

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

**Date: 7/14/20**

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 7/14/20 11 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.**

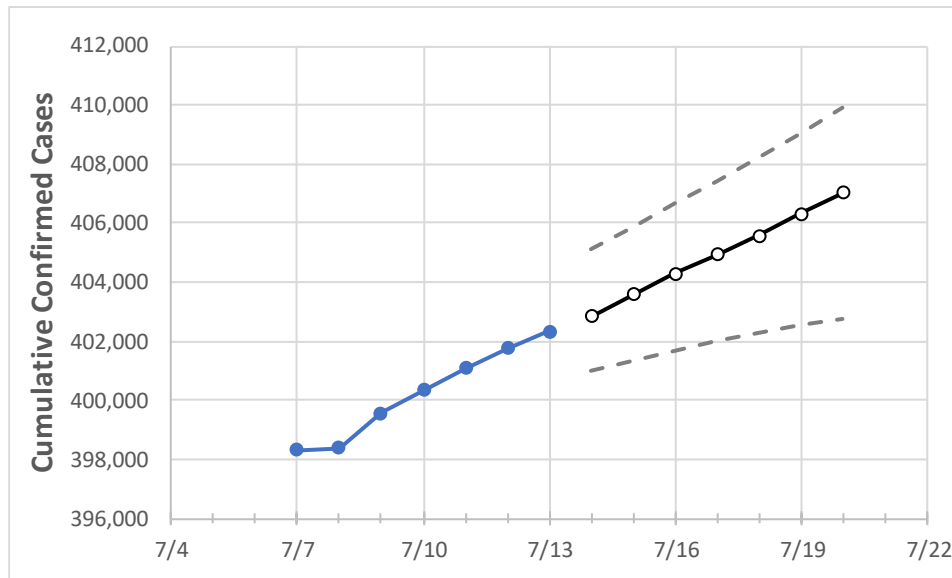
### **IEM's Modeling Lead**

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:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
New York	400,358	401,098	401,775	402,332	402,835	403,570	404,295	404,937	405,574	406,329	407,033

*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:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
Albany	2,190	2,208	2,219	2,225	2,236	2,247	2,259	2,271	2,284	2,297	2,311
Bronx	48,208	48,267	48,327	48,377	48,426	48,474	48,521	48,568	48,614	48,660	48,705
Dutchess	4,262	4,269	4,276	4,280	4,284	4,288	4,291	4,295	4,299	4,302	4,305
Erie	7,660	7,711	7,742	7,766	7,797	7,829	7,860	7,891	7,922	7,953	7,984
Kings	60,560	60,647	60,748	60,815	60,891	60,966	61,041	61,114	61,186	61,258	61,328
Monroe	4,120	4,153	4,177	4,200	4,230	4,260	4,289	4,319	4,349	4,379	4,409
Nassau	42,232	42,267	42,307	42,354	42,395	42,437	42,479	42,522	42,564	42,608	42,651
New York	29,109	29,165	29,237	29,302	29,362	29,423	29,484	29,545	29,606	29,667	29,729
Niagara	1,327	1,334	1,340	1,342	1,349	1,356	1,363	1,370	1,378	1,385	1,393
Onondaga	3,078	3,100	3,124	3,142	3,168	3,195	3,223	3,250	3,279	3,308	3,337
Orange	10,820	10,830	10,835	10,841	10,848	10,855	10,862	10,869	10,876	10,882	10,889
Putnam	1,355	1,361	1,363	1,365	1,368	1,371	1,375	1,378	1,382	1,386	1,390
Queens	66,241	66,323	66,410	66,466	66,532	66,596	66,660	66,722	66,783	66,843	66,902
Rensselaer	588	593	616	617	622	626	631	637	643	649	655
Richmond	14,285	14,308	14,329	14,341	14,359	14,376	14,395	14,413	14,431	14,450	14,468
Rockland	13,691	13,700	13,716	13,719	13,726	13,734	13,741	13,748	13,755	13,761	13,768
Saratoga	587	595	602	610	617	622	627	632	637	642	647
Schenectady	852	856	864	868	872	876	881	885	889	894	898
Suffolk	41,911	41,987	42,028	42,112	42,171	42,232	42,294	42,356	42,420	42,484	42,550
Sullivan	1,464	1,465	1,465	1,465	1,466	1,466	1,467	1,468	1,469	1,469	1,470
Tompkins	181	183	186	186	187	188	189	190	192	193	195
Ulster	1,853	1,855	1,859	1,862	1,866	1,869	1,873	1,877	1,880	1,884	1,887
Westchester	35,226	35,260	35,297	35,327	35,360	35,392	35,424	35,456	35,488	35,520	35,551

