

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 8/14/20**

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 8/14/20 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.**

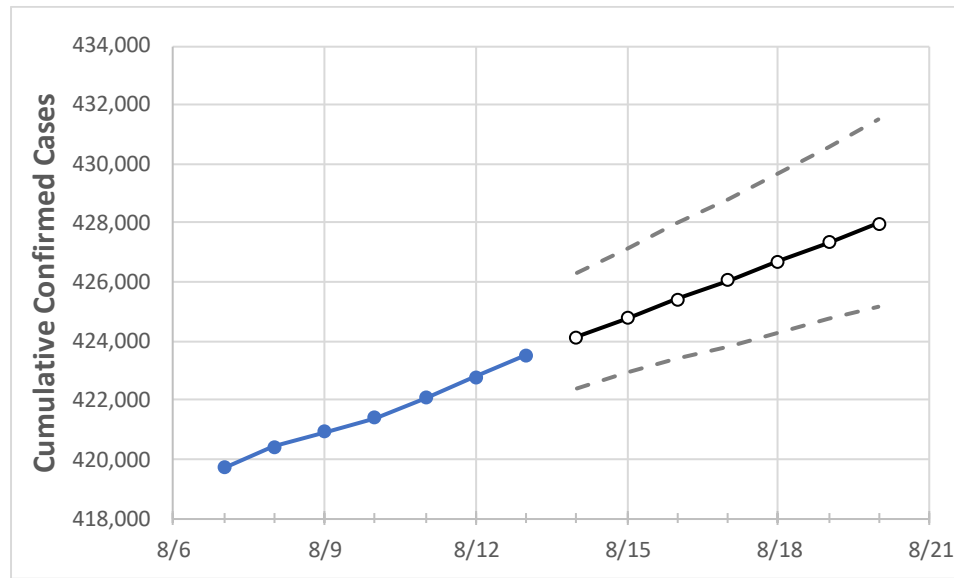
**IEM's Modeling Lead**

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:				
	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20
New York	421,405	422,072	422,772	423,509	424,140	424,772	425,407	426,044	426,683	427,324	427,966

*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:						
	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20
Albany	2,600	2,614	2,624	2,636	2,645	2,654	2,663	2,673	2,682	2,692	2,701
Bronx	50,226	50,278	50,369	50,485	50,549	50,614	50,679	50,745	50,811	50,879	50,947
Dutchess	4,613	4,619	4,631	4,640	4,652	4,663	4,675	4,687	4,700	4,713	4,726
Erie	8,918	8,987	9,013	9,033	9,069	9,106	9,142	9,179	9,216	9,254	9,291
Kings	63,223	63,308	63,410	63,542	63,628	63,716	63,804	63,893	63,982	64,073	64,164
Monroe	4,976	5,002	5,035	5,079	5,106	5,132	5,160	5,187	5,215	5,242	5,271
Nassau	43,690	43,724	43,761	43,795	43,833	43,871	43,909	43,947	43,984	44,021	44,059
New York	31,016	31,071	31,147	31,217	31,272	31,327	31,382	31,437	31,492	31,548	31,603
Niagara	1,500	1,512	1,514	1,518	1,522	1,526	1,530	1,534	1,538	1,542	1,546
Onondaga	3,585	3,602	3,613	3,627	3,636	3,645	3,653	3,662	3,670	3,678	3,687
Orange	11,168	11,180	11,191	11,210	11,218	11,226	11,233	11,241	11,249	11,257	11,265
Putnam	1,449	1,450	1,450	1,455	1,456	1,458	1,459	1,460	1,461	1,462	1,464
Queens	68,670	68,733	68,829	68,925	68,995	69,066	69,137	69,208	69,280	69,352	69,424
Rensselaer	766	770	780	782	785	788	791	795	798	801	804
Richmond	14,934	14,953	14,974	14,998	15,014	15,031	15,047	15,064	15,080	15,096	15,113
Rockland	13,949	13,954	13,966	13,973	13,980	13,986	13,993	14,000	14,007	14,013	14,020
Saratoga	760	767	768	774	777	781	784	787	791	794	797
Schenectady	1,060	1,075	1,079	1,084	1,087	1,090	1,093	1,095	1,098	1,101	1,103
Suffolk	43,844	43,893	43,948	43,987	44,040	44,094	44,148	44,201	44,255	44,309	44,363
Sullivan	1,490	1,490	1,491	1,491	1,492	1,492	1,493	1,494	1,494	1,495	1,496
Tompkins	234	234	234	234	235	235	236	236	237	237	238
Ulster	2,072	2,076	2,077	2,081	2,085	2,090	2,094	2,099	2,103	2,108	2,112
Westchester	36,233	36,272	36,324	36,357	36,388	36,419	36,450	36,481	36,513	36,545	36,577

