

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

**Date: 9/2/20**

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 9/2/20 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.**

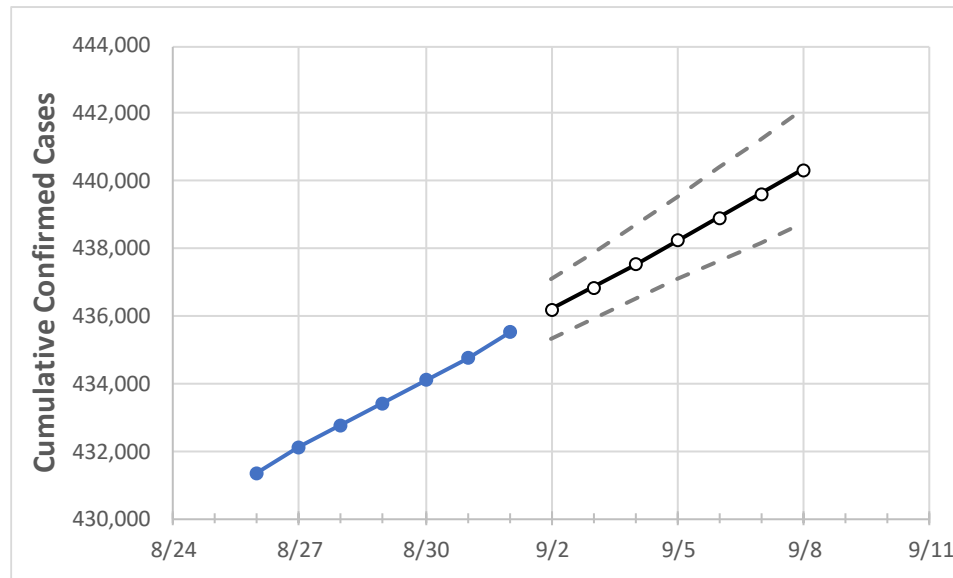
### **IEM's Modeling Lead**

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:						
	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	9/8
New York	433,402	434,100	434,756	435,510	436,180	436,855	437,537	438,224	438,918	439,618	440,324

*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:						
	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	9/8
Albany	2,754	2,764	2,770	2,786	2,793	2,800	2,807	2,815	2,822	2,829	2,837
Bronx	51,468	51,533	51,610	51,663	51,721	51,779	51,836	51,894	51,952	52,010	52,068
Dutchess	4,846	4,852	4,865	4,868	4,878	4,888	4,898	4,907	4,917	4,927	4,937
Erie	9,741	9,807	9,872	9,947	10,008	10,071	10,137	10,204	10,274	10,347	10,421
Kings	64,857	64,930	64,998	65,118	65,197	65,276	65,356	65,436	65,517	65,597	65,679
Monroe	5,422	5,443	5,452	5,462	5,474	5,485	5,495	5,505	5,515	5,524	5,533
Nassau	44,554	44,610	44,677	44,761	44,826	44,892	44,961	45,032	45,104	45,179	45,256
New York	32,013	32,075	32,119	32,165	32,209	32,253	32,296	32,339	32,382	32,424	32,467
Niagara	1,605	1,612	1,618	1,626	1,632	1,639	1,646	1,653	1,660	1,667	1,675
Onondaga	3,866	3,883	3,892	3,912	3,926	3,940	3,955	3,969	3,984	3,999	4,015
Orange	11,410	11,418	11,433	11,445	11,458	11,471	11,485	11,498	11,512	11,527	11,541
Putnam	1,494	1,500	1,501	1,505	1,508	1,511	1,514	1,517	1,521	1,524	1,528
Queens	70,098	70,162	70,222	70,288	70,352	70,416	70,480	70,543	70,605	70,667	70,729
Rensselaer	830	833	838	841	843	845	848	850	852	854	856
Richmond	15,252	15,269	15,288	15,308	15,324	15,341	15,358	15,375	15,392	15,409	15,426
Rockland	14,218	14,233	14,255	14,271	14,290	14,310	14,330	14,351	14,372	14,395	14,418
Saratoga	837	842	844	846	849	851	854	856	859	861	864
Schenectady	1,255	1,260	1,263	1,271	1,278	1,285	1,293	1,300	1,308	1,315	1,323
Suffolk	44,712	44,763	44,820	44,885	44,929	44,972	45,016	45,059	45,103	45,146	45,190
Sullivan	1,516	1,521	1,529	1,530	1,533	1,535	1,538	1,542	1,545	1,549	1,554
Tompkins	261	264	265	270	271	273	274	276	277	279	281
Ulster	2,162	2,168	2,175	2,176	2,180	2,184	2,188	2,192	2,197	2,201	2,205
Westchester	36,895	36,949	36,984	37,021	37,058	37,096	37,134	37,173	37,213	37,253	37,294

