

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 5/13/21**

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 5/13/21 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.

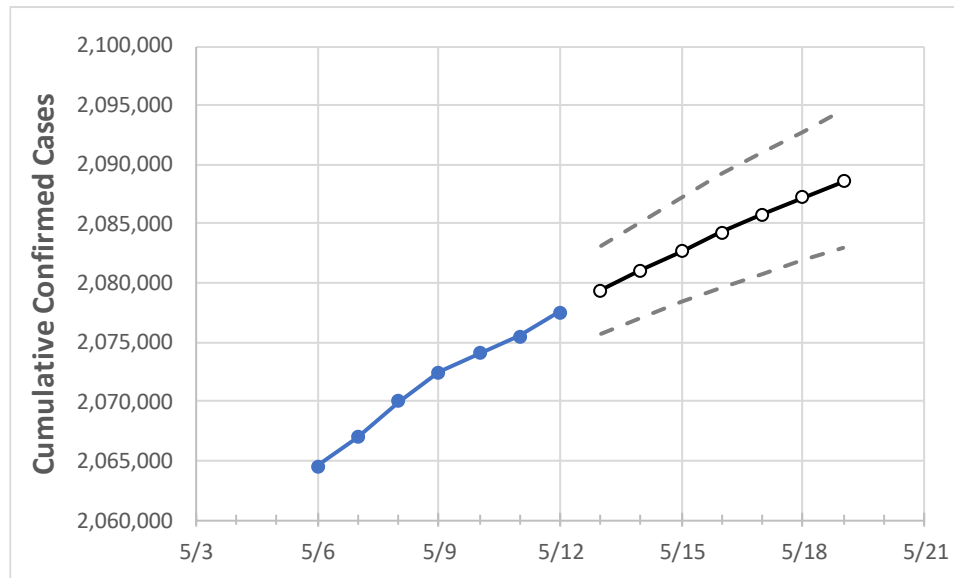
IEM's Modeling Lead

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:						
	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18	5/19
New York	2,072,426	2,074,079	2,075,539	2,077,563	2,079,353	2,081,040	2,082,686	2,084,266	2,085,812	2,087,232	2,088,615

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:						
	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18	5/19
Albany	24,321	24,334	24,349	24,368	24,382	24,394	24,407	24,418	24,429	24,441	24,450
Bronx	180,491	180,623	180,697	180,878	181,011	181,138	181,257	181,373	181,483	181,592	181,695
Dutchess	29,009	29,038	29,064	29,085	29,113	29,140	29,165	29,191	29,214	29,237	29,259
Erie	87,702	87,790	87,877	87,972	88,077	88,179	88,275	88,367	88,454	88,532	88,607
Kings	275,850	276,081	276,228	276,509	276,755	276,983	277,203	277,415	277,607	277,798	277,983
Monroe	65,639	65,791	65,936	66,085	66,262	66,432	66,603	66,769	66,934	67,092	67,252
Nassau	181,639	181,727	181,804	181,920	182,005	182,087	182,167	182,240	182,309	182,376	182,438
New York	136,253	136,330	136,399	136,507	136,600	136,685	136,765	136,841	136,916	136,987	137,055
Niagara	19,506	19,527	19,556	19,595	19,629	19,662	19,694	19,725	19,755	19,783	19,810
Onondaga	37,714	37,744	37,769	37,841	37,894	37,947	38,001	38,049	38,097	38,145	38,190
Orange	47,654	47,682	47,706	47,738	47,769	47,800	47,828	47,855	47,881	47,906	47,929
Putnam	10,512	10,516	10,521	10,528	10,534	10,540	10,545	10,551	10,556	10,560	10,565
Queens	272,871	273,084	273,237	273,483	273,683	273,873	274,053	274,227	274,385	274,541	274,688
Rensselaer	11,026	11,037	11,049	11,054	11,063	11,072	11,080	11,088	11,096	11,104	11,110
Richmond	73,594	73,682	73,733	73,789	73,848	73,904	73,958	74,007	74,055	74,101	74,142
Rockland	46,545	46,553	46,564	46,586	46,604	46,620	46,635	46,650	46,664	46,677	46,690
Saratoga	14,976	14,994	15,014	15,055	15,076	15,098	15,119	15,139	15,160	15,180	15,200
Schenectady	12,888	12,909	12,924	12,938	12,956	12,975	12,994	13,012	13,029	13,047	13,064
Suffolk	198,695	198,802	198,906	199,025	199,137	199,241	199,342	199,439	199,527	199,612	199,691
Sullivan	6,503	6,508	6,517	6,525	6,533	6,540	6,547	6,553	6,560	6,566	6,571
Tompkins	4,209	4,210	4,214	4,216	4,221	4,227	4,232	4,237	4,243	4,247	4,252
Ulster	13,679	13,691	13,705	13,717	13,732	13,745	13,759	13,771	13,783	13,795	13,806
Westchester	128,474	128,531	128,584	128,624	128,678	128,729	128,777	128,822	128,863	128,901	128,940

