

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 4/26/21**

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 4/26/21 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.**

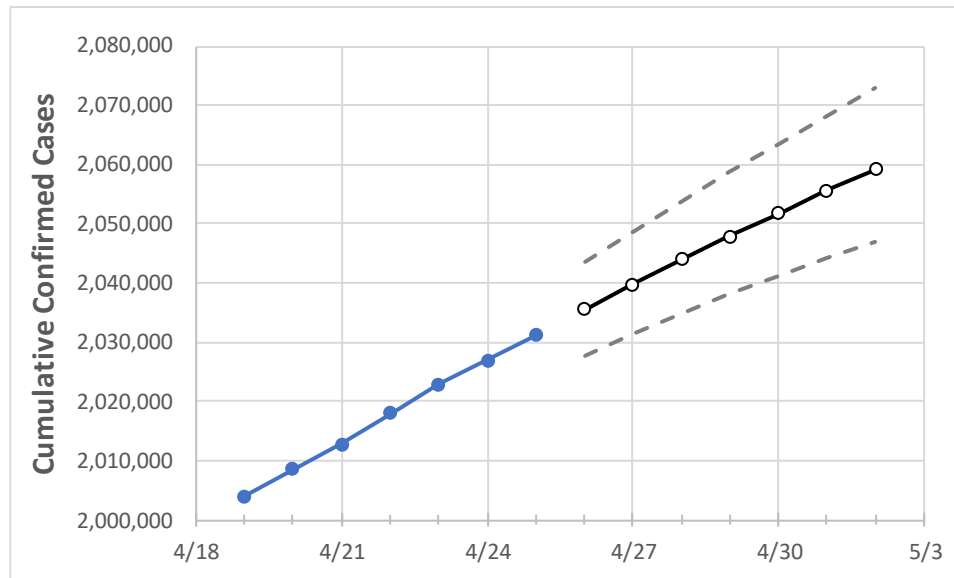
**IEM's Modeling Lead**

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:					
	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	
New York	2,018,044	2,022,891	2,027,029	2,031,093	2,035,501	2,039,762	2,043,948	2,047,934	2,051,830	2,055,580	2,059,256	

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

## New York Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2
Albany	23,870	23,914	23,952	23,976	24,021	24,064	24,108	24,151	24,193	24,234	24,274
Bronx	176,494	176,870	177,160	177,489	177,819	178,132	178,443	178,743	179,032	179,316	179,589
Dutchess	28,213	28,267	28,333	28,392	28,449	28,504	28,558	28,610	28,660	28,709	28,755
Erie	83,918	84,353	84,625	84,866	85,233	85,597	85,951	86,310	86,662	87,005	87,347
Kings	267,936	268,600	269,241	269,887	270,588	271,266	271,931	272,575	273,202	273,814	274,398
Monroe	62,001	62,271	62,455	62,728	62,992	63,262	63,537	63,808	64,084	64,354	64,637
Nassau	178,512	178,834	179,117	179,350	179,624	179,892	180,147	180,392	180,635	180,864	181,084
New York	133,306	133,594	133,818	134,070	134,330	134,576	134,821	135,050	135,275	135,494	135,702
Niagara	18,536	18,642	18,710	18,770	18,848	18,926	19,006	19,083	19,159	19,236	19,311
Onondaga	36,344	36,472	36,536	36,643	36,740	36,836	36,934	37,032	37,130	37,226	37,323
Orange	46,540	46,622	46,734	46,818	46,908	46,995	47,079	47,161	47,239	47,315	47,390
Putnam	10,301	10,316	10,344	10,362	10,382	10,402	10,421	10,440	10,458	10,475	10,493
Queens	266,379	266,950	267,449	267,966	268,516	269,043	269,562	270,048	270,528	270,993	271,432
Rensselaer	10,776	10,802	10,811	10,823	10,846	10,868	10,890	10,910	10,930	10,949	10,968
Richmond	71,608	71,788	71,976	72,136	72,315	72,493	72,666	72,834	72,998	73,160	73,317
Rockland	45,922	46,001	46,049	46,083	46,134	46,183	46,231	46,277	46,321	46,362	46,402
Saratoga	14,550	14,585	14,611	14,635	14,667	14,699	14,729	14,758	14,786	14,814	14,841
Schenectady	12,505	12,531	12,553	12,575	12,599	12,622	12,646	12,669	12,691	12,713	12,735
Suffolk	194,868	195,209	195,534	195,864	196,192	196,515	196,822	197,122	197,405	197,679	197,947
Sullivan	6,235	6,264	6,295	6,320	6,344	6,369	6,393	6,417	6,440	6,463	6,486
Tompkins	4,087	4,096	4,109	4,113	4,120	4,126	4,133	4,139	4,145	4,151	4,157
Ulster	13,205	13,251	13,287	13,323	13,360	13,397	13,433	13,468	13,503	13,538	13,571
Westchester	126,494	126,706	126,896	127,046	127,227	127,397	127,565	127,725	127,882	128,030	128,179

