

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

**Date: 7/6/20**

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 7/6/20 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.**

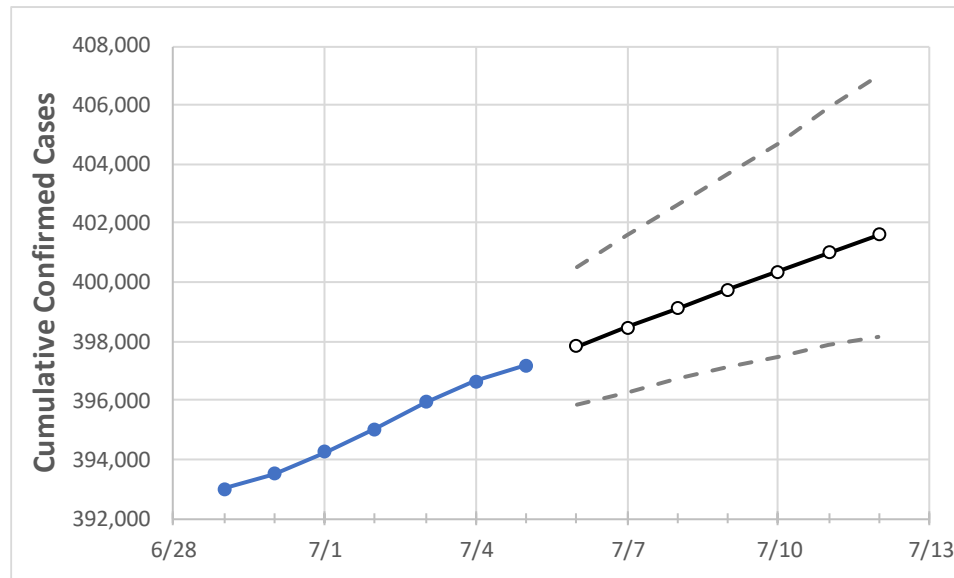
### **IEM's Modeling Lead**

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:				
	7/2	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12
New York	395,021	395,939	396,663	397,200	397,837	398,473	399,106	399,738	400,368	400,996	401,623

*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:						
	7/2	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12
Albany	2,125	2,130	2,145	2,152	2,160	2,168	2,177	2,186	2,195	2,204	2,214
Bronx	47,758	47,838	47,902	47,938	47,995	48,051	48,107	48,162	48,216	48,270	48,323
Dutchess	4,225	4,231	4,238	4,243	4,249	4,254	4,260	4,265	4,271	4,276	4,281
Erie	7,370	7,427	7,462	7,475	7,504	7,534	7,563	7,592	7,621	7,649	7,678
Kings	59,855	59,957	60,078	60,149	60,234	60,318	60,401	60,483	60,565	60,645	60,725
Monroe	3,833	3,885	3,922	3,953	3,995	4,039	4,084	4,132	4,181	4,232	4,286
Nassau	41,910	41,947	41,988	42,031	42,069	42,107	42,144	42,182	42,219	42,257	42,294
New York	28,596	28,698	28,760	28,804	28,861	28,918	28,976	29,033	29,091	29,148	29,206
Niagara	1,248	1,262	1,277	1,284	1,293	1,302	1,311	1,321	1,332	1,343	1,355
Onondaga	2,897	2,909	2,928	2,949	2,970	2,992	3,014	3,037	3,059	3,082	3,105
Orange	10,744	10,759	10,766	10,775	10,783	10,792	10,801	10,809	10,818	10,827	10,836
Putnam	1,332	1,333	1,335	1,336	1,338	1,340	1,342	1,344	1,346	1,348	1,350
Queens	65,568	65,705	65,800	65,876	65,959	66,040	66,121	66,201	66,281	66,359	66,437
Rensselaer	556	559	563	565	567	569	570	572	574	576	577
Richmond	14,125	14,164	14,190	14,202	14,220	14,239	14,258	14,277	14,296	14,316	14,336
Rockland	13,612	13,623	13,629	13,648	13,657	13,666	13,675	13,685	13,694	13,702	13,711
Saratoga	555	561	562	566	568	570	572	574	576	578	580
Schenectady	816	824	831	834	840	847	854	861	869	876	884
Suffolk	41,491	41,538	41,585	41,642	41,691	41,741	41,791	41,841	41,892	41,943	41,994
Sullivan	1,453	1,455	1,456	1,456	1,457	1,457	1,458	1,458	1,459	1,459	1,460
Tompkins	178	178	179	179	179	180	180	181	181	181	182
Ulster	1,790	1,815	1,825	1,834	1,841	1,848	1,856	1,864	1,873	1,882	1,893
Westchester	34,912	34,980	35,020	35,043	35,076	35,109	35,142	35,175	35,207	35,240	35,272

