

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 9/20/21**

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 9/20/21 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.**

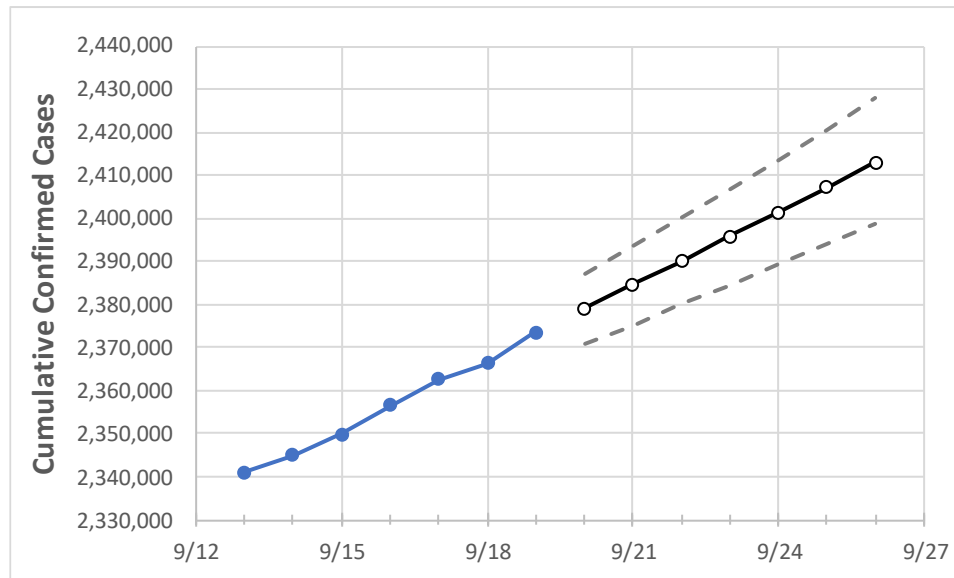
**IEM's Modeling Lead**

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:					
	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	
New York	2,356,680	2,362,682	2,366,441	2,373,659	2,379,125	2,384,644	2,390,023	2,395,842	2,401,350	2,407,179	2,413,005	

*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:						
	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26
Albany	28,004	28,073	28,164	28,239	28,313	28,387	28,462	28,536	28,616	28,693	28,770
Bronx	200,396	200,669	200,959	201,249	201,507	201,776	202,038	202,303	202,563	202,826	203,089
Dutchess	33,342	33,437	33,516	33,589	33,676	33,765	33,854	33,942	34,032	34,127	34,217
Erie	97,813	98,063	98,209	98,475	98,711	98,950	99,186	99,439	99,690	99,948	100,206
Kings	314,752	315,502	316,218	316,934	317,635	318,336	319,062	319,799	320,542	321,313	322,093
Monroe	76,999	77,196	77,364	77,583	77,770	77,961	78,143	78,336	78,526	78,726	78,917
Nassau	204,542	205,019	205,391	205,748	206,148	206,536	206,930	207,333	207,736	208,145	208,546
New York	159,533	159,919	160,392	160,774	161,142	161,506	161,882	162,260	162,631	163,022	163,408
Niagara	21,819	21,881	21,932	22,005	22,067	22,128	22,192	22,258	22,325	22,396	22,464
Onondaga	44,884	45,101	45,229	45,436	45,623	45,809	45,998	46,191	46,387	46,594	46,787
Orange	53,937	54,045	54,147	54,237	54,348	54,463	54,574	54,687	54,800	54,915	55,029
Putnam	11,676	11,705	11,742	11,765	11,788	11,813	11,837	11,861	11,886	11,911	11,936
Queens	302,979	303,500	303,984	304,468	304,920	305,383	305,854	306,315	306,792	307,281	307,774
Rensselaer	13,038	13,084	13,126	13,180	13,226	13,272	13,318	13,364	13,411	13,458	13,506
Richmond	84,765	84,968	85,139	85,309	85,470	85,629	85,789	85,947	86,107	86,271	86,430
Rockland	50,360	50,441	50,497	50,600	50,682	50,767	50,851	50,940	51,029	51,120	51,211
Saratoga	18,150	18,186	18,254	18,312	18,369	18,426	18,481	18,537	18,595	18,654	18,709
Schenectady	15,038	15,071	15,123	15,162	15,200	15,239	15,278	15,316	15,357	15,397	15,437
Suffolk	224,663	225,365	225,877	226,321	226,840	227,354	227,890	228,425	228,939	229,481	230,019
Sullivan	7,688	7,717	7,740	7,765	7,790	7,815	7,840	7,865	7,891	7,917	7,943
Tompkins	5,768	5,795	5,841	5,889	5,921	5,952	5,983	6,015	6,046	6,078	6,109
Ulster	16,106	16,145	16,195	16,239	16,289	16,340	16,391	16,443	16,493	16,545	16,599
Westchester	139,859	140,025	140,204	140,362	140,529	140,688	140,854	141,013	141,180	141,345	141,510

