

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 9/15/21**

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 9/15/21 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.**

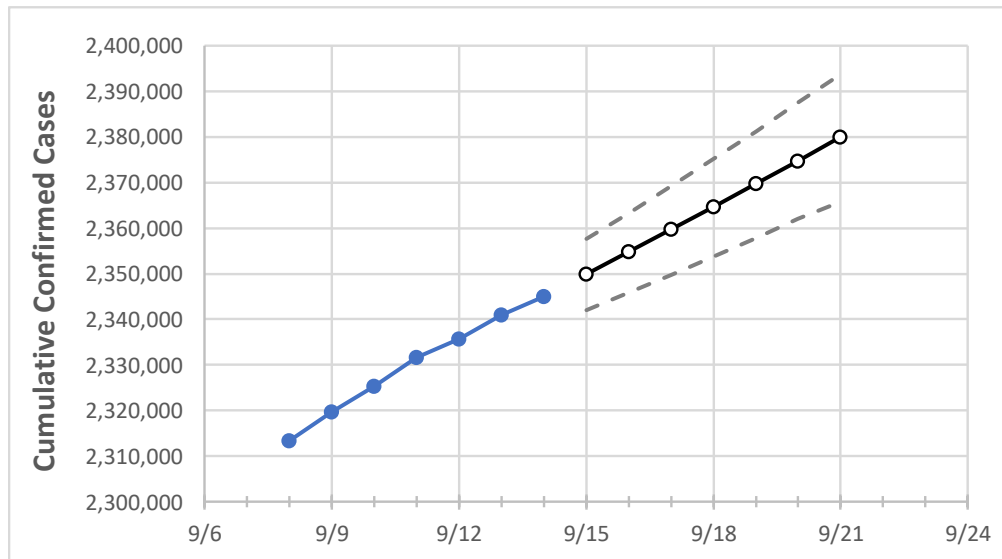
**IEM's Modeling Lead**

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:						
	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21	
New York	2,331,615	2,335,720	2,340,950	2,345,068	2,349,988	2,354,900	2,359,751	2,364,712	2,369,786	2,374,727	2,379,915	

*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:						
	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21
Albany	27,638	27,705	27,769	27,817	27,881	27,945	28,008	28,070	28,135	28,197	28,260
Bronx	199,126	199,389	199,652	199,896	200,158	200,426	200,678	200,943	201,201	201,462	201,719
Dutchess	32,926	33,048	33,101	33,179	33,269	33,357	33,450	33,543	33,635	33,730	33,821
Erie	96,746	96,939	97,137	97,252	97,461	97,669	97,883	98,099	98,321	98,547	98,765
Kings	311,791	312,348	312,904	313,392	313,903	314,420	314,922	315,441	315,942	316,456	316,960
Monroe	76,030	76,268	76,411	76,508	76,664	76,822	76,978	77,132	77,285	77,445	77,598
Nassau	202,573	202,967	203,217	203,624	203,984	204,345	204,712	205,068	205,425	205,793	206,160
New York	157,885	158,255	158,537	158,792	159,116	159,440	159,761	160,083	160,411	160,738	161,060
Niagara	21,549	21,590	21,655	21,683	21,733	21,784	21,834	21,886	21,940	21,992	22,050
Onondaga	44,085	44,329	44,435	44,486	44,646	44,803	44,965	45,127	45,303	45,475	45,642
Orange	53,348	53,494	53,579	53,663	53,774	53,885	53,993	54,103	54,217	54,327	54,441
Putnam	11,566	11,580	11,604	11,628	11,646	11,664	11,680	11,697	11,715	11,732	11,749
Queens	300,972	301,355	301,737	302,178	302,578	302,987	303,386	303,799	304,201	304,606	305,009
Rensselaer	12,838	12,874	12,913	12,944	12,985	13,026	13,067	13,108	13,150	13,190	13,232
Richmond	84,101	84,224	84,346	84,476	84,631	84,790	84,946	85,103	85,264	85,419	85,578
Rockland	49,894	50,015	50,062	50,133	50,200	50,268	50,336	50,406	50,474	50,547	50,617
Saratoga	17,888	17,949	17,988	18,033	18,090	18,149	18,205	18,262	18,318	18,376	18,432
Schenectady	14,854	14,885	14,921	14,951	14,984	15,018	15,051	15,084	15,117	15,150	15,184
Suffolk	222,256	222,776	222,987	223,543	224,036	224,517	224,997	225,486	225,961	226,470	226,946
Sullivan	7,578	7,602	7,620	7,632	7,654	7,675	7,697	7,718	7,740	7,762	7,783
Tompkins	5,621	5,669	5,683	5,690	5,721	5,754	5,783	5,813	5,843	5,872	5,900
Ulster	15,839	15,935	15,968	16,003	16,057	16,109	16,163	16,215	16,272	16,328	16,383
Westchester	139,048	139,198	139,332	139,488	139,652	139,812	139,958	140,121	140,275	140,439	140,593

