,636	(9,527)	[2,287]	{1,143}	48,808	(9,762)	[2,343]	{1,171}

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.