

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

**Date: 10/8/20**

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 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 10/8/20 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.**

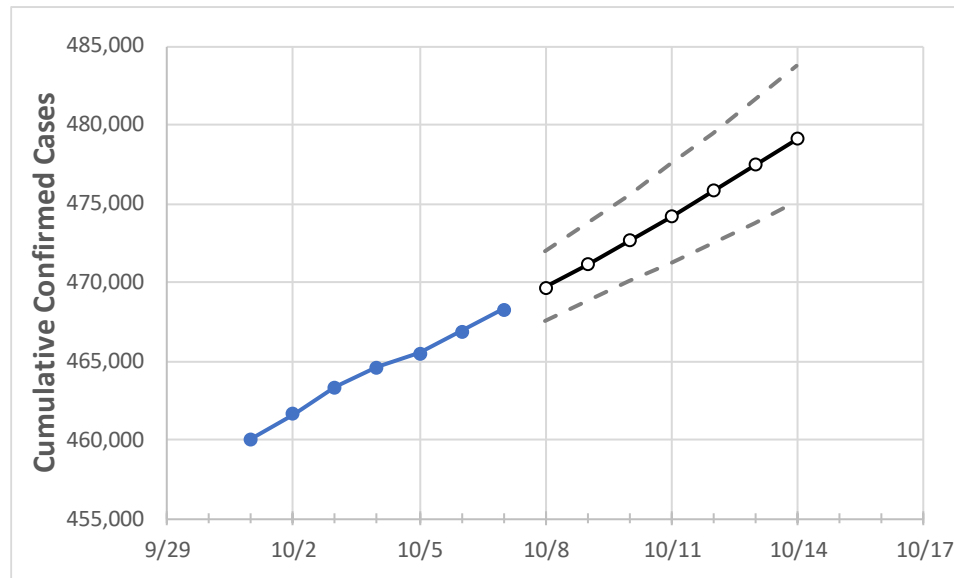
### **IEM's Modeling Lead**

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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
New York	464,582	465,515	466,908	468,268	469,678	471,133	472,634	474,182	475,779	477,426	479,125

*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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Albany	3,190	3,201	3,218	3,233	3,247	3,262	3,277	3,292	3,308	3,324	3,340
Bronx	53,353	53,417	53,501	53,556	53,623	53,691	53,761	53,832	53,904	53,977	54,052
Dutchess	5,179	5,187	5,205	5,214	5,222	5,230	5,237	5,245	5,253	5,261	5,269
Erie	11,767	11,798	11,864	11,898	11,947	11,997	12,046	12,096	12,146	12,195	12,245
Kings	69,933	70,131	70,354	70,616	70,908	71,211	71,527	71,856	72,198	72,555	72,926
Monroe	6,206	6,220	6,248	6,266	6,287	6,309	6,330	6,352	6,374	6,396	6,418
Nassau	47,246	47,302	47,392	47,516	47,606	47,697	47,791	47,886	47,984	48,083	48,185
New York	33,863	33,935	34,005	34,051	34,121	34,194	34,267	34,343	34,421	34,500	34,581
Niagara	1,828	1,834	1,840	1,842	1,848	1,854	1,860	1,867	1,873	1,879	1,886
Onondaga	4,537	4,556	4,593	4,636	4,664	4,693	4,722	4,753	4,784	4,816	4,848
Orange	12,394	12,438	12,493	12,563	12,626	12,693	12,763	12,837	12,915	12,996	13,083
Putnam	1,650	1,652	1,656	1,661	1,666	1,672	1,677	1,683	1,689	1,695	1,702
Queens	73,131	73,245	73,383	73,537	73,681	73,829	73,983	74,141	74,305	74,474	74,649
Rensselaer	944	945	952	957	962	967	972	978	984	990	996
Richmond	16,137	16,157	16,209	16,240	16,276	16,314	16,353	16,392	16,433	16,475	16,519
Rockland	16,016	16,071	16,190	16,256	16,378	16,508	16,645	16,792	16,947	17,113	17,288
Saratoga	1,095	1,100	1,103	1,111	1,118	1,125	1,132	1,139	1,146	1,153	1,160
Schenectady	1,429	1,430	1,430	1,432	1,434	1,435	1,437	1,438	1,439	1,441	1,442
Suffolk	46,842	46,891	46,980	47,089	47,153	47,219	47,285	47,353	47,422	47,493	47,565
Sullivan	1,615	1,616	1,623	1,629	1,633	1,636	1,640	1,645	1,649	1,653	1,658
Tompkins	445	451	455	458	461	465	468	472	476	479	483
Ulster	2,315	2,324	2,329	2,335	2,342	2,349	2,357	2,365	2,373	2,383	2,392
Westchester	38,475	38,515	38,567	38,628	38,684	38,741	38,798	38,857	38,917	38,978	39,040

