

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

Date: 8/27/21

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 8/27/21 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.

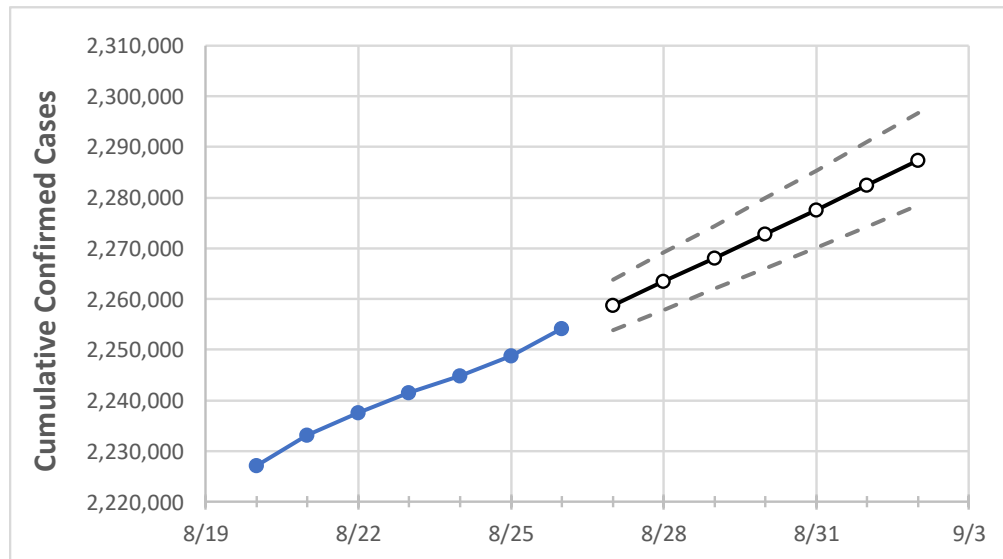
IEM's Modeling Lead

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2	
New York	2,241,468	2,244,898	2,248,791	2,254,155	2,258,828	2,263,511	2,268,138	2,272,843	2,277,642	2,282,490	2,287,302	

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Albany	26,273	26,319	26,382	26,448	26,512	26,577	26,642	26,708	26,776	26,843	26,916
Bronx	193,370	193,696	193,932	194,287	194,617	194,954	195,284	195,624	195,980	196,319	196,669
Dutchess	31,403	31,452	31,541	31,643	31,728	31,814	31,900	31,987	32,076	32,168	32,260
Erie	93,310	93,406	93,536	93,668	93,818	93,968	94,122	94,276	94,436	94,599	94,767
Kings	301,467	301,966	302,409	303,151	303,775	304,418	305,054	305,676	306,309	306,965	307,613
Monroe	72,843	72,949	73,118	73,322	73,497	73,671	73,850	74,034	74,221	74,411	74,605
Nassau	195,401	195,695	195,992	196,540	196,957	197,380	197,809	198,242	198,682	199,124	199,578
New York	151,467	151,721	152,107	152,512	152,899	153,290	153,674	154,070	154,461	154,860	155,250
Niagara	20,777	20,799	20,817	20,847	20,874	20,901	20,929	20,957	20,985	21,014	21,044
Onondaga	41,493	41,532	41,600	41,688	41,800	41,916	42,033	42,154	42,275	42,399	42,524
Orange	51,280	51,347	51,450	51,564	51,670	51,777	51,884	51,992	52,099	52,208	52,319
Putnam	11,176	11,185	11,203	11,232	11,257	11,282	11,307	11,334	11,361	11,388	11,416
Queens	293,320	293,760	294,069	294,584	295,066	295,537	296,025	296,508	296,989	297,485	297,976
Rensselaer	12,099	12,121	12,143	12,166	12,200	12,233	12,267	12,302	12,335	12,371	12,407
Richmond	80,908	81,053	81,173	81,352	81,512	81,671	81,826	81,986	82,144	82,304	82,459
Rockland	48,767	48,808	48,895	48,943	48,997	49,052	49,105	49,160	49,214	49,270	49,326
Saratoga	16,805	16,844	16,885	16,945	16,999	17,055	17,108	17,164	17,221	17,280	17,338
Schenectady	14,149	14,169	14,198	14,213	14,253	14,294	14,334	14,376	14,418	14,460	14,503
Suffolk	212,809	213,121	213,541	214,217	214,741	215,270	215,811	216,363	216,924	217,522	218,112
Sullivan	7,168	7,175	7,192	7,225	7,248	7,270	7,293	7,316	7,340	7,365	7,390
Tompkins	4,800	4,807	4,830	4,861	4,884	4,908	4,933	4,958	4,984	5,012	5,039
Ulster	14,948	14,980	15,022	15,088	15,148	15,211	15,275	15,342	15,411	15,487	15,562
Westchester	135,600	135,746	135,922	136,137	136,336	136,539	136,741	136,943	137,148	137,362	137,576