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:											
	7/2	7/3	7/4	7/5	7/7				7/9				7/11			
Albany	2,125	2,130	2,145	2,152	2,168	(434)	[104]	{52}	2,186	(437)	[105]	{52}	2,204	(441)	[106]	{53}
Bronx	47,758	47,838	47,902	47,938	48,051	(9,610)	[2,306]	{1,153}	48,162	(9,632)	[2,312]	{1,156}	48,270	(9,654)	[2,317]	{1,158}
Dutchess	4,225	4,231	4,238	4,243	4,254	(851)	[204]	{102}	4,265	(853)	[205]	{102}	4,276	(855)	[205]	{103}
Erie	7,370	7,427	7,462	7,475	7,534	(1,507)	[362]	{181}	7,592	(1,518)	[364]	{182}	7,649	(1,530)	[367]	{184}
Kings	59,855	59,957	60,078	60,149	60,318	(12,064)	[2,895]	{1,448}	60,483	(12,097)	[2,903]	{1,452}	60,645	(12,129)	[2,911]	{1,455}
Monroe	3,833	3,885	3,922	3,953	4,039	(808)	[194]	{97}	4,132	(826)	[198]	{99}	4,232	(846)	[203]	{102}
Nassau	41,910	41,947	41,988	42,031	42,107	(8,421)	[2,021]	{1,011}	42,182	(8,436)	[2,025]	{1,012}	42,257	(8,451)	[2,028]	{1,014}
New York	28,596	28,698	28,760	28,804	28,918	(5,784)	[1,388]	{694}	29,033	(5,807)	[1,394]	{697}	29,148	(5,830)	[1,399]	{700}
Niagara	1,248	1,262	1,277	1,284	1,302	(260)	[62]	{31}	1,321	(264)	[63]	{32}	1,343	(269)	[64]	{32}
Onondaga	2,897	2,909	2,928	2,949	2,992	(598)	[144]	{72}	3,037	(607)	[146]	{73}	3,082	(616)	[148]	{74}
Orange	10,744	10,759	10,766	10,775	10,792	(2,158)	[518]	{259}	10,809	(2,162)	[519]	{259}	10,827	(2,165)	[520]	{260}
Putnam	1,332	1,333	1,335	1,336	1,340	(268)	[64]	{32}	1,344	(269)	[64]	{32}	1,348	(270)	[65]	{32}
Queens	65,568	65,705	65,800	65,876	66,040	(13,208)	[3,170]	{1,585}	66,201	(13,240)	[3,178]	{1,589}	66,359	(13,272)	[3,185]	{1,593}
Rensselaer	556	559	563	565	569	(114)	[27]	{14}	572	(114)	[27]	{14}	576	(115)	[28]	{14}
Richmond	14,125	14,164	14,190	14,202	14,239	(2,848)	[683]	{342}	14,277	(2,855)	[685]	{343}	14,316	(2,863)	[687]	{344}
Rockland	13,612	13,623	13,629	13,648	13,666	(2,733)	[656]	{328}	13,685	(2,737)	[657]	{328}	13,702	(2,740)	[658]	{329}
Saratoga	555	561	562	566	570	(114)	[27]	{14}	574	(115)	[28]	{14}	578	(116)	[28]	{14}
Schenectady	816	824	831	834	847	(169)	[41]	{20}	861	(172)	[41]	{21}	876	(175)	[42]	{21}
Suffolk	41,491	41,538	41,585	41,642	41,741	(8,348)	[2,004]	{1,002}	41,841	(8,368)	[2,008]	{1,004}	41,943	(8,389)	[2,013]	{1,007}
Sullivan	1,453	1,455	1,456	1,456	1,457	(291)	[70]	{35}	1,458	(292)	[70]	{35}	1,459	(292)	[70]	{35}
Tompkins	178	178	179	179	180	(36)	[9]	{4}	181	(36)	[9]	{4}	181	(36)	[9]	{4}
Ulster	1,790	1,815	1,825	1,834	1,848	(370)	[89]	{44}	1,864	(373)	[89]	{45}	1,882	(376)	[90]	{45}
Westchester	34,912	34,980	35,020	35,043	35,109	(7,022)	[1,685]	{843}	35,175	(7,035)	[1,688]	{844}	35,240	(7,048)	[1,692]	{846}

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.