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:											
	7/10	7/11	7/12	7/13	7/15				7/17				7/19			
Albany	2,190	2,208	2,219	2,225	2,247	(449)	[108]	{54}	2,271	(454)	[109]	{55}	2,297	(459)	[110]	{55}
Bronx	48,208	48,267	48,327	48,377	48,474	(9,695)	[2,327]	{1,163}	48,568	(9,714)	[2,331]	{1,166}	48,660	(9,732)	[2,336]	{1,168}
Dutchess	4,262	4,269	4,276	4,280	4,288	(858)	[206]	{103}	4,295	(859)	[206]	{103}	4,302	(860)	[206]	{103}
Erie	7,660	7,711	7,742	7,766	7,829	(1,566)	[376]	{188}	7,891	(1,578)	[379]	{189}	7,953	(1,591)	[382]	{191}
Kings	60,560	60,647	60,748	60,815	60,966	(12,193)	[2,926]	{1,463}	61,114	(12,223)	[2,933]	{1,467}	61,258	(12,252)	[2,940]	{1,470}
Monroe	4,120	4,153	4,177	4,200	4,260	(852)	[204]	{102}	4,319	(864)	[207]	{104}	4,379	(876)	[210]	{105}
Nassau	42,232	42,267	42,307	42,354	42,437	(8,487)	[2,037]	{1,018}	42,522	(8,504)	[2,041]	{1,021}	42,608	(8,522)	[2,045]	{1,023}
New York	29,109	29,165	29,237	29,302	29,423	(5,885)	[1,412]	{706}	29,545	(5,909)	[1,418]	{709}	29,667	(5,933)	[1,424]	{712}
Niagara	1,327	1,334	1,340	1,342	1,356	(271)	[65]	{33}	1,370	(274)	[66]	{33}	1,385	(277)	[66]	{33}
Onondaga	3,078	3,100	3,124	3,142	3,195	(639)	[153]	{77}	3,250	(650)	[156]	{78}	3,308	(662)	[159]	{79}
Orange	10,820	10,830	10,835	10,841	10,855	(2,171)	[521]	{261}	10,869	(2,174)	[522]	{261}	10,882	(2,176)	[522]	{261}
Putnam	1,355	1,361	1,363	1,365	1,371	(274)	[66]	{33}	1,378	(276)	[66]	{33}	1,386	(277)	[67]	{33}
Queens	66,241	66,323	66,410	66,466	66,596	(13,319)	[3,197]	{1,598}	66,722	(13,344)	[3,203]	{1,601}	66,843	(13,369)	[3,208]	{1,604}
Rensselaer	588	593	616	617	626	(125)	[30]	{15}	637	(127)	[31]	{15}	649	(130)	[31]	{16}
Richmond	14,285	14,308	14,329	14,341	14,376	(2,875)	[690]	{345}	14,413	(2,883)	[692]	{346}	14,450	(2,890)	[694]	{347}
Rockland	13,691	13,700	13,716	13,719	13,734	(2,747)	[659]	{330}	13,748	(2,750)	[660]	{330}	13,761	(2,752)	[661]	{330}
Saratoga	587	595	602	610	622	(124)	[30]	{15}	632	(126)	[30]	{15}	642	(128)	[31]	{15}
Schenectady	852	856	864	868	876	(175)	[42]	{21}	885	(177)	[42]	{21}	894	(179)	[43]	{21}
Suffolk	41,911	41,987	42,028	42,112	42,232	(8,446)	[2,027]	{1,014}	42,356	(8,471)	[2,033]	{1,017}	42,484	(8,497)	[2,039]	{1,020}
Sullivan	1,464	1,465	1,465	1,465	1,466	(293)	[70]	{35}	1,468	(294)	[70]	{35}	1,469	(294)	[71]	{35}
Tompkins	181	183	186	186	188	(38)	[9]	{5}	190	(38)	[9]	{5}	193	(39)	[9]	{5}
Ulster	1,853	1,855	1,859	1,862	1,869	(374)	[90]	{45}	1,877	(375)	[90]	{45}	1,884	(377)	[90]	{45}
Westchester	35,226	35,260	35,297	35,327	35,392	(7,078)	[1,699]	{849}	35,456	(7,091)	[1,702]	{851}	35,520	(7,104)	[1,705]	{852}

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.