

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

**Date: 2/25/22**

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 2/25/22 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.**

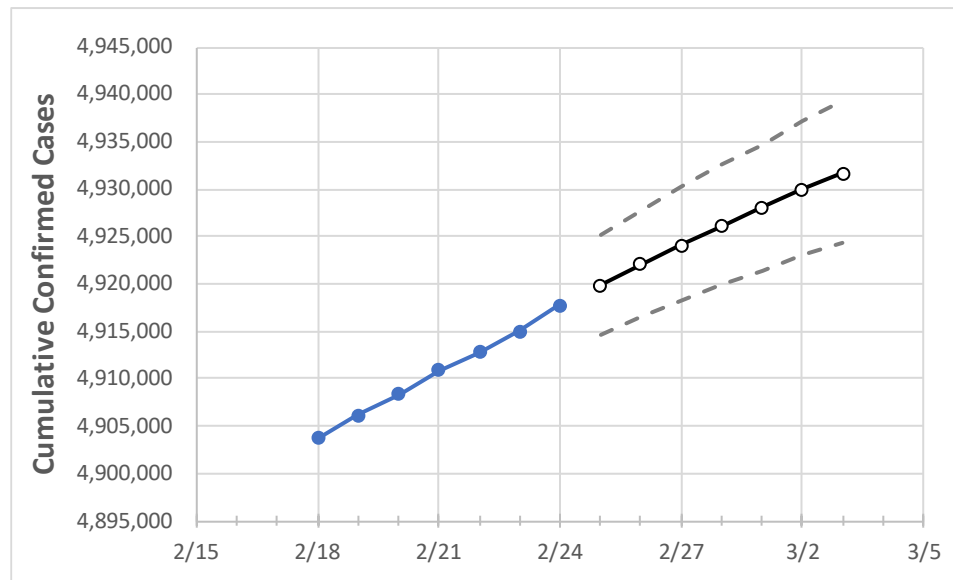
### **IEM's Modeling Lead**

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
New York	4,910,920	4,912,831	4,915,054	4,917,723	4,919,849	4,922,093	4,924,104	4,926,100	4,928,043	4,929,962	4,931,641

*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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Albany	57,715	57,743	57,777	57,817	57,853	57,888	57,921	57,955	57,985	58,015	58,044
Bronx	403,712	403,767	403,829	404,012	404,107	404,203	404,284	404,375	404,459	404,536	404,613
Dutchess	62,981	63,010	63,041	63,072	63,098	63,123	63,146	63,169	63,189	63,209	63,229
Erie	205,086	205,168	205,280	205,386	205,488	205,585	205,679	205,771	205,852	205,937	206,015
Kings	684,181	684,334	684,527	684,898	685,145	685,372	685,583	685,798	686,002	686,191	686,372
Monroe	148,843	148,884	148,943	149,037	149,108	149,175	149,239	149,300	149,360	149,418	149,472
Nassau	397,464	397,550	397,697	397,812	397,929	398,041	398,145	398,243	398,339	398,434	398,521
New York	400,832	401,008	401,237	401,491	401,720	401,937	402,144	402,345	402,531	402,723	402,908
Niagara	47,011	47,036	47,066	47,102	47,125	47,148	47,169	47,189	47,209	47,227	47,246
Onondaga	106,365	106,442	106,548	106,670	106,762	106,854	106,937	107,018	107,096	107,177	107,244
Orange	108,459	108,521	108,521	108,521	108,575	108,628	108,679	108,728	108,774	108,819	108,863
Putnam	23,245	23,250	23,259	23,268	23,279	23,288	23,297	23,307	23,317	23,325	23,334
Queens	633,234	633,358	633,549	633,799	633,966	634,125	634,266	634,411	634,549	634,678	634,807
Rensselaer	30,637	30,652	30,670	30,703	30,729	30,751	30,774	30,798	30,820	30,839	30,861
Richmond	163,765	163,807	163,846	163,883	163,930	163,976	164,019	164,060	164,100	164,137	164,173
Rockland	91,010	91,033	91,052	91,078	91,101	91,123	91,143	91,164	91,182	91,200	91,218
Saratoga	44,837	44,866	44,902	44,947	44,985	45,019	45,054	45,088	45,120	45,152	45,181
Schenectady	32,168	32,190	32,202	32,240	32,264	32,289	32,310	32,334	32,354	32,374	32,394
Suffolk	421,752	421,863	422,039	422,158	422,281	422,398	422,507	422,615	422,716	422,816	422,906
Sullivan	18,108	18,117	18,125	18,144	18,156	18,167	18,178	18,188	18,198	18,208	18,218
Tompkins	17,236	17,255	17,279	17,296	17,320	17,344	17,365	17,387	17,406	17,428	17,450
Ulster	30,642	30,663	30,684	30,718	30,742	30,766	30,789	30,811	30,833	30,855	30,875
Westchester	246,001	246,059	246,158	246,263	246,357	246,449	246,538	246,621	246,702	246,790	246,863

