

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

Date: 2/16/22

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 2/16/22 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.**

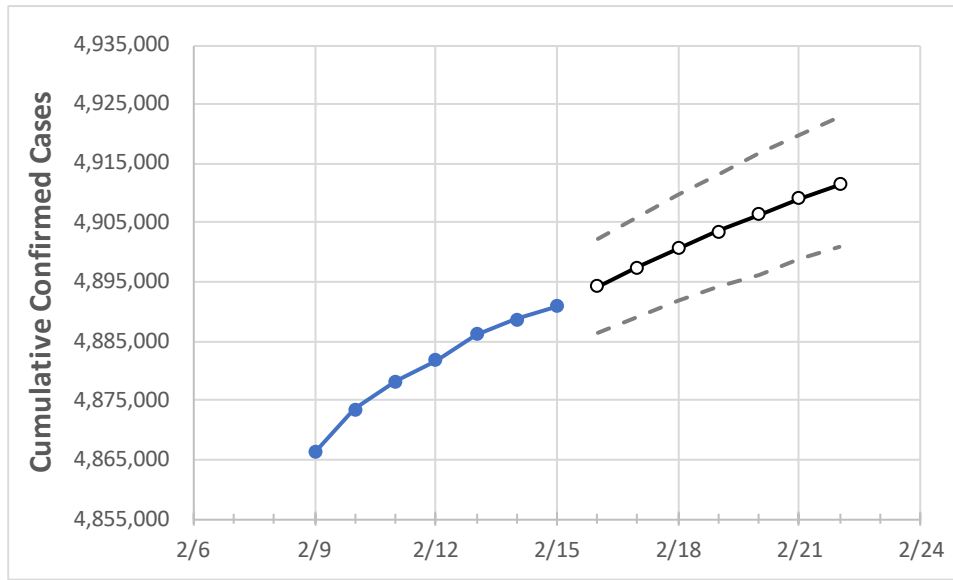
### IEM's Modeling Lead

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:						
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22
New York	4,881,825	4,886,180	4,888,634	4,890,903	4,894,328	4,897,530	4,900,648	4,903,526	4,906,424	4,909,137	4,911,523

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:							
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
Albany	57,236	57,292	57,334	57,381	57,465	57,548	57,628	57,697	57,776	57,855	57,929	
Bronx	402,385	402,592	402,723	402,795	402,955	403,107	403,240	403,374	403,500	403,610	403,723	
Dutchess	62,659	62,716	62,749	62,776	62,824	62,869	62,910	62,950	62,990	63,028	63,062	
Erie	203,777	203,945	204,072	204,219	204,392	204,545	204,690	204,834	204,966	205,100	205,215	
Kings	681,040	681,514	681,826	682,070	682,448	682,800	683,138	683,451	683,746	684,031	684,300	
Monroe	147,942	148,071	148,153	148,218	148,335	148,447	148,551	148,652	148,750	148,837	148,927	
Nassau	395,873	396,090	396,250	396,418	396,631	396,837	397,028	397,212	397,391	397,557	397,723	
New York	398,161	398,451	398,597	398,762	399,024	399,279	399,517	399,750	399,958	400,172	400,359	
Niagara	46,740	46,772	46,803	46,840	46,878	46,915	46,949	46,980	47,013	47,043	47,070	
Onondaga	105,247	105,413	105,492	105,589	105,742	105,887	106,018	106,161	106,289	106,418	106,530	
Orange	106,987	106,987	106,987	106,987	107,150	107,310	107,467	107,614	107,761	107,905	108,040	
Putnam	23,114	23,121	23,131	23,140	23,153	23,165	23,176	23,186	23,197	23,207	23,216	
Queens	631,106	631,435	631,620	631,785	632,137	632,420	632,695	632,988	633,240	633,527	633,733	
Rensselaer	30,275	30,352	30,375	30,406	30,451	30,494	30,535	30,576	30,616	30,653	30,686	
Richmond	163,086	163,175	163,250	163,316	163,395	163,467	163,538	163,602	163,666	163,725	163,781	
Rockland	90,674	90,723	90,758	90,802	90,853	90,899	90,943	90,986	91,026	91,067	91,102	
Saratoga	44,396	44,437	44,496	44,526	44,589	44,649	44,705	44,757	44,811	44,863	44,909	
Schenectady	31,882	31,935	31,958	31,973	32,011	32,048	32,084	32,117	32,148	32,181	32,209	
Suffolk	420,205	420,424	420,599	420,752	420,958	421,150	421,326	421,488	421,655	421,809	421,948	
Sullivan	17,975	17,992	18,002	18,013	18,030	18,046	18,061	18,076	18,088	18,102	18,114	
Tompkins	16,958	17,004	17,011	17,034	17,066	17,098	17,127	17,155	17,182	17,209	17,234	
Ulster	30,366	30,396	30,409	30,426	30,456	30,487	30,516	30,543	30,569	30,596	30,621	
Westchester	244,862	244,998	245,086	245,173	245,306	245,435	245,550	245,660	245,771	245,878	245,973	

