

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 7/23/21**

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 7/23/21 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.**

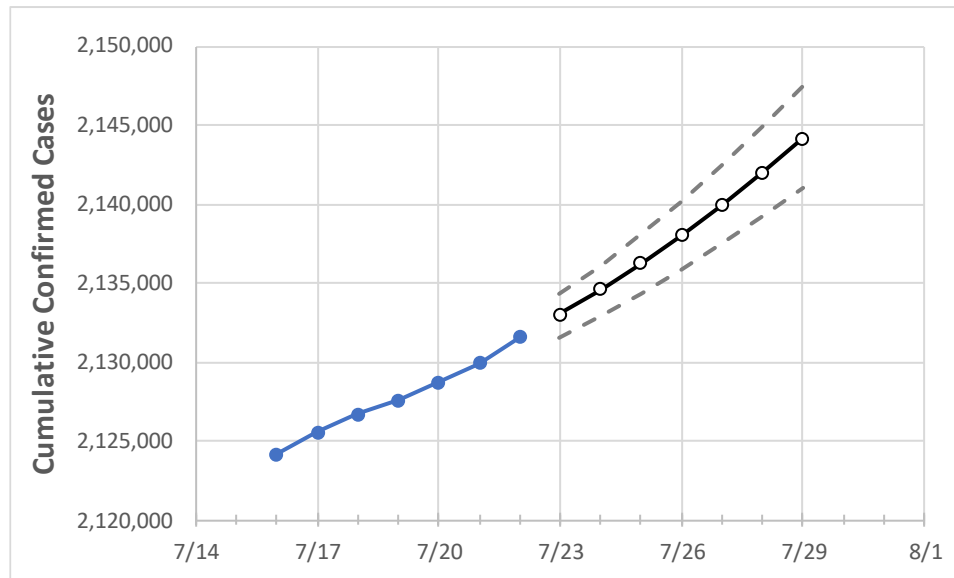
**IEM's Modeling Lead**

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:						
	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29
New York	2,127,592	2,128,710	2,129,897	2,131,535	2,133,016	2,134,583	2,136,258	2,138,033	2,139,936	2,141,991	2,144,144

*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:						
	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29
Albany	24,823	24,831	24,842	24,859	24,873	24,889	24,906	24,924	24,945	24,967	24,991
Bronx	185,036	185,133	185,191	185,332	185,437	185,546	185,662	185,783	185,910	186,049	186,196
Dutchess	29,632	29,641	29,656	29,675	29,691	29,708	29,728	29,748	29,770	29,794	29,819
Erie	89,976	90,009	90,050	90,090	90,126	90,165	90,205	90,249	90,296	90,347	90,400
Kings	283,685	283,941	284,128	284,460	284,763	285,090	285,445	285,816	286,220	286,660	287,125
Monroe	69,463	69,481	69,502	69,534	69,556	69,578	69,601	69,624	69,649	69,674	69,700
Nassau	185,134	185,235	185,373	185,525	185,672	185,833	186,003	186,188	186,388	186,603	186,835
New York	140,314	140,434	140,630	140,855	141,049	141,260	141,487	141,728	141,990	142,269	142,566
Niagara	20,129	20,137	20,142	20,154	20,162	20,171	20,181	20,191	20,202	20,214	20,227
Onondaga	39,212	39,228	39,242	39,253	39,264	39,275	39,286	39,298	39,309	39,322	39,334
Orange	48,612	48,628	48,667	48,705	48,731	48,758	48,787	48,818	48,852	48,887	48,925
Putnam	10,657	10,659	10,662	10,667	10,670	10,673	10,676	10,679	10,683	10,686	10,690
Queens	279,746	279,873	279,995	280,204	280,384	280,576	280,782	280,996	281,222	281,461	281,714
Rensselaer	11,305	11,311	11,314	11,320	11,327	11,334	11,342	11,350	11,359	11,368	11,378
Richmond	76,147	76,188	76,233	76,314	76,379	76,447	76,519	76,593	76,672	76,754	76,839
Rockland	47,236	47,247	47,258	47,269	47,280	47,291	47,303	47,314	47,325	47,337	47,349
Saratoga	15,487	15,498	15,511	15,524	15,538	15,553	15,570	15,588	15,607	15,629	15,653
Schenectady	13,245	13,250	13,259	13,263	13,267	13,272	13,277	13,282	13,287	13,293	13,300
Suffolk	202,363	202,460	202,585	202,711	202,837	202,974	203,122	203,281	203,453	203,638	203,841
Sullivan	6,718	6,721	6,722	6,728	6,730	6,732	6,734	6,736	6,738	6,740	6,743
Tompkins	4,378	4,379	4,379	4,380	4,381	4,382	4,383	4,384	4,384	4,385	4,386
Ulster	14,001	14,004	14,013	14,020	14,027	14,034	14,042	14,050	14,059	14,068	14,077
Westchester	130,421	130,472	130,528	130,591	130,658	130,728	130,803	130,883	130,968	131,058	131,154

