

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

Date: 3/15/22

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 3/15/22 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.

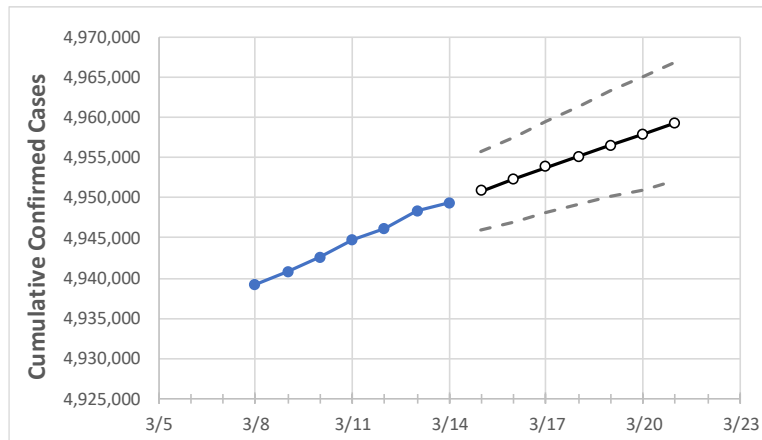
IEM's Modeling Lead

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:						
	3/11	3/12	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21
New York	4,944,777	4,946,173	4,948,375	4,949,357	4,950,849	4,952,290	4,953,781	4,955,155	4,956,555	4,957,963	4,959,334

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:						
	3/11	3/12	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21
Albany	58,247	58,269	58,299	58,307	58,330	58,353	58,376	58,398	58,421	58,442	58,463
Bronx	405,087	405,144	405,200	405,246	405,299	405,349	405,402	405,447	405,499	405,548	405,594
Dutchess	63,391	63,417	63,428	63,439	63,453	63,468	63,483	63,496	63,510	63,523	63,537
Erie	206,470	206,530	206,602	206,636	206,691	206,742	206,792	206,841	206,890	206,936	206,981
Kings	688,014	688,307	688,599	688,799	688,997	689,180	689,368	689,559	689,735	689,929	690,105
Monroe	149,762	149,800	149,849	149,890	149,928	149,965	150,001	150,037	150,072	150,105	150,139
Nassau	399,467	399,571	399,681	399,755	399,847	399,939	400,031	400,118	400,204	400,297	400,381
New York	404,896	405,176	405,431	405,542	405,761	405,985	406,206	406,418	406,638	406,866	407,075
Niagara	47,389	47,403	47,418	47,431	47,444	47,457	47,469	47,481	47,493	47,504	47,515
Onondaga	108,272	108,353	108,500	108,543	108,652	108,758	108,864	108,972	109,079	109,188	109,291
Orange	0	0	0	0	0	0	0	0	0	0	0
Putnam	23,369	23,374	23,383	23,385	23,390	23,395	23,400	23,404	23,409	23,413	23,418
Queens	635,875	636,010	636,144	636,231	636,339	636,438	636,533	636,634	636,729	636,819	636,912
Rensselaer	31,008	31,026	31,035	31,038	31,051	31,063	31,075	31,087	31,098	31,110	31,121
Richmond	164,514	164,546	164,578	164,609	164,642	164,675	164,707	164,739	164,769	164,800	164,830
Rockland	91,415	91,442	91,460	91,475	91,496	91,516	91,536	91,557	91,577	91,597	91,617
Saratoga	45,415	45,444	45,468	45,478	45,502	45,527	45,550	45,574	45,596	45,619	45,641
Schenectady	32,486	32,508	32,523	32,527	32,539	32,550	32,560	32,570	32,581	32,591	32,600
Suffolk	423,580	423,673	423,774	423,828	423,903	423,979	424,048	424,118	424,187	424,253	424,321
Sullivan	18,240	18,249	18,254	18,255	18,259	18,263	18,267	18,271	18,275	18,278	18,282
Tompkins	17,704	17,730	17,753	17,756	17,780	17,805	17,828	17,852	17,877	17,901	17,925
Ulster	31,013	31,028	31,046	31,050	31,064	31,078	31,091	31,104	31,117	31,130	31,143
Westchester	247,647	247,738	247,816	247,864	247,957	248,046	248,137	248,231	248,319	248,410	248,502