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:							
	8/10	8/11	8/12	8/13	8/15		8/17		8/19			
Albany	2,600	2,614	2,624	2,636	2,654	(531) [127] {64}	2,673	(535) [128] {64}	2,692	(538) [129] {65}		
Bronx	50,226	50,278	50,369	50,485	50,614	(10,123) [2,429] {1,215}	50,745	(10,149) [2,436] {1,218}	50,879	(10,176) [2,442] {1,221}		
Dutchess	4,613	4,619	4,631	4,640	4,663	(933) [224] {112}	4,687	(937) [225] {112}	4,713	(943) [226] {113}		
Erie	8,918	8,987	9,013	9,033	9,106	(1,821) [437] {219}	9,179	(1,836) [441] {220}	9,254	(1,851) [444] {222}		
Kings	63,223	63,308	63,410	63,542	63,716	(12,743) [3,058] {1,529}	63,893	(12,779) [3,067] {1,533}	64,073	(12,815) [3,075] {1,538}		
Monroe	4,976	5,002	5,035	5,079	5,132	(1,026) [246] {123}	5,187	(1,037) [249] {124}	5,242	(1,048) [252] {126}		
Nassau	43,690	43,724	43,761	43,795	43,871	(8,774) [2,106] {1,053}	43,947	(8,789) [2,109] {1,055}	44,021	(8,804) [2,113] {1,057}		
New York	31,016	31,071	31,147	31,217	31,327	(6,265) [1,504] {752}	31,437	(6,287) [1,509] {754}	31,548	(6,310) [1,514] {757}		
Niagara	1,500	1,512	1,514	1,518	1,526	(305) [73] {37}	1,534	(307) [74] {37}	1,542	(308) [74] {37}		
Onondaga	3,585	3,602	3,613	3,627	3,645	(729) [175] {87}	3,662	(732) [176] {88}	3,678	(736) [177] {88}		
Orange	11,168	11,180	11,191	11,210	11,226	(2,245) [539] {269}	11,241	(2,248) [540] {270}	11,257	(2,251) [540] {270}		
Putnam	1,449	1,450	1,450	1,455	1,458	(292) [70] {35}	1,460	(292) [70] {35}	1,462	(292) [70] {35}		
Queens	68,670	68,733	68,829	68,925	69,066	(13,813) [3,315] {1,658}	69,208	(13,842) [3,322] {1,661}	69,352	(13,870) [3,329] {1,664}		
Rensselaer	766	770	780	782	788	(158) [38] {19}	795	(159) [38] {19}	801	(160) [38] {19}		
Richmond	14,934	14,953	14,974	14,998	15,031	(3,006) [721] {361}	15,064	(3,013) [723] {362}	15,096	(3,019) [725] {362}		
Rockland	13,949	13,954	13,966	13,973	13,986	(2,797) [671] {336}	14,000	(2,800) [672] {336}	14,013	(2,803) [673] {336}		
Saratoga	760	767	768	774	781	(156) [37] {19}	787	(157) [38] {19}	794	(159) [38] {19}		
Schenectady	1,060	1,075	1,079	1,084	1,090	(218) [52] {26}	1,095	(219) [53] {26}	1,101	(220) [53] {26}		
Suffolk	43,844	43,893	43,948	43,987	44,094	(8,819) [2,117] {1,058}	44,201	(8,840) [2,122] {1,061}	44,309	(8,862) [2,127] {1,063}		
Sullivan	1,490	1,490	1,491	1,491	1,492	(298) [72] {36}	1,494	(299) [72] {36}	1,495	(299) [72] {36}		
Tompkins	234	234	234	234	235	(47) [11] {6}	236	(47) [11] {6}	237	(47) [11] {6}		
Ulster	2,072	2,076	2,077	2,081	2,090	(418) [100] {50}	2,099	(420) [101] {50}	2,108	(422) [101] {51}		
Westchester	36,233	36,272	36,324	36,357	36,419	(7,284) [1,748] {874}	36,481	(7,296) [1,751] {876}	36,545	(7,309) [1,754] {877}		

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.