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:											
	4/22	4/23	4/24	4/25	4/27				4/29				5/1			
Albany	23,870	23,914	23,952	23,976	24,064	(4,813)	[1,155]	{578}	24,151	(4,830)	[1,159]	{580}	24,234	(4,847)	[1,163]	{582}
Bronx	176,494	176,870	177,160	177,489	178,132	(35,626)	[8,550]	{4,275}	178,743	(35,749)	[8,580]	{4,290}	179,316	(35,863)	[8,607]	{4,304}
Dutchess	28,213	28,267	28,333	28,392	28,504	(5,701)	[1,368]	{684}	28,610	(5,722)	[1,373]	{687}	28,709	(5,742)	[1,378]	{689}
Erie	83,918	84,353	84,625	84,866	85,597	(17,119)	[4,109]	{2,054}	86,310	(17,262)	[4,143]	{2,071}	87,005	(17,401)	[4,176]	{2,088}
Kings	267,936	268,600	269,241	269,887	271,266	(54,253)	[13,021]	{6,510}	272,575	(54,515)	[13,084]	{6,542}	273,814	(54,763)	[13,143]	{6,572}
Monroe	62,001	62,271	62,455	62,728	63,262	(12,652)	[3,037]	{1,518}	63,808	(12,762)	[3,063]	{1,531}	64,354	(12,871)	[3,089]	{1,544}
Nassau	178,512	178,834	179,117	179,350	179,892	(35,978)	[8,635]	{4,317}	180,392	(36,078)	[8,659]	{4,329}	180,864	(36,173)	[8,681]	{4,341}
New York	133,306	133,594	133,818	134,070	134,576	(26,915)	[6,460]	{3,230}	135,050	(27,010)	[6,482]	{3,241}	135,494	(27,099)	[6,504]	{3,252}
Niagara	18,536	18,642	18,710	18,770	18,926	(3,785)	[908]	{454}	19,083	(3,817)	[916]	{458}	19,236	(3,847)	[923]	{462}
Onondaga	36,344	36,472	36,536	36,643	36,836	(7,367)	[1,768]	{884}	37,032	(7,406)	[1,778]	{889}	37,226	(7,445)	[1,787]	{893}
Orange	46,540	46,622	46,734	46,818	46,995	(9,399)	[2,256]	{1,128}	47,161	(9,432)	[2,264]	{1,132}	47,315	(9,463)	[2,271]	{1,136}
Putnam	10,301	10,316	10,344	10,362	10,402	(2,080)	[499]	{250}	10,440	(2,088)	[501]	{251}	10,475	(2,095)	[503]	{251}
Queens	266,379	266,950	267,449	267,966	269,043	(53,809)	[12,914]	{6,457}	270,048	(54,010)	[12,962]	{6,481}	270,993	(54,199)	[13,008]	{6,504}
Rensselaer	10,776	10,802	10,811	10,823	10,868	(2,174)	[522]	{261}	10,910	(2,182)	[524]	{262}	10,949	(2,190)	[526]	{263}
Richmond	71,608	71,788	71,976	72,136	72,493	(14,499)	[3,480]	{1,740}	72,834	(14,567)	[3,496]	{1,748}	73,160	(14,632)	[3,512]	{1,756}
Rockland	45,922	46,001	46,049	46,083	46,183	(9,237)	[2,217]	{1,108}	46,277	(9,255)	[2,221]	{1,111}	46,362	(9,272)	[2,225]	{1,113}
Saratoga	14,550	14,585	14,611	14,635	14,699	(2,940)	[706]	{353}	14,758	(2,952)	[708]	{354}	14,814	(2,963)	[711]	{356}
Schenectady	12,505	12,531	12,553	12,575	12,622	(2,524)	[606]	{303}	12,669	(2,534)	[608]	{304}	12,713	(2,543)	[610]	{305}
Suffolk	194,868	195,209	195,534	195,864	196,515	(39,303)	[9,433]	{4,716}	197,122	(39,424)	[9,462]	{4,731}	197,679	(39,536)	[9,489]	{4,744}
Sullivan	6,235	6,264	6,295	6,320	6,369	(1,274)	[306]	{153}	6,417	(1,283)	[308]	{154}	6,463	(1,293)	[310]	{155}
Tompkins	4,087	4,096	4,109	4,113	4,126	(825)	[198]	{99}	4,139	(828)	[199]	{99}	4,151	(830)	[199]	{100}
Ulster	13,205	13,251	13,287	13,323	13,397	(2,679)	[643]	{322}	13,468	(2,694)	[646]	{323}	13,538	(2,708)	[650]	{325}
Westchester	126,494	126,706	126,896	127,046	127,397	(25,479)	[6,115]	{3,058}	127,725	(25,545)	[6,131]	{3,065}	128,030	(25,606)	[6,145]	{3,073}

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.