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:											
	8/23	8/24	8/25	8/26	8/28				8/30				9/1			
Albany	26,273	26,319	26,382	26,448	26,577	(5,315)	[1,276]	{638}	26,708	(5,342)	[1,282]	{641}	26,843	(5,369)	[1,288]	{644}
Bronx	193,370	193,696	193,932	194,287	194,954	(38,991)	[9,358]	{4,679}	195,624	(39,125)	[9,390]	{4,695}	196,319	(39,264)	[9,423]	{4,712}
Dutchess	31,403	31,452	31,541	31,643	31,814	(6,363)	[1,527]	{764}	31,987	(6,397)	[1,535]	{768}	32,168	(6,434)	[1,544]	{772}
Erie	93,310	93,406	93,536	93,668	93,968	(18,794)	[4,510]	{2,255}	94,276	(18,855)	[4,525]	{2,263}	94,599	(18,920)	[4,541]	{2,270}
Kings	301,467	301,966	302,409	303,151	304,418	(60,884)	[14,612]	{7,306}	305,676	(61,135)	[14,672]	{7,336}	306,965	(61,393)	[14,734]	{7,367}
Monroe	72,843	72,949	73,118	73,322	73,671	(14,734)	[3,536]	{1,768}	74,034	(14,807)	[3,554]	{1,777}	74,411	(14,882)	[3,572]	{1,786}
Nassau	195,401	195,695	195,992	196,540	197,380	(39,476)	[9,474]	{4,737}	198,242	(39,648)	[9,516]	{4,758}	199,124	(39,825)	[9,558]	{4,779}
New York	151,467	151,721	152,107	152,512	153,290	(30,658)	[7,358]	{3,679}	154,070	(30,814)	[7,395]	{3,698}	154,860	(30,972)	[7,433]	{3,717}
Niagara	20,777	20,799	20,817	20,847	20,901	(4,180)	[1,003]	{502}	20,957	(4,191)	[1,006]	{503}	21,014	(4,203)	[1,009]	{504}
Onondaga	41,493	41,532	41,600	41,688	41,916	(8,383)	[2,012]	{1,006}	42,154	(8,431)	[2,023]	{1,012}	42,399	(8,480)	[2,035]	{1,018}
Orange	51,280	51,347	51,450	51,564	51,777	(10,355)	[2,485]	{1,243}	51,992	(10,398)	[2,496]	{1,248}	52,208	(10,442)	[2,506]	{1,253}
Putnam	11,176	11,185	11,203	11,232	11,282	(2,256)	[542]	{271}	11,334	(2,267)	[544]	{272}	11,388	(2,278)	[547]	{273}
Queens	293,320	293,760	294,069	294,584	295,537	(59,107)	[14,186]	{7,093}	296,508	(59,302)	[14,232]	{7,116}	297,485	(59,497)	[14,279]	{7,140}
Rensselaer	12,099	12,121	12,143	12,166	12,233	(2,447)	[587]	{294}	12,302	(2,460)	[590]	{295}	12,371	(2,474)	[594]	{297}
Richmond	80,908	81,053	81,173	81,352	81,671	(16,334)	[3,920]	{1,960}	81,986	(16,397)	[3,935]	{1,968}	82,304	(16,461)	[3,951]	{1,975}
Rockland	48,767	48,808	48,895	48,943	49,052	(9,810)	[2,354]	{1,177}	49,160	(9,832)	[2,360]	{1,180}	49,270	(9,854)	[2,365]	{1,182}
Saratoga	16,805	16,844	16,885	16,945	17,055	(3,411)	[819]	{409}	17,164	(3,433)	[824]	{412}	17,280	(3,456)	[829]	{415}
Schenectady	14,149	14,169	14,198	14,213	14,294	(2,859)	[686]	{343}	14,376	(2,875)	[690]	{345}	14,460	(2,892)	[694]	{347}
Suffolk	212,809	213,121	213,541	214,217	215,270	(43,054)	[10,333]	{5,166}	216,363	(43,273)	[10,385]	{5,193}	217,522	(43,504)	[10,441]	{5,221}
Sullivan	7,168	7,175	7,192	7,225	7,270	(1,454)	[349]	{174}	7,316	(1,463)	[351]	{176}	7,365	(1,473)	[354]	{177}
Tompkins	4,800	4,807	4,830	4,861	4,908	(982)	[236]	{118}	4,958	(992)	[238]	{119}	5,012	(1,002)	[241]	{120}
Ulster	14,948	14,980	15,022	15,088	15,211	(3,042)	[730]	{365}	15,342	(3,068)	[736]	{368}	15,487	(3,097)	[743]	{372}
Westchester	135,600	135,746	135,922	136,137	136,539	(27,308)	[6,554]	{3,277}	136,943	(27,389)	[6,573]	{3,287}	137,362	(27,472)	[6,593]	{3,297}

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.