

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/29/21**

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 9/29/21 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.

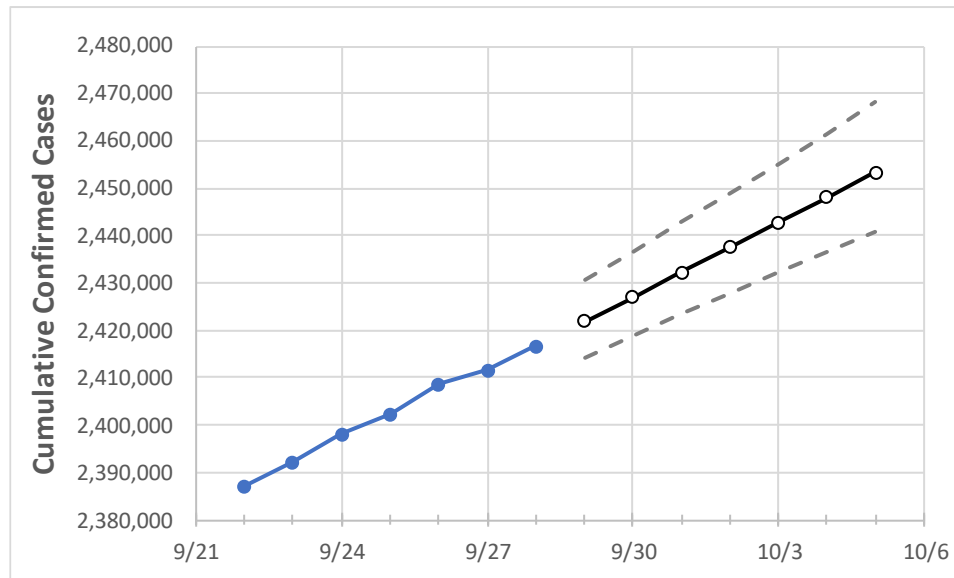
IEM's Modeling Lead

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:						
	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5
New York	2,402,248	2,408,593	2,411,626	2,416,683	2,421,972	2,427,060	2,432,260	2,437,508	2,442,709	2,448,033	2,453,418

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:						
	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5
Albany	28,708	28,778	28,836	28,933	29,017	29,100	29,186	29,271	29,358	29,447	29,535
Bronx	202,703	202,997	203,164	203,330	203,559	203,791	204,017	204,245	204,469	204,693	204,915
Dutchess	33,960	34,029	34,073	34,139	34,200	34,259	34,319	34,378	34,436	34,494	34,550
Erie	99,889	100,094	100,356	100,521	100,767	101,022	101,268	101,521	101,779	102,038	102,282
Kings	320,264	320,936	321,402	321,867	322,475	323,088	323,691	324,299	324,921	325,557	326,170
Monroe	78,767	78,943	79,131	79,289	79,497	79,704	79,920	80,128	80,347	80,565	80,783
Nassau	207,815	208,087	208,290	208,596	208,925	209,244	209,567	209,889	210,209	210,520	210,847
New York	162,548	162,810	163,017	163,268	163,573	163,865	164,162	164,457	164,742	165,044	165,338
Niagara	22,357	22,399	22,456	22,504	22,568	22,634	22,700	22,766	22,835	22,905	22,977
Onondaga	46,538	46,663	46,939	47,082	47,288	47,485	47,690	47,890	48,110	48,320	48,531
Orange	54,852	54,975	55,053	55,130	55,229	55,327	55,423	55,519	55,616	55,712	55,809
Putnam	11,928	11,941	11,955	11,973	11,999	12,025	12,052	12,079	12,106	12,134	12,162
Queens	306,937	307,389	307,705	308,020	308,435	308,850	309,266	309,681	310,102	310,530	310,948
Rensselaer	13,483	13,522	13,565	13,604	13,656	13,706	13,758	13,809	13,863	13,916	13,969
Richmond	86,125	86,271	86,365	86,458	86,585	86,712	86,837	86,962	87,087	87,212	87,334
Rockland	51,090	51,151	51,271	51,342	51,435	51,528	51,620	51,713	51,810	51,907	52,004
Saratoga	18,595	18,656	18,703	18,764	18,815	18,865	18,918	18,968	19,022	19,073	19,124
Schenectady	15,434	15,473	15,512	15,558	15,605	15,652	15,701	15,748	15,797	15,848	15,898
Suffolk	229,286	229,695	229,990	230,459	230,932	231,392	231,863	232,334	232,806	233,274	233,750
Sullivan	7,879	7,897	7,922	7,936	7,957	7,978	7,998	8,019	8,040	8,060	8,081
Tompkins	6,024	6,071	6,079	6,097	6,123	6,148	6,171	6,198	6,221	6,245	6,270
Ulster	16,449	16,501	16,522	16,546	16,580	16,612	16,645	16,676	16,708	16,740	16,770
Westchester	141,220	141,335	141,416	141,532	141,657	141,780	141,900	142,017	142,135	142,251	142,364