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:											
	5/9	5/10	5/11	5/12	5/14				5/16				5/18			
Albany	24,321	24,334	24,349	24,368	24,394	(4,879)	[1,171]	{585}	24,418	(4,884)	[1,172]	{586}	24,441	(4,888)	[1,173]	{587}
Bronx	180,491	180,623	180,697	180,878	181,138	(36,228)	[8,695]	{4,347}	181,373	(36,275)	[8,706]	{4,353}	181,592	(36,318)	[8,716]	{4,358}
Dutchess	29,009	29,038	29,064	29,085	29,140	(5,828)	[1,399]	{699}	29,191	(5,838)	[1,401]	{701}	29,237	(5,847)	[1,403]	{702}
Erie	87,702	87,790	87,877	87,972	88,179	(17,636)	[4,233]	{2,116}	88,367	(17,673)	[4,242]	{2,121}	88,532	(17,706)	[4,250]	{2,125}
Kings	275,850	276,081	276,228	276,509	276,983	(55,397)	[13,295]	{6,648}	277,415	(55,483)	[13,316]	{6,658}	277,798	(55,560)	[13,334]	{6,667}
Monroe	65,639	65,791	65,936	66,085	66,432	(13,286)	[3,189]	{1,594}	66,769	(13,354)	[3,205]	{1,602}	67,092	(13,418)	[3,220]	{1,610}
Nassau	181,639	181,727	181,804	181,920	182,087	(36,417)	[8,740]	{4,370}	182,240	(36,448)	[8,748]	{4,374}	182,376	(36,475)	[8,754]	{4,377}
New York	136,253	136,330	136,399	136,507	136,685	(27,337)	[6,561]	{3,280}	136,841	(27,368)	[6,568]	{3,284}	136,987	(27,397)	[6,575]	{3,288}
Niagara	19,506	19,527	19,556	19,595	19,662	(3,932)	[944]	{472}	19,725	(3,945)	[947]	{473}	19,783	(3,957)	[950]	{475}
Onondaga	37,714	37,744	37,769	37,841	37,947	(7,589)	[1,821]	{911}	38,049	(7,610)	[1,826]	{913}	38,145	(7,629)	[1,831]	{915}
Orange	47,654	47,682	47,706	47,738	47,800	(9,560)	[2,294]	{1,147}	47,855	(9,571)	[2,297]	{1,149}	47,906	(9,581)	[2,299]	{1,150}
Putnam	10,512	10,516	10,521	10,528	10,540	(2,108)	[506]	{253}	10,551	(2,110)	[506]	{253}	10,560	(2,112)	[507]	{253}
Queens	272,871	273,084	273,237	273,483	273,873	(54,775)	[13,146]	{6,573}	274,227	(54,845)	[13,163]	{6,581}	274,541	(54,908)	[13,178]	{6,589}
Rensselaer	11,026	11,037	11,049	11,054	11,072	(2,214)	[531]	{266}	11,088	(2,218)	[532]	{266}	11,104	(2,221)	[533]	{266}
Richmond	73,594	73,682	73,733	73,789	73,904	(14,781)	[3,547]	{1,774}	74,007	(14,801)	[3,552]	{1,776}	74,101	(14,820)	[3,557]	{1,778}
Rockland	46,545	46,553	46,564	46,586	46,620	(9,324)	[2,238]	{1,119}	46,650	(9,330)	[2,239]	{1,120}	46,677	(9,335)	[2,241]	{1,120}
Saratoga	14,976	14,994	15,014	15,055	15,098	(3,020)	[725]	{362}	15,139	(3,028)	[727]	{363}	15,180	(3,036)	[729]	{364}
Schenectady	12,888	12,909	12,924	12,938	12,975	(2,595)	[623]	{311}	13,012	(2,602)	[625]	{312}	13,047	(2,609)	[626]	{313}
Suffolk	198,695	198,802	198,906	199,025	199,241	(39,848)	[9,564]	{4,782}	199,439	(39,888)	[9,573]	{4,787}	199,612	(39,922)	[9,581]	{4,791}
Sullivan	6,503	6,508	6,517	6,525	6,540	(1,308)	[314]	{157}	6,553	(1,311)	[315]	{157}	6,566	(1,313)	[315]	{158}
Tompkins	4,209	4,210	4,214	4,216	4,227	(845)	[203]	{101}	4,237	(847)	[203]	{102}	4,247	(849)	[204]	{102}
Ulster	13,679	13,691	13,705	13,717	13,745	(2,749)	[660]	{330}	13,771	(2,754)	[661]	{331}	13,795	(2,759)	[662]	{331}
Westchester	128,474	128,531	128,584	128,624	128,729	(25,746)	[6,179]	{3,089}	128,822	(25,764)	[6,183]	{3,092}	128,901	(25,780)	[6,187]	{3,094}

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.