

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

Date: 10/22/21

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 10/22/21 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.

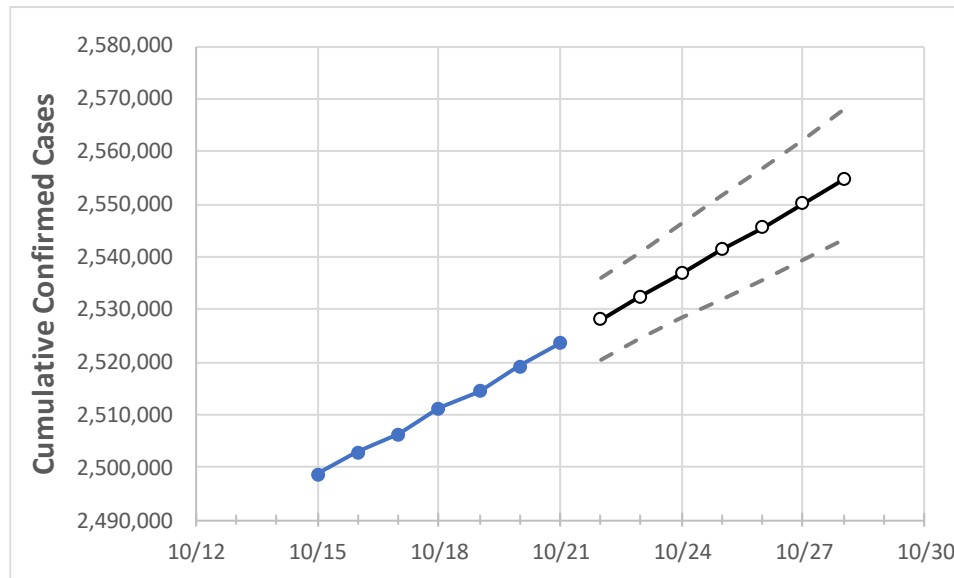
IEM's Modeling Lead

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:						
	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28
New York	2,511,182	2,514,422	2,519,197	2,523,560	2,528,045	2,532,410	2,536,852	2,541,335	2,545,651	2,550,199	2,554,669

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:						
	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28
Albany	30,581	30,633	30,760	30,838	30,925	31,011	31,098	31,188	31,279	31,364	31,456
Bronx	207,152	207,326	207,500	207,662	207,810	207,955	208,098	208,241	208,380	208,523	208,654
Dutchess	35,451	35,490	35,563	35,615	35,673	35,732	35,788	35,846	35,901	35,958	36,016
Erie	105,661	105,791	106,139	106,417	106,687	106,950	107,223	107,495	107,765	108,043	108,319
Kings	332,489	333,028	333,567	334,053	334,530	335,011	335,491	335,957	336,432	336,919	337,391
Monroe	83,708	83,830	84,045	84,297	84,517	84,743	84,961	85,189	85,414	85,643	85,872
Nassau	213,730	213,905	214,153	214,370	214,587	214,810	215,028	215,234	215,455	215,669	215,880
New York	167,593	167,767	167,919	168,107	168,286	168,457	168,631	168,800	168,967	169,144	169,309
Niagara	23,854	23,884	23,976	24,031	24,100	24,166	24,233	24,300	24,367	24,435	24,505
Onondaga	51,624	51,689	51,911	52,054	52,256	52,455	52,651	52,847	53,046	53,247	53,437
Orange	57,270	57,344	57,452	57,538	57,644	57,749	57,856	57,959	58,068	58,173	58,279
Putnam	12,439	12,448	12,469	12,492	12,515	12,538	12,561	12,583	12,607	12,629	12,652
Queens	314,480	314,855	315,123	315,368	315,639	315,912	316,167	316,430	316,693	316,948	317,205
Rensselaer	14,669	14,692	14,761	14,808	14,861	14,915	14,968	15,023	15,077	15,132	15,185
Richmond	88,603	88,731	88,838	88,944	89,049	89,156	89,260	89,367	89,472	89,579	89,683
Rockland	52,918	52,979	53,047	53,112	53,184	53,256	53,326	53,397	53,468	53,540	53,609
Saratoga	20,080	20,111	20,195	20,287	20,357	20,425	20,494	20,566	20,636	20,707	20,780
Schenectady	16,584	16,592	16,673	16,731	16,790	16,851	16,913	16,975	17,038	17,103	17,167
Suffolk	238,494	238,801	239,179	239,557	239,906	240,261	240,603	240,942	241,288	241,629	241,969
Sullivan	8,420	8,431	8,447	8,473	8,498	8,524	8,549	8,575	8,600	8,627	8,652
Tompkins	6,465	6,475	6,491	6,504	6,520	6,536	6,552	6,567	6,583	6,599	6,614
Ulster	17,205	17,224	17,248	17,273	17,302	17,331	17,359	17,387	17,414	17,442	17,470
Westchester	143,434	143,481	143,554	143,636	143,715	143,791	143,867	143,943	144,017	144,092	144,164