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:											
	9/25	9/26	9/27	9/28	9/30			10/2			10/4					
Albany	28,708	28,778	28,836	28,933	29,100	(5,820)	[1,397]	{698}	29,271	(5,854)	[1,405]	{702}	29,447	(5,889)	[1,413]	{707}
Bronx	202,703	202,997	203,164	203,330	203,791	(40,758)	[9,782]	{4,891}	204,245	(40,849)	[9,804]	{4,902}	204,693	(40,939)	[9,825]	{4,913}
Dutchess	33,960	34,029	34,073	34,139	34,259	(6,852)	[1,644]	{822}	34,378	(6,876)	[1,650]	{825}	34,494	(6,899)	[1,656]	{828}
Erie	99,889	100,094	100,356	100,521	101,022	(20,204)	[4,849]	{2,425}	101,521	(20,304)	[4,873]	{2,436}	102,038	(20,408)	[4,898]	{2,449}
Kings	320,264	320,936	321,402	321,867	323,088	(64,618)	[15,508]	{7,754}	324,299	(64,860)	[15,566]	{7,783}	325,557	(65,111)	[15,627]	{7,813}
Monroe	78,767	78,943	79,131	79,289	79,704	(15,941)	[3,826]	{1,913}	80,128	(16,026)	[3,846]	{1,923}	80,565	(16,113)	[3,867]	{1,934}
Nassau	207,815	208,087	208,290	208,596	209,244	(41,849)	[10,044]	{5,022}	209,889	(41,978)	[10,075]	{5,037}	210,520	(42,104)	[10,105]	{5,052}
New York	162,548	162,810	163,017	163,268	163,865	(32,773)	[7,866]	{3,933}	164,457	(32,891)	[7,894]	{3,947}	165,044	(33,009)	[7,922]	{3,961}
Niagara	22,357	22,399	22,456	22,504	22,634	(4,527)	[1,086]	{543}	22,766	(4,553)	[1,093]	{546}	22,905	(4,581)	[1,099]	{550}
Onondaga	46,538	46,663	46,939	47,082	47,485	(9,497)	[2,279]	{1,140}	47,890	(9,578)	[2,299]	{1,149}	48,320	(9,664)	[2,319]	{1,160}
Orange	54,852	54,975	55,053	55,130	55,327	(11,065)	[2,656]	{1,328}	55,519	(11,104)	[2,665]	{1,332}	55,712	(11,142)	[2,674]	{1,337}
Putnam	11,928	11,941	11,955	11,973	12,025	(2,405)	[577]	{289}	12,079	(2,416)	[580]	{290}	12,134	(2,427)	[582]	{291}
Queens	306,937	307,389	307,705	308,020	308,850	(61,770)	[14,825]	{7,412}	309,681	(61,936)	[14,865]	{7,432}	310,530	(62,106)	[14,905]	{7,453}
Rensselaer	13,483	13,522	13,565	13,604	13,706	(2,741)	[658]	{329}	13,809	(2,762)	[663]	{331}	13,916	(2,783)	[668]	{334}
Richmond	86,125	86,271	86,365	86,458	86,712	(17,342)	[4,162]	{2,081}	86,962	(17,392)	[4,174]	{2,087}	87,212	(17,442)	[4,186]	{2,093}
Rockland	51,090	51,151	51,271	51,342	51,528	(10,306)	[2,473]	{1,237}	51,713	(10,343)	[2,482]	{1,241}	51,907	(10,381)	[2,492]	{1,246}
Saratoga	18,595	18,656	18,703	18,764	18,865	(3,773)	[905]	{453}	18,968	(3,794)	[910]	{455}	19,073	(3,815)	[916]	{458}
Schenectady	15,434	15,473	15,512	15,558	15,652	(3,130)	[751]	{376}	15,748	(3,150)	[756]	{378}	15,848	(3,170)	[761]	{380}
Suffolk	229,286	229,695	229,990	230,459	231,392	(46,278)	[11,107]	{5,553}	232,334	(46,467)	[11,152]	{5,576}	233,274	(46,655)	[11,197]	{5,599}
Sullivan	7,879	7,897	7,922	7,936	7,978	(1,596)	[383]	{191}	8,019	(1,604)	[385]	{192}	8,060	(1,612)	[387]	{193}
Tompkins	6,024	6,071	6,079	6,097	6,148	(1,230)	[295]	{148}	6,198	(1,240)	[297]	{149}	6,245	(1,249)	[300]	{150}
Ulster	16,449	16,501	16,522	16,546	16,612	(3,322)	[797]	{399}	16,676	(3,335)	[800]	{400}	16,740	(3,348)	[803]	{402}
Westchester	141,220	141,335	141,416	141,532	141,780	(28,356)	[6,805]	{3,403}	142,017	(28,403)	[6,817]	{3,408}	142,251	(28,450)	[6,828]	{3,414}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.