

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/6/21**

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 10/6/21 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.

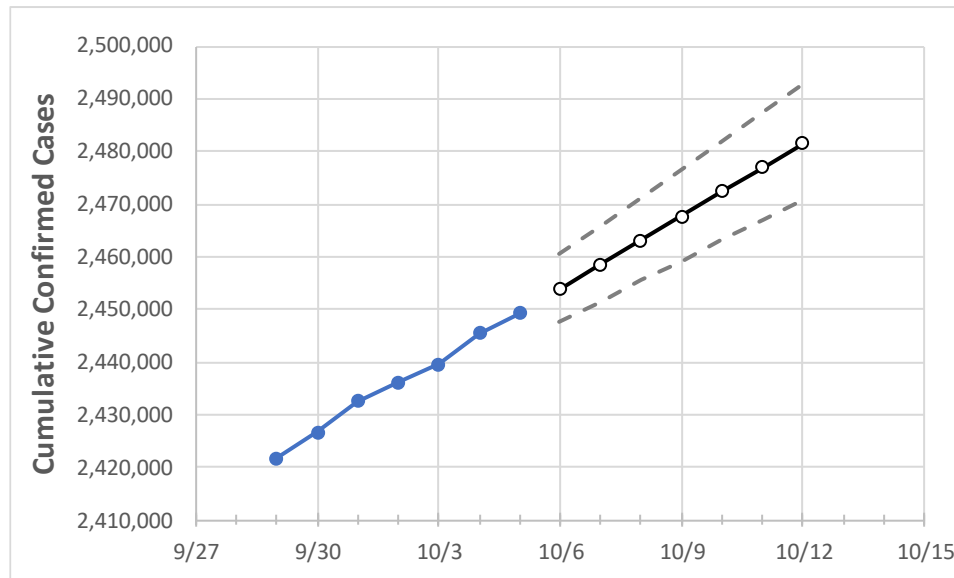
IEM's Modeling Lead

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:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
New York	2,436,048	2,439,639	2,445,371	2,449,261	2,453,815	2,458,464	2,463,071	2,467,684	2,472,346	2,476,936	2,481,550

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:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
Albany	29,269	29,378	29,409	29,475	29,558	29,640	29,721	29,802	29,886	29,972	30,056
Bronx	204,268	204,461	204,654	204,787	204,995	205,200	205,404	205,605	205,813	206,011	206,205
Dutchess	34,456	34,519	34,557	34,591	34,650	34,710	34,768	34,825	34,884	34,941	34,999
Erie	101,506	101,835	101,993	102,188	102,430	102,678	102,922	103,177	103,428	103,678	103,929
Kings	324,050	324,634	325,219	325,693	326,223	326,757	327,288	327,820	328,346	328,875	329,399
Monroe	80,252	80,439	80,574	80,758	80,970	81,181	81,398	81,616	81,833	82,055	82,274
Nassau	209,782	209,987	210,154	210,362	210,593	210,827	211,048	211,276	211,499	211,712	211,926
New York	164,312	164,507	164,720	164,924	165,142	165,355	165,565	165,769	165,976	166,179	166,377
Niagara	22,796	22,876	22,914	22,968	23,038	23,105	23,175	23,246	23,317	23,390	23,463
Onondaga	48,123	48,409	48,488	48,651	48,890	49,139	49,385	49,634	49,887	50,146	50,418
Orange	55,569	55,659	55,729	55,828	55,926	56,025	56,119	56,217	56,314	56,412	56,509
Putnam	12,070	12,090	12,103	12,119	12,139	12,158	12,177	12,196	12,215	12,233	12,252
Queens	309,502	309,849	310,196	310,473	310,813	311,150	311,482	311,814	312,142	312,465	312,791
Rensselaer	13,823	13,879	13,903	13,946	13,994	14,043	14,092	14,141	14,192	14,241	14,292
Richmond	86,933	87,037	87,142	87,221	87,324	87,425	87,522	87,620	87,716	87,811	87,904
Rockland	51,646	51,729	51,780	51,883	51,963	52,037	52,115	52,190	52,268	52,345	52,422
Saratoga	19,070	19,114	19,165	19,214	19,280	19,347	19,417	19,485	19,557	19,628	19,701
Schenectady	15,738	15,782	15,794	15,826	15,868	15,908	15,950	15,990	16,031	16,073	16,117
Suffolk	232,356	232,788	233,008	233,362	233,761	234,167	234,551	234,946	235,332	235,719	236,109
Sullivan	8,034	8,050	8,065	8,083	8,104	8,125	8,146	8,166	8,187	8,208	8,230
Tompkins	6,169	6,197	6,202	6,223	6,241	6,259	6,278	6,295	6,312	6,329	6,346
Ulster	16,713	16,737	16,753	16,782	16,813	16,844	16,874	16,904	16,932	16,962	16,991
Westchester	141,942	142,030	142,111	142,200	142,288	142,375	142,457	142,539	142,618	142,696	142,772