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:							
	10/4	10/5	10/6	10/7	10/9		10/11		10/13			
Albany	3,190	3,201	3,218	3,233	3,262	(652) [157] {78}	3,292	(658) [158] {79}	3,324	(665) [160] {80}		
Bronx	53,353	53,417	53,501	53,556	53,691	(10,738) [2,577] {1,289}	53,832	(10,766) [2,584] {1,292}	53,977	(10,795) [2,591] {1,295}		
Dutchess	5,179	5,187	5,205	5,214	5,230	(1,046) [251] {126}	5,245	(1,049) [252] {126}	5,261	(1,052) [253] {126}		
Erie	11,767	11,798	11,864	11,898	11,997	(2,399) [576] {288}	12,096	(2,419) [581] {290}	12,195	(2,439) [585] {293}		
Kings	69,933	70,131	70,354	70,616	71,211	(14,242) [3,418] {1,709}	71,856	(14,371) [3,449] {1,725}	72,555	(14,511) [3,483] {1,741}		
Monroe	6,206	6,220	6,248	6,266	6,309	(1,262) [303] {151}	6,352	(1,270) [305] {152}	6,396	(1,279) [307] {153}		
Nassau	47,246	47,302	47,392	47,516	47,697	(9,539) [2,289] {1,145}	47,886	(9,577) [2,299] {1,149}	48,083	(9,617) [2,308] {1,154}		
New York	33,863	33,935	34,005	34,051	34,194	(6,839) [1,641] {821}	34,343	(6,869) [1,648] {824}	34,500	(6,900) [1,656] {828}		
Niagara	1,828	1,834	1,840	1,842	1,854	(371) [89] {44}	1,867	(373) [90] {45}	1,879	(376) [90] {45}		
Onondaga	4,537	4,556	4,593	4,636	4,693	(939) [225] {113}	4,753	(951) [228] {114}	4,816	(963) [231] {116}		
Orange	12,394	12,438	12,493	12,563	12,693	(2,539) [609] {305}	12,837	(2,567) [616] {308}	12,996	(2,599) [624] {312}		
Putnam	1,650	1,652	1,656	1,661	1,672	(334) [80] {40}	1,683	(337) [81] {40}	1,695	(339) [81] {41}		
Queens	73,131	73,245	73,383	73,537	73,829	(14,766) [3,544] {1,772}	74,141	(14,828) [3,559] {1,779}	74,474	(14,895) [3,575] {1,787}		
Rensselaer	944	945	952	957	967	(193) [46] {23}	978	(196) [47] {23}	990	(198) [48] {24}		
Richmond	16,137	16,157	16,209	16,240	16,314	(3,263) [783] {392}	16,392	(3,278) [787] {393}	16,475	(3,295) [791] {395}		
Rockland	16,016	16,071	16,190	16,256	16,508	(3,302) [792] {396}	16,792	(3,358) [806] {403}	17,113	(3,423) [821] {411}		
Saratoga	1,095	1,100	1,103	1,111	1,125	(225) [54] {27}	1,139	(228) [55] {27}	1,153	(231) [55] {28}		
Schenectady	1,429	1,430	1,430	1,432	1,435	(287) [69] {34}	1,438	(288) [69] {35}	1,441	(288) [69] {35}		
Suffolk	46,842	46,891	46,980	47,089	47,219	(9,444) [2,266] {1,133}	47,353	(9,471) [2,273] {1,136}	47,493	(9,499) [2,280] {1,140}		
Sullivan	1,615	1,616	1,623	1,629	1,636	(327) [79] {39}	1,645	(329) [79] {39}	1,653	(331) [79] {40}		
Tompkins	445	451	455	458	465	(93) [22] {11}	472	(94) [23] {11}	479	(96) [23] {12}		
Ulster	2,315	2,324	2,329	2,335	2,349	(470) [113] {56}	2,365	(473) [114] {57}	2,383	(477) [114] {57}		
Westchester	38,475	38,515	38,567	38,628	38,741	(7,748) [1,860] {930}	38,857	(7,771) [1,865] {933}	38,978	(7,796) [1,871] {935}		

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.