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:											
	10/18	10/19	10/20	10/21	10/23				10/25				10/27			
Albany	30,581	30,633	30,760	30,838	31,011	(6,202)	[1,489]	{744}	31,188	(6,238)	[1,497]	{749}	31,364	(6,273)	[1,505]	{753}
Bronx	207,152	207,326	207,500	207,662	207,955	(41,591)	[9,982]	{4,991}	208,241	(41,648)	[9,996]	{4,998}	208,523	(41,705)	[10,009]	{5,005}
Dutchess	35,451	35,490	35,563	35,615	35,732	(7,146)	[1,715]	{858}	35,846	(7,169)	[1,721]	{860}	35,958	(7,192)	[1,726]	{863}
Erie	105,661	105,791	106,139	106,417	106,950	(21,390)	[5,134]	{2,567}	107,495	(21,499)	[5,160]	{2,580}	108,043	(21,609)	[5,186]	{2,593}
Kings	332,489	333,028	333,567	334,053	335,011	(67,002)	[16,081]	{8,040}	335,957	(67,191)	[16,126]	{8,063}	336,919	(67,384)	[16,172]	{8,086}
Monroe	83,708	83,830	84,045	84,297	84,743	(16,949)	[4,068]	{2,034}	85,189	(17,038)	[4,089]	{2,045}	85,643	(17,129)	[4,111]	{2,055}
Nassau	213,730	213,905	214,153	214,370	214,810	(42,962)	[10,311]	{5,155}	215,234	(43,047)	[10,331]	{5,166}	215,669	(43,134)	[10,352]	{5,176}
New York	167,593	167,767	167,919	168,107	168,457	(33,691)	[8,086]	{4,043}	168,800	(33,760)	[8,102]	{4,051}	169,144	(33,829)	[8,119]	{4,059}
Niagara	23,854	23,884	23,976	24,031	24,166	(4,833)	[1,160]	{580}	24,300	(4,860)	[1,166]	{583}	24,435	(4,887)	[1,173]	{586}
Onondaga	51,624	51,689	51,911	52,054	52,455	(10,491)	[2,518]	{1,259}	52,847	(10,569)	[2,537]	{1,268}	53,247	(10,649)	[2,556]	{1,278}
Orange	57,270	57,344	57,452	57,538	57,749	(11,550)	[2,772]	{1,386}	57,959	(11,592)	[2,782]	{1,391}	58,173	(11,635)	[2,792]	{1,396}
Putnam	12,439	12,448	12,469	12,492	12,538	(2,508)	[602]	{301}	12,583	(2,517)	[604]	{302}	12,629	(2,526)	[606]	{303}
Queens	314,480	314,855	315,123	315,368	315,912	(63,182)	[15,164]	{7,582}	316,430	(63,286)	[15,189]	{7,594}	316,948	(63,390)	[15,214]	{7,607}
Rensselaer	14,669	14,692	14,761	14,808	14,915	(2,983)	[716]	{358}	15,023	(3,005)	[721]	{361}	15,132	(3,026)	[726]	{363}
Richmond	88,603	88,731	88,838	88,944	89,156	(17,831)	[4,279]	{2,140}	89,367	(17,873)	[4,290]	{2,145}	89,579	(17,916)	[4,300]	{2,150}
Rockland	52,918	52,979	53,047	53,112	53,256	(10,651)	[2,556]	{1,278}	53,397	(10,679)	[2,563]	{1,282}	53,540	(10,708)	[2,570]	{1,285}
Saratoga	20,080	20,111	20,195	20,287	20,425	(4,085)	[980]	{490}	20,566	(4,113)	[987]	{494}	20,707	(4,141)	[994]	{497}
Schenectady	16,584	16,592	16,673	16,731	16,851	(3,370)	[809]	{404}	16,975	(3,395)	[815]	{407}	17,103	(3,421)	[821]	{410}
Suffolk	238,494	238,801	239,179	239,557	240,261	(48,052)	[11,533]	{5,766}	240,942	(48,188)	[11,565]	{5,783}	241,629	(48,326)	[11,598]	{5,799}
Sullivan	8,420	8,431	8,447	8,473	8,524	(1,705)	[409]	{205}	8,575	(1,715)	[412]	{206}	8,627	(1,725)	[414]	{207}
Tompkins	6,465	6,475	6,491	6,504	6,536	(1,307)	[314]	{157}	6,567	(1,313)	[315]	{158}	6,599	(1,320)	[317]	{158}
Ulster	17,205	17,224	17,248	17,273	17,331	(3,466)	[832]	{416}	17,387	(3,477)	[835]	{417}	17,442	(3,488)	[837]	{419}
Westchester	143,434	143,481	143,554	143,636	143,791	(28,758)	[6,902]	{3,451}	143,943	(28,789)	[6,909]	{3,455}	144,092	(28,818)	[6,916]	{3,458}

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.