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:											
	3/11	3/12	3/13	3/14	3/16				3/18				3/20			
Albany	58,247	58,269	58,299	58,307	58,353	(11,671)	[2,801]	{1,400}	58,398	(11,680)	[2,803]	{1,402}	58,442	(11,688)	[2,805]	{1,403}
Bronx	405,087	405,144	405,200	405,246	405,349	(81,070)	[19,457]	{9,728}	405,447	(81,089)	[19,461]	{9,731}	405,548	(81,110)	[19,466]	{9,733}
Dutchess	63,391	63,417	63,428	63,439	63,468	(12,694)	[3,046]	{1,523}	63,496	(12,699)	[3,048]	{1,524}	63,523	(12,705)	[3,049]	{1,525}
Erie	206,470	206,530	206,602	206,636	206,742	(41,348)	[9,924]	{4,962}	206,841	(41,368)	[9,928]	{4,964}	206,936	(41,387)	[9,933]	{4,966}
Kings	688,014	688,307	688,599	688,799	689,180	(137,836)	[33,081]	{16,540}	689,559	(137,912)	[33,099]	{16,549}	689,929	(137,986)	[33,117]	{16,558}
Monroe	149,762	149,800	149,849	149,890	149,965	(29,993)	[7,198]	{3,599}	150,037	(30,007)	[7,202]	{3,601}	150,105	(30,021)	[7,205]	{3,603}
Nassau	399,467	399,571	399,681	399,755	399,939	(79,988)	[19,197]	{9,599}	400,118	(80,024)	[19,206]	{9,603}	400,297	(80,059)	[19,214]	{9,607}
New York	404,896	405,176	405,431	405,542	405,985	(81,197)	[19,487]	{9,744}	406,418	(81,284)	[19,508]	{9,754}	406,866	(81,373)	[19,530]	{9,765}
Niagara	47,389	47,403	47,418	47,431	47,457	(9,491)	[2,278]	{1,139}	47,481	(9,496)	[2,279]	{1,140}	47,504	(9,501)	[2,280]	{1,140}
Onondaga	108,272	108,353	108,500	108,543	108,758	(21,752)	[5,220]	{2,610}	108,972	(21,794)	[5,231]	{2,615}	109,188	(21,838)	[5,241]	{2,621}
Orange	0	0	0	0	{}				{}				{}			
Putnam	23,369	23,374	23,383	23,385	23,395	(4,679)	[1,123]	{561}	23,404	(4,681)	[1,123]	{562}	23,413	(4,683)	[1,124]	{562}
Queens	635,875	636,010	636,144	636,231	636,438	(127,288)	[30,549]	{15,275}	636,634	(127,327)	[30,558]	{15,279}	636,819	(127,364)	[30,567]	{15,284}
Rensselaer	31,008	31,026	31,035	31,038	31,063	(6,213)	[1,491]	{746}	31,087	(6,217)	[1,492]	{746}	31,110	(6,222)	[1,493]	{747}
Richmond	164,514	164,546	164,578	164,609	164,675	(32,935)	[7,904]	{3,952}	164,739	(32,948)	[7,907]	{3,954}	164,800	(32,960)	[7,910]	{3,955}
Rockland	91,415	91,442	91,460	91,475	91,516	(18,303)	[4,393]	{2,196}	91,557	(18,311)	[4,395]	{2,197}	91,597	(18,319)	[4,397]	{2,198}
Saratoga	45,415	45,444	45,468	45,478	45,527	(9,105)	[2,185]	{1,093}	45,574	(9,115)	[2,188]	{1,094}	45,619	(9,124)	[2,190]	{1,095}
Schenectady	32,486	32,508	32,523	32,527	32,550	(6,510)	[1,562]	{781}	32,570	(6,514)	[1,563]	{782}	32,591	(6,518)	[1,564]	{782}
Suffolk	423,580	423,673	423,774	423,828	423,979	(84,796)	[20,351]	{10,175}	424,118	(84,824)	[20,358]	{10,179}	424,253	(84,851)	[20,364]	{10,182}
Sullivan	18,240	18,249	18,254	18,255	18,263	(3,653)	[877]	{438}	18,271	(3,654)	[877]	{439}	18,278	(3,656)	[877]	{439}
Tompkins	17,704	17,730	17,753	17,756	17,805	(3,561)	[855]	{427}	17,852	(3,570)	[857]	{428}	17,901	(3,580)	[859]	{430}
Ulster	31,013	31,028	31,046	31,050	31,078	(6,216)	[1,492]	{746}	31,104	(6,221)	[1,493]	{746}	31,130	(6,226)	[1,494]	{747}
Westchester	247,647	247,738	247,816	247,864	248,046	(49,609)	[11,906]	{5,953}	248,231	(49,646)	[11,915]	{5,958}	248,410	(49,682)	[11,924]	{5,962}

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.