

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/13/21**

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 9/13/21 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.

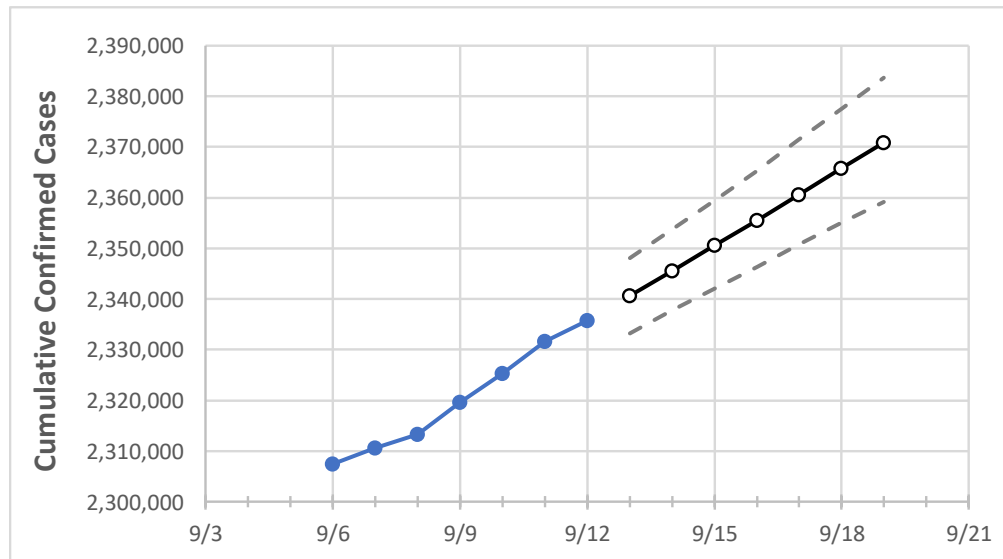
IEM's Modeling Lead

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:							
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	
New York	2,319,680	2,325,332	2,331,615	2,335,720	2,340,707	2,345,554	2,350,562	2,355,523	2,360,566	2,365,738	2,370,842	

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:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Albany	27,481	27,571	27,638	27,705	27,779	27,852	27,924	28,001	28,075	28,153	28,229
Bronx	198,414	198,770	199,126	199,126	199,404	199,686	199,967	200,252	200,530	200,803	201,090
Dutchess	32,723	32,816	32,926	33,048	33,139	33,231	33,324	33,416	33,513	33,610	33,706
Erie	96,255	96,432	96,746	96,939	97,160	97,383	97,608	97,837	98,077	98,318	98,556
Kings	310,586	311,080	311,791	311,791	312,287	312,787	313,272	313,758	314,248	314,742	315,226
Monroe	75,613	75,818	76,030	76,268	76,446	76,628	76,809	76,996	77,184	77,369	77,559
Nassau	201,651	202,196	202,573	202,967	203,351	203,724	204,102	204,476	204,862	205,241	205,629
New York	156,925	157,377	157,885	158,255	158,584	158,920	159,243	159,568	159,902	160,230	160,578
Niagara	21,447	21,497	21,549	21,590	21,642	21,695	21,748	21,803	21,859	21,917	21,975
Onondaga	43,698	43,906	44,085	44,329	44,512	44,695	44,882	45,077	45,276	45,478	45,685
Orange	53,075	53,209	53,348	53,494	53,614	53,733	53,857	53,980	54,104	54,231	54,355
Putnam	11,531	11,556	11,566	11,580	11,599	11,619	11,637	11,657	11,675	11,694	11,714
Queens	299,947	300,381	300,972	300,972	301,363	301,756	302,131	302,520	302,904	303,295	303,676
Rensselaer	12,738	12,780	12,838	12,874	12,917	12,960	13,004	13,048	13,093	13,138	13,183
Richmond	83,723	83,921	84,101	84,101	84,274	84,449	84,625	84,801	84,975	85,153	85,331
Rockland	49,780	49,823	49,894	50,015	50,081	50,150	50,219	50,287	50,358	50,428	50,498
Saratoga	17,742	17,793	17,888	17,949	18,012	18,073	18,136	18,200	18,264	18,329	18,396
Schenectady	14,774	14,809	14,854	14,885	14,921	14,958	14,994	15,029	15,066	15,103	15,139
Suffolk	221,068	221,796	222,256	222,776	223,314	223,839	224,367	224,928	225,468	226,033	226,584
Sullivan	7,522	7,549	7,578	7,602	7,626	7,651	7,675	7,700	7,724	7,750	7,776
Tompkins	5,544	5,594	5,621	5,669	5,722	5,774	5,826	5,881	5,937	5,994	6,051
Ulster	15,726	15,775	15,839	15,935	15,992	16,049	16,107	16,166	16,225	16,285	16,347
Westchester	138,583	138,883	139,048	139,198	139,366	139,540	139,706	139,874	140,044	140,217	140,384