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:											
	9/16	9/17	9/18	9/19	9/21				9/23				9/25			
Albany	28,004	28,073	28,164	28,239	28,387	(5,677)	[1,363]	{681}	28,536	(5,707)	[1,370]	{685}	28,693	(5,739)	[1,377]	{689}
Bronx	200,396	200,669	200,959	201,249	201,776	(40,355)	[9,685]	{4,843}	202,303	(40,461)	[9,711]	{4,855}	202,826	(40,565)	[9,736]	{4,868}
Dutchess	33,342	33,437	33,516	33,589	33,765	(6,753)	[1,621]	{810}	33,942	(6,788)	[1,629]	{815}	34,127	(6,825)	[1,638]	{819}
Erie	97,813	98,063	98,209	98,475	98,950	(19,790)	[4,750]	{2,375}	99,439	(19,888)	[4,773]	{2,387}	99,948	(19,990)	[4,797]	{2,399}
Kings	314,752	315,502	316,218	316,934	318,336	(63,667)	[15,280]	{7,640}	319,799	(63,960)	[15,350]	{7,675}	321,313	(64,263)	[15,423]	{7,712}
Monroe	76,999	77,196	77,364	77,583	77,961	(15,592)	[3,742]	{1,871}	78,336	(15,667)	[3,760]	{1,880}	78,726	(15,745)	[3,779]	{1,889}
Nassau	204,542	205,019	205,391	205,748	206,536	(41,307)	[9,914]	{4,957}	207,333	(41,467)	[9,952]	{4,976}	208,145	(41,629)	[9,991]	{4,995}
New York	159,533	159,919	160,392	160,774	161,506	(32,301)	[7,752]	{3,876}	162,260	(32,452)	[7,788]	{3,894}	163,022	(32,604)	[7,825]	{3,913}
Niagara	21,819	21,881	21,932	22,005	22,128	(4,426)	[1,062]	{531}	22,258	(4,452)	[1,068]	{534}	22,396	(4,479)	[1,075]	{538}
Onondaga	44,884	45,101	45,229	45,436	45,809	(9,162)	[2,199]	{1,099}	46,191	(9,238)	[2,217]	{1,109}	46,594	(9,319)	[2,237]	{1,118}
Orange	53,937	54,045	54,147	54,237	54,463	(10,893)	[2,614]	{1,307}	54,687	(10,937)	[2,625]	{1,312}	54,915	(10,983)	[2,636]	{1,318}
Putnam	11,676	11,705	11,742	11,765	11,813	(2,363)	[567]	{284}	11,861	(2,372)	[569]	{285}	11,911	(2,382)	[572]	{286}
Queens	302,979	303,500	303,984	304,468	305,383	(61,077)	[14,658]	{7,329}	306,315	(61,263)	[14,703]	{7,352}	307,281	(61,456)	[14,750]	{7,375}
Rensselaer	13,038	13,084	13,126	13,180	13,272	(2,654)	[637]	{319}	13,364	(2,673)	[641]	{321}	13,458	(2,692)	[646]	{323}
Richmond	84,765	84,968	85,139	85,309	85,629	(17,126)	[4,110]	{2,055}	85,947	(17,189)	[4,125]	{2,063}	86,271	(17,254)	[4,141]	{2,071}
Rockland	50,360	50,441	50,497	50,600	50,767	(10,153)	[2,437]	{1,218}	50,940	(10,188)	[2,445]	{1,223}	51,120	(10,224)	[2,454]	{1,227}
Saratoga	18,150	18,186	18,254	18,312	18,426	(3,685)	[884]	{442}	18,537	(3,707)	[890]	{445}	18,654	(3,731)	[895]	{448}
Schenectady	15,038	15,071	15,123	15,162	15,239	(3,048)	[731]	{366}	15,316	(3,063)	[735]	{368}	15,397	(3,079)	[739]	{370}
Suffolk	224,663	225,365	225,877	226,321	227,354	(45,471)	[10,913]	{5,457}	228,425	(45,685)	[10,964]	{5,482}	229,481	(45,896)	[11,015]	{5,508}
Sullivan	7,688	7,717	7,740	7,765	7,815	(1,563)	[375]	{188}	7,865	(1,573)	[378]	{189}	7,917	(1,583)	[380]	{190}
Tompkins	5,768	5,795	5,841	5,889	5,952	(1,190)	[286]	{143}	6,015	(1,203)	[289]	{144}	6,078	(1,216)	[292]	{146}
Ulster	16,106	16,145	16,195	16,239	16,340	(3,268)	[784]	{392}	16,443	(3,289)	[789]	{395}	16,545	(3,309)	[794]	{397}
Westchester	139,859	140,025	140,204	140,362	140,688	(28,138)	[6,753]	{3,377}	141,013	(28,203)	[6,769]	{3,384}	141,345	(28,269)	[6,785]	{3,392}

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.