

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/18/21**

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 10/18/21 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.

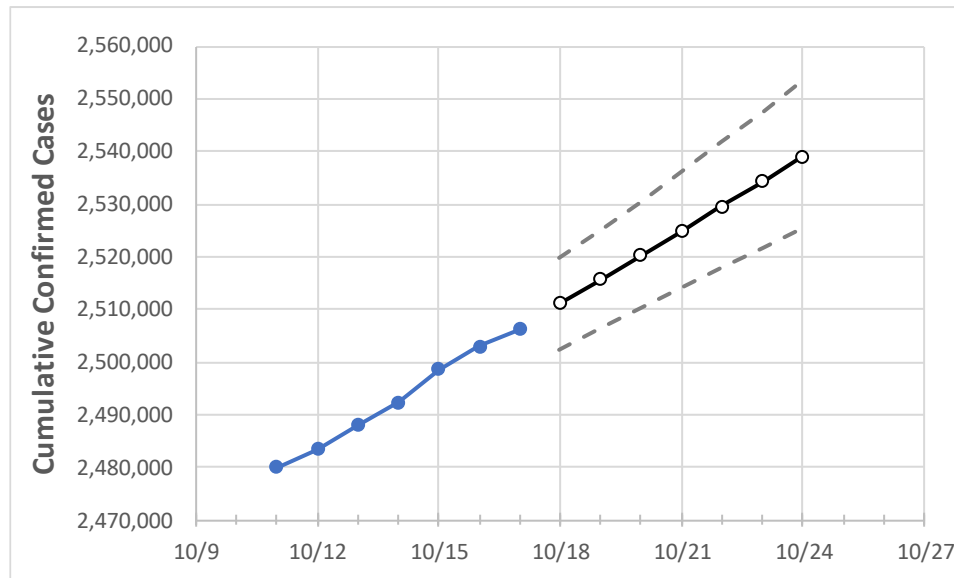
IEM's Modeling Lead

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:						
	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24
New York	2,492,423	2,498,646	2,502,914	2,506,247	2,511,062	2,515,652	2,520,330	2,524,822	2,529,499	2,534,237	2,539,072

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:						
	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24
Albany	30,214	30,319	30,443	30,510	30,596	30,682	30,767	30,857	30,944	31,039	31,124
Bronx	206,547	206,791	206,791	206,791	206,972	207,143	207,308	207,476	207,645	207,809	207,975
Dutchess	35,245	35,306	35,358	35,411	35,474	35,541	35,603	35,667	35,731	35,799	35,865
Erie	104,539	104,904	105,215	105,477	105,758	106,035	106,316	106,597	106,885	107,179	107,479
Kings	330,557	331,299	331,299	331,299	331,859	332,415	332,970	333,512	334,076	334,635	335,196
Monroe	82,767	83,033	83,299	83,519	83,757	83,998	84,233	84,477	84,724	84,970	85,217
Nassau	212,807	213,093	213,353	213,603	213,857	214,103	214,353	214,598	214,849	215,097	215,343
New York	166,797	167,058	167,308	167,492	167,688	167,892	168,089	168,285	168,482	168,680	168,875
Niagara	23,560	23,621	23,713	23,795	23,865	23,937	24,009	24,078	24,151	24,224	24,297
Onondaga	50,637	50,966	51,242	51,456	51,694	51,923	52,154	52,391	52,620	52,857	53,095
Orange	56,801	56,959	57,074	57,192	57,307	57,427	57,546	57,665	57,786	57,907	58,030
Putnam	12,358	12,385	12,405	12,420	12,445	12,470	12,494	12,520	12,545	12,570	12,597
Queens	313,314	313,827	313,827	313,827	314,139	314,446	314,755	315,057	315,364	315,672	315,970
Rensselaer	14,443	14,517	14,570	14,618	14,673	14,734	14,790	14,850	14,907	14,967	15,028
Richmond	88,141	88,293	88,293	88,293	88,391	88,489	88,586	88,684	88,778	88,878	88,971
Rockland	52,635	52,711	52,800	52,859	52,943	53,025	53,107	53,190	53,272	53,360	53,441
Saratoga	19,803	19,884	19,975	20,034	20,104	20,175	20,248	20,318	20,393	20,467	20,542
Schenectady	16,324	16,396	16,478	16,525	16,586	16,647	16,712	16,774	16,840	16,908	16,976
Suffolk	236,972	237,506	237,959	238,318	238,696	239,084	239,469	239,848	240,221	240,604	240,990
Sullivan	8,290	8,325	8,362	8,394	8,421	8,450	8,479	8,509	8,539	8,568	8,599
Tompkins	6,385	6,403	6,425	6,463	6,481	6,499	6,518	6,536	6,553	6,572	6,589
Ulster	17,091	17,120	17,148	17,179	17,210	17,243	17,275	17,306	17,339	17,370	17,402
Westchester	143,100	143,201	143,310	143,388	143,481	143,572	143,661	143,752	143,844	143,933	144,018