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:											
	9/11	9/12	9/13	9/14	9/16				9/18				9/20			
Albany	27,638	27,705	27,769	27,817	27,945	(5,589)	[1,341]	{671}	28,070	(5,614)	[1,347]	{674}	28,197	(5,639)	[1,353]	{677}
Bronx	199,126	199,389	199,652	199,896	200,426	(40,085)	[9,620]	{4,810}	200,943	(40,189)	[9,645]	{4,823}	201,462	(40,292)	[9,670]	{4,835}
Dutchess	32,926	33,048	33,101	33,179	33,357	(6,671)	[1,601]	{801}	33,543	(6,709)	[1,610]	{805}	33,730	(6,746)	[1,619]	{810}
Erie	96,746	96,939	97,137	97,252	97,669	(19,534)	[4,688]	{2,344}	98,099	(19,620)	[4,709]	{2,354}	98,547	(19,709)	[4,730]	{2,365}
Kings	311,791	312,348	312,904	313,392	314,420	(62,884)	[15,092]	{7,546}	315,441	(63,088)	[15,141]	{7,571}	316,456	(63,291)	[15,190]	{7,595}
Monroe	76,030	76,268	76,411	76,508	76,822	(15,364)	[3,687]	{1,844}	77,132	(15,426)	[3,702]	{1,851}	77,445	(15,489)	[3,717]	{1,859}
Nassau	202,573	202,967	203,217	203,624	204,345	(40,869)	[9,809]	{4,904}	205,068	(41,014)	[9,843]	{4,922}	205,793	(41,159)	[9,878]	{4,939}
New York	157,885	158,255	158,537	158,792	159,440	(31,888)	[7,653]	{3,827}	160,083	(32,017)	[7,684]	{3,842}	160,738	(32,148)	[7,715]	{3,858}
Niagara	21,549	21,590	21,655	21,683	21,784	(4,357)	[1,046]	{523}	21,886	(4,377)	[1,051]	{525}	21,992	(4,398)	[1,056]	{528}
Onondaga	44,085	44,329	44,435	44,486	44,803	(8,961)	[2,151]	{1,075}	45,127	(9,025)	[2,166]	{1,083}	45,475	(9,095)	[2,183]	{1,091}
Orange	53,348	53,494	53,579	53,663	53,885	(10,777)	[2,586]	{1,293}	54,103	(10,821)	[2,597]	{1,298}	54,327	(10,865)	[2,608]	{1,304}
Putnam	11,566	11,580	11,604	11,628	11,664	(2,333)	[560]	{280}	11,697	(2,339)	[561]	{281}	11,732	(2,346)	[563]	{282}
Queens	300,972	301,355	301,737	302,178	302,987	(60,597)	[14,543]	{7,272}	303,799	(60,760)	[14,582]	{7,291}	304,606	(60,921)	[14,621]	{7,311}
Rensselaer	12,838	12,874	12,913	12,944	13,026	(2,605)	[625]	{313}	13,108	(2,622)	[629]	{315}	13,190	(2,638)	[633]	{317}
Richmond	84,101	84,224	84,346	84,476	84,790	(16,958)	[4,070]	{2,035}	85,103	(17,021)	[4,085]	{2,042}	85,419	(17,084)	[4,100]	{2,050}
Rockland	49,894	50,015	50,062	50,133	50,268	(10,054)	[2,413]	{1,206}	50,406	(10,081)	[2,419]	{1,210}	50,547	(10,109)	[2,426]	{1,213}
Saratoga	17,888	17,949	17,988	18,033	18,149	(3,630)	[871]	{436}	18,262	(3,652)	[877]	{438}	18,376	(3,675)	[882]	{441}
Schenectady	14,854	14,885	14,921	14,951	15,018	(3,004)	[721]	{360}	15,084	(3,017)	[724]	{362}	15,150	(3,030)	[727]	{364}
Suffolk	222,256	222,776	222,987	223,543	224,517	(44,903)	[10,777]	{5,388}	225,486	(45,097)	[10,823]	{5,412}	226,470	(45,294)	[10,871]	{5,435}
Sullivan	7,578	7,602	7,620	7,632	7,675	(1,535)	[368]	{184}	7,718	(1,544)	[370]	{185}	7,762	(1,552)	[373]	{186}
Tompkins	5,621	5,669	5,683	5,690	5,754	(1,151)	[276]	{138}	5,813	(1,163)	[279]	{140}	5,872	(1,174)	[282]	{141}
Ulster	15,839	15,935	15,968	16,003	16,109	(3,222)	[773]	{387}	16,215	(3,243)	[778]	{389}	16,328	(3,266)	[784]	{392}
Westchester	139,048	139,198	139,332	139,488	139,812	(27,962)	[6,711]	{3,355}	140,121	(28,024)	[6,726]	{3,363}	140,439	(28,088)	[6,741]	{3,371}

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.