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:											
	8/29	8/30	8/31	9/1	9/3				9/5				9/7			
Albany	2,754	2,764	2,770	2,786	2,800 (560) [134] {67}				2,815 (563) [135] {68}				2,829 (566) [136] {68}			
Bronx	51,468	51,533	51,610	51,663	51,779 (10,356) [2,485] {1,243}				51,894 (10,379) [2,491] {1,245}				52,010 (10,402) [2,496] {1,248}			
Dutchess	4,846	4,852	4,865	4,868	4,888 (978) [235] {117}				4,907 (981) [236] {118}				4,927 (985) [237] {118}			
Erie	9,741	9,807	9,872	9,947	10,071 (2,014) [483] {242}				10,204 (2,041) [490] {245}				10,347 (2,069) [497] {248}			
Kings	64,857	64,930	64,998	65,118	65,276 (13,055) [3,133] {1,567}				65,436 (13,087) [3,141] {1,570}				65,597 (13,119) [3,149] {1,574}			
Monroe	5,422	5,443	5,452	5,462	5,485 (1,097) [263] {132}				5,505 (1,101) [264] {132}				5,524 (1,105) [265] {133}			
Nassau	44,554	44,610	44,677	44,761	44,892 (8,978) [2,155] {1,077}				45,032 (9,006) [2,162] {1,081}				45,179 (9,036) [2,169] {1,084}			
New York	32,013	32,075	32,119	32,165	32,253 (6,451) [1,548] {774}				32,339 (6,468) [1,552] {776}				32,424 (6,485) [1,556] {778}			
Niagara	1,605	1,612	1,618	1,626	1,639 (328) [79] {39}				1,653 (331) [79] {40}				1,667 (333) [80] {40}			
Onondaga	3,866	3,883	3,892	3,912	3,940 (788) [189] {95}				3,969 (794) [191] {95}				3,999 (800) [192] {96}			
Orange	11,410	11,418	11,433	11,445	11,471 (2,294) [551] {275}				11,498 (2,300) [552] {276}				11,527 (2,305) [553] {277}			
Putnam	1,494	1,500	1,501	1,505	1,511 (302) [73] {36}				1,517 (303) [73] {36}				1,524 (305) [73] {37}			
Queens	70,098	70,162	70,222	70,288	70,416 (14,083) [3,380] {1,690}				70,543 (14,109) [3,386] {1,693}				70,667 (14,133) [3,392] {1,696}			
Rensselaer	830	833	838	841	845 (169) [41] {20}				850 (170) [41] {20}				854 (171) [41] {20}			
Richmond	15,252	15,269	15,288	15,308	15,341 (3,068) [736] {368}				15,375 (3,075) [738] {369}				15,409 (3,082) [740] {370}			
Rockland	14,218	14,233	14,255	14,271	14,310 (2,862) [687] {343}				14,351 (2,870) [689] {344}				14,395 (2,879) [691] {345}			
Saratoga	837	842	844	846	851 (170) [41] {20}				856 (171) [41] {21}				861 (172) [41] {21}			
Schenectady	1,255	1,260	1,263	1,271	1,285 (257) [62] {31}				1,300 (260) [62] {31}				1,315 (263) [63] {32}			
Suffolk	44,712	44,763	44,820	44,885	44,972 (8,994) [2,159] {1,079}				45,059 (9,012) [2,163] {1,081}				45,146 (9,029) [2,167] {1,084}			
Sullivan	1,516	1,521	1,529	1,530	1,535 (307) [74] {37}				1,542 (308) [74] {37}				1,549 (310) [74] {37}			
Tompkins	261	264	265	270	273 (55) [13] {7}				276 (55) [13] {7}				279 (56) [13] {7}			
Ulster	2,162	2,168	2,175	2,176	2,184 (437) [105] {52}				2,192 (438) [105] {53}				2,201 (440) [106] {53}			
Westchester	36,895	36,949	36,984	37,021	37,096 (7,419) [1,781] {890}				37,173 (7,435) [1,784] {892}				37,253 (7,451) [1,788] {894}			

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.