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:											
	2/21	2/22	2/23	2/24	2/26			2/28			3/2					
Albany	57,715	57,743	57,777	57,817	57,888	(11,578)	[2,779]	{1,389}	57,955	(11,591)	[2,782]	{1,391}	58,015	(11,603)	[2,785]	{1,392}
Bronx	403,712	403,767	403,829	404,012	404,203	(80,841)	[19,402]	{9,701}	404,375	(80,875)	[19,410]	{9,705}	404,536	(80,907)	[19,418]	{9,709}
Dutchess	62,981	63,010	63,041	63,072	63,123	(12,625)	[3,030]	{1,515}	63,169	(12,634)	[3,032]	{1,516}	63,209	(12,642)	[3,034]	{1,517}
Erie	205,086	205,168	205,280	205,386	205,585	(41,117)	[9,868]	{4,934}	205,771	(41,154)	[9,877]	{4,939}	205,937	(41,187)	[9,885]	{4,942}
Kings	684,181	684,334	684,527	684,898	685,372	(137,074)	[32,898]	{16,449}	685,798	(137,160)	[32,918]	{16,459}	686,191	(137,238)	[32,937]	{16,469}
Monroe	148,843	148,884	148,943	149,037	149,175	(29,835)	[7,160]	{3,580}	149,300	(29,860)	[7,166]	{3,583}	149,418	(29,884)	[7,172]	{3,586}
Nassau	397,464	397,550	397,697	397,812	398,041	(79,608)	[19,106]	{9,553}	398,243	(79,649)	[19,116]	{9,558}	398,434	(79,687)	[19,125]	{9,562}
New York	400,832	401,008	401,237	401,491	401,937	(80,387)	[19,293]	{9,646}	402,345	(80,469)	[19,313]	{9,656}	402,723	(80,545)	[19,331]	{9,665}
Niagara	47,011	47,036	47,066	47,102	47,148	(9,430)	[2,263]	{1,132}	47,189	(9,438)	[2,265]	{1,133}	47,227	(9,445)	[2,267]	{1,133}
Onondaga	106,365	106,442	106,548	106,670	106,854	(21,371)	[5,129]	{2,565}	107,018	(21,404)	[5,137]	{2,568}	107,177	(21,435)	[5,144]	{2,572}
Orange	108,459	108,521	108,521	108,521	108,628	(21,726)	[5,214]	{2,607}	108,728	(21,746)	[5,219]	{2,609}	108,819	(21,764)	[5,223]	{2,612}
Putnam	23,245	23,250	23,259	23,268	23,288	(4,658)	[1,118]	{559}	23,307	(4,661)	[1,119]	{559}	23,325	(4,665)	[1,120]	{560}
Queens	633,234	633,358	633,549	633,799	634,125	(126,825)	[30,438]	{15,219}	634,411	(126,882)	[30,452]	{15,226}	634,678	(126,936)	[30,465]	{15,232}
Rensselaer	30,637	30,652	30,670	30,703	30,751	(6,150)	[1,476]	{738}	30,798	(6,160)	[1,478]	{739}	30,839	(6,168)	[1,480]	{740}
Richmond	163,765	163,807	163,846	163,883	163,976	(32,795)	[7,871]	{3,935}	164,060	(32,812)	[7,875]	{3,937}	164,137	(32,827)	[7,879]	{3,939}
Rockland	91,010	91,033	91,052	91,078	91,123	(18,225)	[4,374]	{2,187}	91,164	(18,233)	[4,376]	{2,188}	91,200	(18,240)	[4,378]	{2,189}
Saratoga	44,837	44,866	44,902	44,947	45,019	(9,004)	[2,161]	{1,080}	45,088	(9,018)	[2,164]	{1,082}	45,152	(9,030)	[2,167]	{1,084}
Schenectady	32,168	32,190	32,202	32,240	32,289	(6,458)	[1,550]	{775}	32,334	(6,467)	[1,552]	{776}	32,374	(6,475)	[1,554]	{777}
Suffolk	421,752	421,863	422,039	422,158	422,398	(84,480)	[20,275]	{10,138}	422,615	(84,523)	[20,286]	{10,143}	422,816	(84,563)	[20,295]	{10,148}
Sullivan	18,108	18,117	18,125	18,144	18,167	(3,633)	[872]	{436}	18,188	(3,638)	[873]	{437}	18,208	(3,642)	[874]	{437}
Tompkins	17,236	17,255	17,279	17,296	17,344	(3,469)	[832]	{416}	17,387	(3,477)	[835]	{417}	17,428	(3,486)	[837]	{418}
Ulster	30,642	30,663	30,684	30,718	30,766	(6,153)	[1,477]	{738}	30,811	(6,162)	[1,479]	{739}	30,855	(6,171)	[1,481]	{741}
Westchester	246,001	246,059	246,158	246,263	246,449	(49,290)	[11,830]	{5,915}	246,621	(49,324)	[11,838]	{5,919}	246,790	(49,358)	[11,846]	{5,923}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.