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:											
	2/12	2/13	2/14	2/15	2/17			2/19			2/21					
Albany	57,236	57,292	57,334	57,381	57,548	(11,510)	[2,762]	{1,381}	57,697	(11,539)	[2,769]	{1,385}	57,855	(11,571)	[2,777]	{1,389}
Bronx	402,385	402,592	402,723	402,795	403,107	(80,621)	[19,349]	{9,675}	403,374	(80,675)	[19,362]	{9,681}	403,610	(80,722)	[19,373]	{9,687}
Dutchess	62,659	62,716	62,749	62,776	62,869	(12,574)	[3,018]	{1,509}	62,950	(12,590)	[3,022]	{1,511}	63,028	(12,606)	[3,025]	{1,513}
Erie	203,777	203,945	204,072	204,219	204,545	(40,909)	[9,818]	{4,909}	204,834	(40,967)	[9,832]	{4,916}	205,100	(41,020)	[9,845]	{4,922}
Kings	681,040	681,514	681,826	682,070	682,800	(136,560)	[32,774]	{16,387}	683,451	(136,690)	[32,806]	{16,403}	684,031	(136,806)	[32,834]	{16,417}
Monroe	147,942	148,071	148,153	148,218	148,447	(29,689)	[7,125]	{3,563}	148,652	(29,730)	[7,135]	{3,568}	148,837	(29,767)	[7,144]	{3,572}
Nassau	395,873	396,090	396,250	396,418	396,837	(79,367)	[19,048]	{9,524}	397,212	(79,442)	[19,066]	{9,533}	397,557	(79,511)	[19,083]	{9,541}
New York	398,161	398,451	398,597	398,762	399,279	(79,856)	[19,165]	{9,583}	399,750	(79,950)	[19,188]	{9,594}	400,172	(80,034)	[19,208]	{9,604}
Niagara	46,740	46,772	46,803	46,840	46,915	(9,383)	[2,252]	{1,126}	46,980	(9,396)	[2,255]	{1,128}	47,043	(9,409)	[2,258]	{1,129}
Onondaga	105,247	105,413	105,492	105,589	105,887	(21,177)	[5,083]	{2,541}	106,161	(21,232)	[5,096]	{2,548}	106,418	(21,284)	[5,108]	{2,554}
Orange	106,987	106,987	106,987	106,987	107,310	(21,462)	[5,151]	{2,575}	107,614	(21,523)	[5,165]	{2,583}	107,905	(21,581)	[5,179]	{2,590}
Putnam	23,114	23,121	23,131	23,140	23,165	(4,633)	[1,112]	{556}	23,186	(4,637)	[1,113]	{556}	23,207	(4,641)	[1,114]	{557}
Queens	631,106	631,435	631,620	631,785	632,420	(126,484)	[30,356]	{15,178}	632,988	(126,598)	[30,383]	{15,192}	633,527	(126,705)	[30,409]	{15,205}
Rensselaer	30,275	30,352	30,375	30,406	30,494	(6,099)	[1,464]	{732}	30,576	(6,115)	[1,468]	{734}	30,653	(6,131)	[1,471]	{736}
Richmond	163,086	163,175	163,250	163,316	163,467	(32,693)	[7,846]	{3,923}	163,602	(32,720)	[7,853]	{3,926}	163,725	(32,745)	[7,859]	{3,929}
Rockland	90,674	90,723	90,758	90,802	90,899	(18,180)	[4,363]	{2,182}	90,986	(18,197)	[4,367]	{2,184}	91,067	(18,213)	[4,371]	{2,186}
Saratoga	44,396	44,437	44,496	44,526	44,649	(8,930)	[2,143]	{1,072}	44,757	(8,951)	[2,148]	{1,074}	44,863	(8,973)	[2,153]	{1,077}
Schenectady	31,882	31,935	31,958	31,973	32,048	(6,410)	[1,538]	{769}	32,117	(6,423)	[1,542]	{771}	32,181	(6,436)	[1,545]	{772}
Suffolk	420,205	420,424	420,599	420,752	421,150	(84,230)	[20,215]	{10,108}	421,488	(84,298)	[20,231]	{10,116}	421,809	(84,362)	[20,247]	{10,123}
Sullivan	17,975	17,992	18,002	18,013	18,046	(3,609)	[866]	{433}	18,076	(3,615)	[868]	{434}	18,102	(3,620)	[869]	{434}
Tompkins	16,958	17,004	17,011	17,034	17,098	(3,420)	[821]	{410}	17,155	(3,431)	[823]	{412}	17,209	(3,442)	[826]	{413}
Ulster	30,366	30,396	30,409	30,426	30,487	(6,097)	[1,463]	{732}	30,543	(6,109)	[1,466]	{733}	30,596	(6,119)	[1,469]	{734}
Westchester	244,862	244,998	245,086	245,173	245,435	(49,087)	[11,781]	{5,890}	245,660	(49,132)	[11,792]	{5,896}	245,878	(49,176)	[11,802]	{5,901}

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.