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:											
	7/19	7/20	7/21	7/22	7/24				7/26				7/28			
Albany	24,823	24,831	24,842	24,859	24,889	(4,978)	[1,195]	{597}	24,924	(4,985)	[1,196]	{598}	24,967	(4,993)	[1,198]	{599}
Bronx	185,036	185,133	185,191	185,332	185,546	(37,109)	[8,906]	{4,453}	185,783	(37,157)	[8,918]	{4,459}	186,049	(37,210)	[8,930]	{4,465}
Dutchess	29,632	29,641	29,656	29,675	29,708	(5,942)	[1,426]	{713}	29,748	(5,950)	[1,428]	{714}	29,794	(5,959)	[1,430]	{715}
Erie	89,976	90,009	90,050	90,090	90,165	(18,033)	[4,328]	{2,164}	90,249	(18,050)	[4,332]	{2,166}	90,347	(18,069)	[4,337]	{2,168}
Kings	283,685	283,941	284,128	284,460	285,090	(57,018)	[13,684]	{6,842}	285,816	(57,163)	[13,719]	{6,860}	286,660	(57,332)	[13,760]	{6,880}
Monroe	69,463	69,481	69,502	69,534	69,578	(13,916)	[3,340]	{1,670}	69,624	(13,925)	[3,342]	{1,671}	69,674	(13,935)	[3,344]	{1,672}
Nassau	185,134	185,235	185,373	185,525	185,833	(37,167)	[8,920]	{4,460}	186,188	(37,238)	[8,937]	{4,469}	186,603	(37,321)	[8,957]	{4,478}
New York	140,314	140,434	140,630	140,855	141,260	(28,252)	[6,780]	{3,390}	141,728	(28,346)	[6,803]	{3,401}	142,269	(28,454)	[6,829]	{3,414}
Niagara	20,129	20,137	20,142	20,154	20,171	(4,034)	[968]	{484}	20,191	(4,038)	[969]	{485}	20,214	(4,043)	[970]	{485}
Onondaga	39,212	39,228	39,242	39,253	39,275	(7,855)	[1,885]	{943}	39,298	(7,860)	[1,886]	{943}	39,322	(7,864)	[1,887]	{944}
Orange	48,612	48,628	48,667	48,705	48,758	(9,752)	[2,340]	{1,170}	48,818	(9,764)	[2,343]	{1,172}	48,887	(9,777)	[2,347]	{1,173}
Putnam	10,657	10,659	10,662	10,667	10,673	(2,135)	[512]	{256}	10,679	(2,136)	[513]	{256}	10,686	(2,137)	[513]	{256}
Queens	279,746	279,873	279,995	280,204	280,576	(56,115)	[13,468]	{6,734}	280,996	(56,199)	[13,488]	{6,744}	281,461	(56,292)	[13,510]	{6,755}
Rensselaer	11,305	11,311	11,314	11,320	11,334	(2,267)	[544]	{272}	11,350	(2,270)	[545]	{272}	11,368	(2,274)	[546]	{273}
Richmond	76,147	76,188	76,233	76,314	76,447	(15,289)	[3,669]	{1,835}	76,593	(15,319)	[3,676]	{1,838}	76,754	(15,351)	[3,684]	{1,842}
Rockland	47,236	47,247	47,258	47,269	47,291	(9,458)	[2,270]	{1,135}	47,314	(9,463)	[2,271]	{1,136}	47,337	(9,467)	[2,272]	{1,136}
Saratoga	15,487	15,498	15,511	15,524	15,553	(3,111)	[747]	{373}	15,588	(3,118)	[748]	{374}	15,629	(3,126)	[750]	{375}
Schenectady	13,245	13,250	13,259	13,263	13,272	(2,654)	[637]	{319}	13,282	(2,656)	[638]	{319}	13,293	(2,659)	[638]	{319}
Suffolk	202,363	202,460	202,585	202,711	202,974	(40,595)	[9,743]	{4,871}	203,281	(40,656)	[9,758]	{4,879}	203,638	(40,728)	[9,775]	{4,887}
Sullivan	6,718	6,721	6,722	6,728	6,732	(1,346)	[323]	{162}	6,736	(1,347)	[323]	{162}	6,740	(1,348)	[324]	{162}
Tompkins	4,378	4,379	4,379	4,380	4,382	(876)	[210]	{105}	4,384	(877)	[210]	{105}	4,385	(877)	[211]	{105}
Ulster	14,001	14,004	14,013	14,020	14,034	(2,807)	[674]	{337}	14,050	(2,810)	[674]	{337}	14,068	(2,814)	[675]	{338}
Westchester	130,421	130,472	130,528	130,591	130,728	(26,146)	[6,275]	{3,137}	130,883	(26,177)	[6,282]	{3,141}	131,058	(26,212)	[6,291]	{3,145}

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.