

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

Date: 3/4/22

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 3/4/22 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.

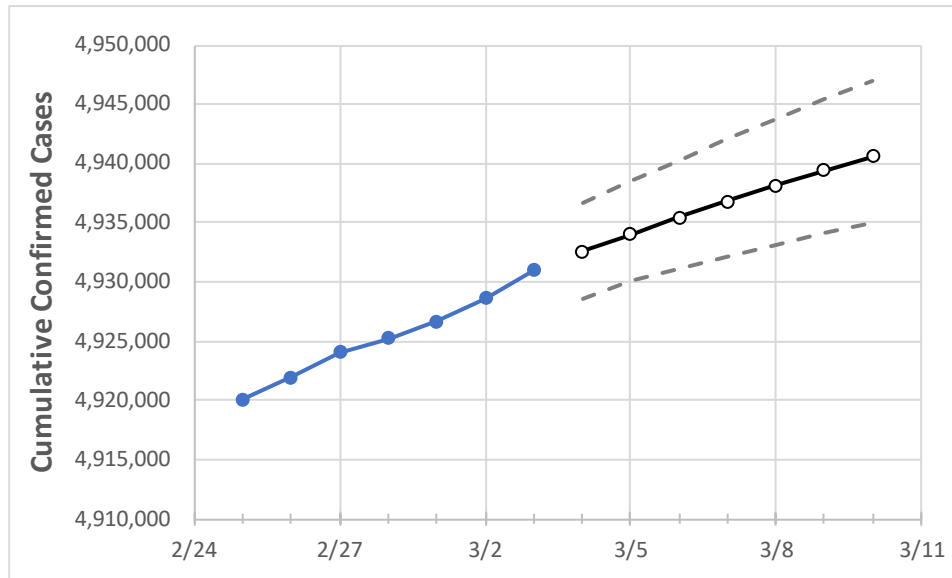
IEM's Modeling Lead

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:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
New York	4,925,221	4,926,708	4,928,597	4,930,987	4,932,578	4,934,004	4,935,446	4,936,788	4,938,153	4,939,418	4,940,568

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:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
Albany	57,922	57,952	57,983	58,018	58,040	58,062	58,083	58,103	58,122	58,141	58,157
Bronx	404,334	404,379	404,404	404,481	404,546	404,609	404,660	404,713	404,765	404,826	404,866
Dutchess	63,182	63,189	63,209	63,256	63,275	63,295	63,314	63,331	63,348	63,365	63,381
Erie	205,702	205,766	205,863	205,953	206,018	206,083	206,147	206,204	206,263	206,317	206,369
Kings	685,853	685,975	686,055	686,289	686,460	686,621	686,777	686,926	687,066	687,213	687,338
Monroe	149,251	149,286	149,362	149,417	149,462	149,506	149,548	149,586	149,623	149,662	149,697
Nassau	398,278	398,376	398,487	398,668	398,759	398,844	398,929	399,013	399,088	399,165	399,236
New York	402,298	402,430	402,699	403,049	403,247	403,408	403,570	403,750	403,909	404,071	404,213
Niagara	47,197	47,212	47,239	47,261	47,281	47,299	47,317	47,335	47,352	47,370	47,386
Onondaga	107,001	107,100	107,268	107,408	107,490	107,569	107,645	107,717	107,793	107,865	107,932
Orange	108,728	108,762	108,762	108,762	108,790	108,816	108,841	108,866	108,888	108,910	108,930
Putnam	23,302	23,307	23,315	23,320	23,327	23,333	23,338	23,343	23,349	23,354	23,359
Queens	634,435	634,520	634,689	634,874	634,993	635,115	635,225	635,332	635,433	635,534	635,629
Rensselaer	30,812	30,822	30,851	30,875	30,895	30,914	30,933	30,950	30,970	30,987	31,005
Richmond	164,069	164,094	164,127	164,185	164,218	164,249	164,281	164,310	164,337	164,364	164,389
Rockland	91,166	91,180	91,196	91,221	91,235	91,249	91,261	91,273	91,285	91,297	91,307
Saratoga	45,072	45,101	45,140	45,175	45,201	45,227	45,252	45,276	45,299	45,321	45,341
Schenectady	32,326	32,333	32,347	32,374	32,388	32,402	32,415	32,428	32,440	32,451	32,462
Suffolk	422,575	422,642	422,746	422,911	423,005	423,089	423,173	423,254	423,332	423,407	423,477
Sullivan	18,176	18,178	18,183	18,194	18,201	18,207	18,214	18,219	18,225	18,230	18,236
Tompkins	17,396	17,418	17,446	17,472	17,492	17,510	17,529	17,547	17,565	17,583	17,598
Ulster	30,812	30,826	30,839	30,874	30,894	30,913	30,931	30,949	30,967	30,984	31,001
Westchester	246,551	246,611	246,697	246,820	246,888	246,952	247,008	247,069	247,124	247,186	247,231

