

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 8/12/20**

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 8/12/20 1 p.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.**

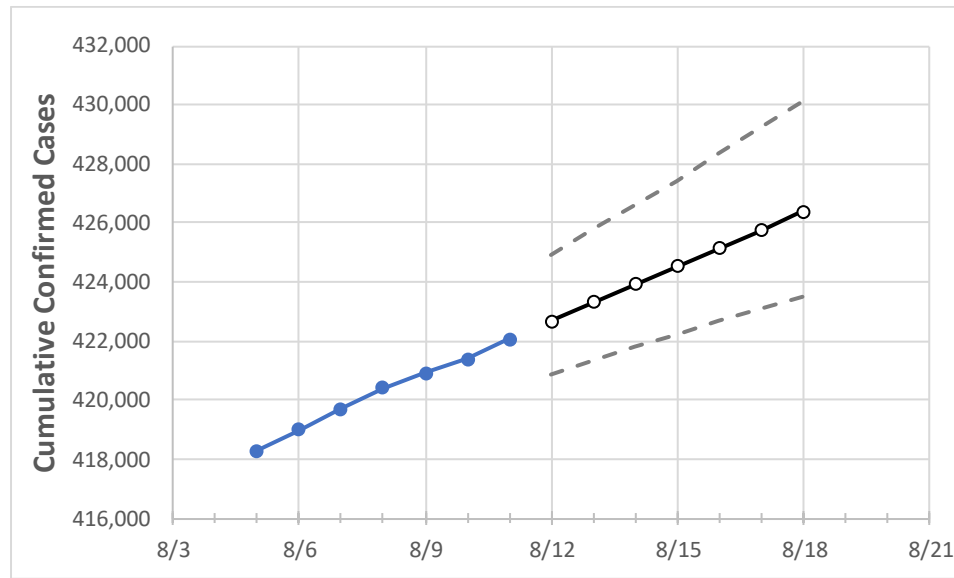
**IEM's Modeling Lead**

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:					
	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18
New York	420,414	420,929	421,405	422,072	422,687	423,302	423,917	424,532	425,147	425,762	426,377

*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 20%, and are often within 10%, of actual confirmed cases.*

## New York Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18
Albany	2,581	2,595	2,600	2,614	2,623	2,631	2,640	2,649	2,658	2,667	2,676
Bronx	50,120	50,188	50,226	50,278	50,334	50,390	50,446	50,502	50,559	50,615	50,672
Dutchess	4,600	4,607	4,613	4,619	4,631	4,643	4,655	4,667	4,680	4,694	4,707
Erie	8,850	8,904	8,918	8,987	9,029	9,071	9,115	9,159	9,203	9,249	9,295
Kings	63,086	63,155	63,223	63,308	63,386	63,464	63,543	63,622	63,700	63,780	63,859
Monroe	4,922	4,956	4,976	5,002	5,025	5,049	5,072	5,096	5,119	5,143	5,166
Nassau	43,628	43,655	43,690	43,724	43,764	43,805	43,845	43,885	43,925	43,965	44,005
New York	30,921	30,964	31,016	31,071	31,122	31,174	31,225	31,276	31,328	31,379	31,430
Niagara	1,494	1,498	1,500	1,512	1,516	1,521	1,525	1,530	1,534	1,539	1,543
Onondaga	3,565	3,576	3,585	3,602	3,611	3,620	3,629	3,637	3,646	3,654	3,662
Orange	11,156	11,159	11,168	11,180	11,187	11,195	11,202	11,209	11,217	11,224	11,231
Putnam	1,447	1,449	1,449	1,449	1,452	1,454	1,457	1,460	1,463	1,466	1,469
Queens	68,548	68,604	68,670	68,733	68,798	68,863	68,927	68,992	69,056	69,121	69,185
Rensselaer	761	765	766	770	773	776	779	783	786	789	792
Richmond	14,909	14,921	14,934	14,953	14,969	14,984	15,000	15,015	15,030	15,045	15,060
Rockland	13,936	13,942	13,949	13,954	13,960	13,966	13,972	13,978	13,984	13,991	13,997
Saratoga	755	757	760	767	771	775	780	784	788	792	797
Schenectady	1,058	1,059	1,060	1,075	1,078	1,081	1,084	1,087	1,090	1,093	1,096
Suffolk	43,749	43,786	43,844	43,893	43,949	44,006	44,063	44,120	44,177	44,235	44,293
Sullivan	1,489	1,489	1,490	1,490	1,491	1,491	1,492	1,492	1,493	1,494	1,494
Tompkins	234	234	234	234	235	235	236	236	237	237	238
Ulster	2,057	2,062	2,072	2,076	2,082	2,088	2,095	2,101	2,108	2,115	2,122
Westchester	36,180	36,205	36,233	36,272	36,301	36,331	36,360	36,390	36,420	36,449	36,479