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:											
	9/9	9/10	9/11	9/12	9/14				9/16				9/18			
Albany	27,481	27,571	27,638	27,705	27,852	(5,570)	[1,337]	{668}	28,001	(5,600)	[1,344]	{672}	28,153	(5,631)	[1,351]	{676}
Bronx	198,414	198,770	199,126	199,126	199,686	(39,937)	[9,585]	{4,792}	200,252	(40,050)	[9,612]	{4,806}	200,803	(40,161)	[9,639]	{4,819}
Dutchess	32,723	32,816	32,926	33,048	33,231	(6,646)	[1,595]	{798}	33,416	(6,683)	[1,604]	{802}	33,610	(6,722)	[1,613]	{807}
Erie	96,255	96,432	96,746	96,939	97,383	(19,477)	[4,674]	{2,337}	97,837	(19,567)	[4,696]	{2,348}	98,318	(19,664)	[4,719]	{2,360}
Kings	310,586	311,080	311,791	311,791	312,787	(62,557)	[15,014]	{7,507}	313,758	(62,752)	[15,060]	{7,530}	314,742	(62,948)	[15,108]	{7,554}
Monroe	75,613	75,818	76,030	76,268	76,628	(15,326)	[3,678]	{1,839}	76,996	(15,399)	[3,696]	{1,848}	77,369	(15,474)	[3,714]	{1,857}
Nassau	201,651	202,196	202,573	202,967	203,724	(40,745)	[9,779]	{4,889}	204,476	(40,895)	[9,815]	{4,907}	205,241	(41,048)	[9,852]	{4,926}
New York	156,925	157,377	157,885	158,255	158,920	(31,784)	[7,628]	{3,814}	159,568	(31,914)	[7,659]	{3,830}	160,230	(32,046)	[7,691]	{3,846}
Niagara	21,447	21,497	21,549	21,590	21,695	(4,339)	[1,041]	{521}	21,803	(4,361)	[1,047]	{523}	21,917	(4,383)	[1,052]	{526}
Onondaga	43,698	43,906	44,085	44,329	44,695	(8,939)	[2,145]	{1,073}	45,077	(9,015)	[2,164]	{1,082}	45,478	(9,096)	[2,183]	{1,091}
Orange	53,075	53,209	53,348	53,494	53,733	(10,747)	[2,579]	{1,290}	53,980	(10,796)	[2,591]	{1,296}	54,231	(10,846)	[2,603]	{1,302}
Putnam	11,531	11,556	11,566	11,580	11,619	(2,324)	[558]	{279}	11,657	(2,331)	[560]	{280}	11,694	(2,339)	[561]	{281}
Queens	299,947	300,381	300,972	300,972	301,756	(60,351)	[14,484]	{7,242}	302,520	(60,504)	[14,521]	{7,260}	303,295	(60,659)	[14,558]	{7,279}
Rensselaer	12,738	12,780	12,838	12,874	12,960	(2,592)	[622]	{311}	13,048	(2,610)	[626]	{313}	13,138	(2,628)	[631]	{315}
Richmond	83,723	83,921	84,101	84,101	84,449	(16,890)	[4,054]	{2,027}	84,801	(16,960)	[4,070]	{2,035}	85,153	(17,031)	[4,087]	{2,044}
Rockland	49,780	49,823	49,894	50,015	50,150	(10,030)	[2,407]	{1,204}	50,287	(10,057)	[2,414]	{1,207}	50,428	(10,086)	[2,421]	{1,210}
Saratoga	17,742	17,793	17,888	17,949	18,073	(3,615)	[868]	{434}	18,200	(3,640)	[874]	{437}	18,329	(3,666)	[880]	{440}
Schenectady	14,774	14,809	14,854	14,885	14,958	(2,992)	[718]	{359}	15,029	(3,006)	[721]	{361}	15,103	(3,021)	[725]	{362}
Suffolk	221,068	221,796	222,256	222,776	223,839	(44,768)	[10,744]	{5,372}	224,928	(44,986)	[10,797]	{5,398}	226,033	(45,207)	[10,850]	{5,425}
Sullivan	7,522	7,549	7,578	7,602	7,651	(1,530)	[367]	{184}	7,700	(1,540)	[370]	{185}	7,750	(1,550)	[372]	{186}
Tompkins	5,544	5,594	5,621	5,669	5,774	(1,155)	[277]	{139}	5,881	(1,176)	[282]	{141}	5,994	(1,199)	[288]	{144}
Ulster	15,726	15,775	15,839	15,935	16,049	(3,210)	[770]	{385}	16,166	(3,233)	[776]	{388}	16,285	(3,257)	[782]	{391}
Westchester	138,583	138,883	139,048	139,198	139,540	(27,908)	[6,698]	{3,349}	139,874	(27,975)	[6,714]	{3,357}	140,217	(28,043)	[6,730]	{3,365}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.