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:											
	2/28	3/1	3/2	3/3	3/5			3/7			3/9					
Albany	57,922	57,952	57,983	58,018	58,062	(11,612)	[2,787]	{1,393}	58,103	(11,621)	[2,789]	{1,394}	58,141	(11,628)	[2,791]	{1,395}
Bronx	404,334	404,379	404,404	404,481	404,609	(80,922)	[19,421]	{9,711}	404,713	(80,943)	[19,426]	{9,713}	404,826	(80,965)	[19,432]	{9,716}
Dutchess	63,182	63,189	63,209	63,256	63,295	(12,659)	[3,038]	{1,519}	63,331	(12,666)	[3,040]	{1,520}	63,365	(12,673)	[3,042]	{1,521}
Erie	205,702	205,766	205,863	205,953	206,083	(41,217)	[9,892]	{4,946}	206,204	(41,241)	[9,898]	{4,949}	206,317	(41,263)	[9,903]	{4,952}
Kings	685,853	685,975	686,055	686,289	686,621	(137,324)	[32,958]	{16,479}	686,926	(137,385)	[32,972]	{16,486}	687,213	(137,443)	[32,986]	{16,493}
Monroe	149,251	149,286	149,362	149,417	149,506	(29,901)	[7,176]	{3,588}	149,586	(29,917)	[7,180]	{3,590}	149,662	(29,932)	[7,184]	{3,592}
Nassau	398,278	398,376	398,487	398,668	398,844	(79,769)	[19,144]	{9,572}	399,013	(79,803)	[19,153]	{9,576}	399,165	(79,833)	[19,160]	{9,580}
New York	402,298	402,430	402,699	403,049	403,408	(80,682)	[19,364]	{9,682}	403,750	(80,750)	[19,380]	{9,690}	404,071	(80,814)	[19,395]	{9,698}
Niagara	47,197	47,212	47,239	47,261	47,299	(9,460)	[2,270]	{1,135}	47,335	(9,467)	[2,272]	{1,136}	47,370	(9,474)	[2,274]	{1,137}
Onondaga	107,001	107,100	107,268	107,408	107,569	(21,514)	[5,163]	{2,582}	107,717	(21,543)	[5,170]	{2,585}	107,865	(21,573)	[5,178]	{2,589}
Orange	108,728	108,762	108,762	108,762	108,816	(21,763)	[5,223]	{2,612}	108,866	(21,773)	[5,226]	{2,613}	108,910	(21,782)	[5,228]	{2,614}
Putnam	23,302	23,307	23,315	23,320	23,333	(4,667)	[1,120]	{560}	23,343	(4,669)	[1,120]	{560}	23,354	(4,671)	[1,121]	{561}
Queens	634,435	634,520	634,689	634,874	635,115	(127,023)	[30,486]	{15,243}	635,332	(127,066)	[30,496]	{15,248}	635,534	(127,107)	[30,506]	{15,253}
Rensselaer	30,812	30,822	30,851	30,875	30,914	(6,183)	[1,484]	{742}	30,950	(6,190)	[1,486]	{743}	30,987	(6,197)	[1,487]	{744}
Richmond	164,069	164,094	164,127	164,185	164,249	(32,850)	[7,884]	{3,942}	164,310	(32,862)	[7,887]	{3,943}	164,364	(32,873)	[7,889]	{3,945}
Rockland	91,166	91,180	91,196	91,221	91,249	(18,250)	[4,380]	{2,190}	91,273	(18,255)	[4,381]	{2,191}	91,297	(18,259)	[4,382]	{2,191}
Saratoga	45,072	45,101	45,140	45,175	45,227	(9,045)	[2,171]	{1,085}	45,276	(9,055)	[2,173]	{1,087}	45,321	(9,064)	[2,175]	{1,088}
Schenectady	32,326	32,333	32,347	32,374	32,402	(6,480)	[1,555]	{778}	32,428	(6,486)	[1,557]	{778}	32,451	(6,490)	[1,558]	{779}
Suffolk	422,575	422,642	422,746	422,911	423,089	(84,618)	[20,308]	{10,154}	423,254	(84,651)	[20,316]	{10,158}	423,407	(84,681)	[20,324]	{10,162}
Sullivan	18,176	18,178	18,183	18,194	18,207	(3,641)	[874]	{437}	18,219	(3,644)	[875]	{437}	18,230	(3,646)	[875]	{438}
Tompkins	17,396	17,418	17,446	17,472	17,510	(3,502)	[840]	{420}	17,547	(3,509)	[842]	{421}	17,583	(3,517)	[844]	{422}
Ulster	30,812	30,826	30,839	30,874	30,913	(6,183)	[1,484]	{742}	30,949	(6,190)	[1,486]	{743}	30,984	(6,197)	[1,487]	{744}
Westchester	246,551	246,611	246,697	246,820	246,952	(49,390)	[11,854]	{5,927}	247,069	(49,414)	[11,859]	{5,930}	247,186	(49,437)	[11,865]	{5,932}

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.