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:											
	8/8	8/9	8/10	8/11	8/13				8/15				8/17			
Albany	2,581	2,595	2,600	2,614	2,631	(526)	[126]	{63}	2,649	(530)	[127]	{64}	2,667	(533)	[128]	{64}
Bronx	50,120	50,188	50,226	50,278	50,390	(10,078)	[2,419]	{1,209}	50,502	(10,100)	[2,424]	{1,212}	50,615	(10,123)	[2,430]	{1,215}
Dutchess	4,600	4,607	4,613	4,619	4,643	(929)	[223]	{111}	4,667	(933)	[224]	{112}	4,694	(939)	[225]	{113}
Erie	8,850	8,904	8,918	8,987	9,071	(1,814)	[435]	{218}	9,159	(1,832)	[440]	{220}	9,249	(1,850)	[444]	{222}
Kings	63,086	63,155	63,223	63,308	63,464	(12,693)	[3,046]	{1,523}	63,622	(12,724)	[3,054]	{1,527}	63,780	(12,756)	[3,061]	{1,530}
Monroe	4,922	4,956	4,976	5,002	5,049	(1,010)	[242]	{121}	5,096	(1,019)	[245]	{122}	5,143	(1,029)	[247]	{123}
Nassau	43,628	43,655	43,690	43,724	43,805	(8,761)	[2,103]	{1,051}	43,885	(8,777)	[2,106]	{1,053}	43,965	(8,793)	[2,110]	{1,055}
New York	30,921	30,964	31,016	31,071	31,174	(6,235)	[1,496]	{748}	31,276	(6,255)	[1,501]	{751}	31,379	(6,276)	[1,506]	{753}
Niagara	1,494	1,498	1,500	1,512	1,521	(304)	[73]	{36}	1,530	(306)	[73]	{37}	1,539	(308)	[74]	{37}
Onondaga	3,565	3,576	3,585	3,602	3,620	(724)	[174]	{87}	3,637	(727)	[175]	{87}	3,654	(731)	[175]	{88}
Orange	11,156	11,159	11,168	11,180	11,195	(2,239)	[537]	{269}	11,209	(2,242)	[538]	{269}	11,224	(2,245)	[539]	{269}
Putnam	1,447	1,449	1,449	1,449	1,454	(291)	[70]	{35}	1,460	(292)	[70]	{35}	1,466	(293)	[70]	{35}
Queens	68,548	68,604	68,670	68,733	68,863	(13,773)	[3,305]	{1,653}	68,992	(13,798)	[3,312]	{1,656}	69,121	(13,824)	[3,318]	{1,659}
Rensselaer	761	765	766	770	776	(155)	[37]	{19}	783	(157)	[38]	{19}	789	(158)	[38]	{19}
Richmond	14,909	14,921	14,934	14,953	14,984	(2,997)	[719]	{360}	15,015	(3,003)	[721]	{360}	15,045	(3,009)	[722]	{361}
Rockland	13,936	13,942	13,949	13,954	13,966	(2,793)	[670]	{335}	13,978	(2,796)	[671]	{335}	13,991	(2,798)	[672]	{336}
Saratoga	755	757	760	767	775	(155)	[37]	{19}	784	(157)	[38]	{19}	792	(158)	[38]	{19}
Schenectady	1,058	1,059	1,060	1,075	1,081	(216)	[52]	{26}	1,087	(217)	[52]	{26}	1,093	(219)	[52]	{26}
Suffolk	43,749	43,786	43,844	43,893	44,006	(8,801)	[2,112]	{1,056}	44,120	(8,824)	[2,118]	{1,059}	44,235	(8,847)	[2,123]	{1,062}
Sullivan	1,489	1,489	1,490	1,490	1,491	(298)	[72]	{36}	1,492	(298)	[72]	{36}	1,494	(299)	[72]	{36}
Tompkins	234	234	234	234	235	(47)	[11]	{6}	236	(47)	[11]	{6}	237	(47)	[11]	{6}
Ulster	2,057	2,062	2,072	2,076	2,088	(418)	[100]	{50}	2,101	(420)	[101]	{50}	2,115	(423)	[102]	{51}
Westchester	36,180	36,205	36,233	36,272	36,331	(7,266)	[1,744]	{872}	36,390	(7,278)	[1,747]	{873}	36,449	(7,290)	[1,750]	{875}

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.