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:											
	10/2	10/3	10/4	10/5	10/7				10/9				10/11			
Albany	29,269	29,378	29,409	29,475	29,640	(5,928)	[1,423]	{711}	29,802	(5,960)	[1,430]	{715}	29,972	(5,994)	[1,439]	{719}
Bronx	204,268	204,461	204,654	204,787	205,200	(41,040)	[9,850]	{4,925}	205,605	(41,121)	[9,869]	{4,935}	206,011	(41,202)	[9,889]	{4,944}
Dutchess	34,456	34,519	34,557	34,591	34,710	(6,942)	[1,666]	{833}	34,825	(6,965)	[1,672]	{836}	34,941	(6,988)	[1,677]	{839}
Erie	101,506	101,835	101,993	102,188	102,678	(20,536)	[4,929]	{2,464}	103,177	(20,635)	[4,953]	{2,476}	103,678	(20,736)	[4,977]	{2,488}
Kings	324,050	324,634	325,219	325,693	326,757	(65,351)	[15,684]	{7,842}	327,820	(65,564)	[15,735]	{7,868}	328,875	(65,775)	[15,786]	{7,893}
Monroe	80,252	80,439	80,574	80,758	81,181	(16,236)	[3,897]	{1,948}	81,616	(16,323)	[3,918]	{1,959}	82,055	(16,411)	[3,939]	{1,969}
Nassau	209,782	209,987	210,154	210,362	210,827	(42,165)	[10,120]	{5,060}	211,276	(42,255)	[10,141]	{5,071}	211,712	(42,342)	[10,162]	{5,081}
New York	164,312	164,507	164,720	164,924	165,355	(33,071)	[7,937]	{3,969}	165,769	(33,154)	[7,957]	{3,978}	166,179	(33,236)	[7,977]	{3,988}
Niagara	22,796	22,876	22,914	22,968	23,105	(4,621)	[1,109]	{555}	23,246	(4,649)	[1,116]	{558}	23,390	(4,678)	[1,123]	{561}
Onondaga	48,123	48,409	48,488	48,651	49,139	(9,828)	[2,359]	{1,179}	49,634	(9,927)	[2,382]	{1,191}	50,146	(10,029)	[2,407]	{1,204}
Orange	55,569	55,659	55,729	55,828	56,025	(11,205)	[2,689]	{1,345}	56,217	(11,243)	[2,698]	{1,349}	56,412	(11,282)	[2,708]	{1,354}
Putnam	12,070	12,090	12,103	12,119	12,158	(2,432)	[584]	{292}	12,196	(2,439)	[585]	{293}	12,233	(2,447)	[587]	{294}
Queens	309,502	309,849	310,196	310,473	311,150	(62,230)	[14,935]	{7,468}	311,814	(62,363)	[14,967]	{7,484}	312,465	(62,493)	[14,998]	{7,499}
Rensselaer	13,823	13,879	13,903	13,946	14,043	(2,809)	[674]	{337}	14,141	(2,828)	[679]	{339}	14,241	(2,848)	[684]	{342}
Richmond	86,933	87,037	87,142	87,221	87,425	(17,485)	[4,196]	{2,098}	87,620	(17,524)	[4,206]	{2,103}	87,811	(17,562)	[4,215]	{2,107}
Rockland	51,646	51,729	51,780	51,883	52,037	(10,407)	[2,498]	{1,249}	52,190	(10,438)	[2,505]	{1,253}	52,345	(10,469)	[2,513]	{1,256}
Saratoga	19,070	19,114	19,165	19,214	19,347	(3,869)	[929]	{464}	19,485	(3,897)	[935]	{468}	19,628	(3,926)	[942]	{471}
Schenectady	15,738	15,782	15,794	15,826	15,908	(3,182)	[764]	{382}	15,990	(3,198)	[768]	{384}	16,073	(3,215)	[772]	{386}
Suffolk	232,356	232,788	233,008	233,362	234,167	(46,833)	[11,240]	{5,620}	234,946	(46,989)	[11,277]	{5,639}	235,719	(47,144)	[11,315]	{5,657}
Sullivan	8,034	8,050	8,065	8,083	8,125	(1,625)	[390]	{195}	8,166	(1,633)	[392]	{196}	8,208	(1,642)	[394]	{197}
Tompkins	6,169	6,197	6,202	6,223	6,259	(1,252)	[300]	{150}	6,295	(1,259)	[302]	{151}	6,329	(1,266)	[304]	{152}
Ulster	16,713	16,737	16,753	16,782	16,844	(3,369)	[809]	{404}	16,904	(3,381)	[811]	{406}	16,962	(3,392)	[814]	{407}
Westchester	141,942	142,030	142,111	142,200	142,375	(28,475)	[6,834]	{3,417}	142,539	(28,508)	[6,842]	{3,421}	142,696	(28,539)	[6,849]	{3,425}

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.