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:											
	10/14	10/15	10/16	10/17	10/19				10/21				10/23			
Albany	30,214	30,319	30,443	30,510	30,682	(6,136)	[1,473]	{736}	30,857	(6,171)	[1,481]	{741}	31,039	(6,208)	[1,490]	{745}
Bronx	206,547	206,791	206,791	206,791	207,143	(41,429)	[9,943]	{4,971}	207,476	(41,495)	[9,959]	{4,979}	207,809	(41,562)	[9,975]	{4,987}
Dutchess	35,245	35,306	35,358	35,411	35,541	(7,108)	[1,706]	{853}	35,667	(7,133)	[1,712]	{856}	35,799	(7,160)	[1,718]	{859}
Erie	104,539	104,904	105,215	105,477	106,035	(21,207)	[5,090]	{2,545}	106,597	(21,319)	[5,117]	{2,558}	107,179	(21,436)	[5,145]	{2,572}
Kings	330,557	331,299	331,299	331,299	332,415	(66,483)	[15,956]	{7,978}	333,512	(66,702)	[16,009]	{8,004}	334,635	(66,927)	[16,062]	{8,031}
Monroe	82,767	83,033	83,299	83,519	83,998	(16,800)	[4,032]	{2,016}	84,477	(16,895)	[4,055]	{2,027}	84,970	(16,994)	[4,079]	{2,039}
Nassau	212,807	213,093	213,353	213,603	214,103	(42,821)	[10,277]	{5,138}	214,598	(42,920)	[10,301]	{5,150}	215,097	(43,019)	[10,325]	{5,162}
New York	166,797	167,058	167,308	167,492	167,892	(33,578)	[8,059]	{4,029}	168,285	(33,657)	[8,078]	{4,039}	168,680	(33,736)	[8,097]	{4,048}
Niagara	23,560	23,621	23,713	23,795	23,937	(4,787)	[1,149]	{574}	24,078	(4,816)	[1,156]	{578}	24,224	(4,845)	[1,163]	{581}
Onondaga	50,637	50,966	51,242	51,456	51,923	(10,385)	[2,492]	{1,246}	52,391	(10,478)	[2,515]	{1,257}	52,857	(10,571)	[2,537]	{1,269}
Orange	56,801	56,959	57,074	57,192	57,427	(11,485)	[2,756]	{1,378}	57,665	(11,533)	[2,768]	{1,384}	57,907	(11,581)	[2,780]	{1,390}
Putnam	12,358	12,385	12,405	12,420	12,470	(2,494)	[599]	{299}	12,520	(2,504)	[601]	{300}	12,570	(2,514)	[603]	{302}
Queens	313,314	313,827	313,827	313,827	314,446	(62,889)	[15,093]	{7,547}	315,057	(63,011)	[15,123]	{7,561}	315,672	(63,134)	[15,152]	{7,576}
Rensselaer	14,443	14,517	14,570	14,618	14,734	(2,947)	[707]	{354}	14,850	(2,970)	[713]	{356}	14,967	(2,993)	[718]	{359}
Richmond	88,141	88,293	88,293	88,293	88,489	(17,698)	[4,247]	{2,124}	88,684	(17,737)	[4,257]	{2,128}	88,878	(17,776)	[4,266]	{2,133}
Rockland	52,635	52,711	52,800	52,859	53,025	(10,605)	[2,545]	{1,273}	53,190	(10,638)	[2,553]	{1,277}	53,360	(10,672)	[2,561]	{1,281}
Saratoga	19,803	19,884	19,975	20,034	20,175	(4,035)	[968]	{484}	20,318	(4,064)	[975]	{488}	20,467	(4,093)	[982]	{491}
Schenectady	16,324	16,396	16,478	16,525	16,647	(3,329)	[799]	{400}	16,774	(3,355)	[805]	{403}	16,908	(3,382)	[812]	{406}
Suffolk	236,972	237,506	237,959	238,318	239,084	(47,817)	[11,476]	{5,738}	239,848	(47,970)	[11,513]	{5,756}	240,604	(48,121)	[11,549]	{5,774}
Sullivan	8,290	8,325	8,362	8,394	8,450	(1,690)	[406]	{203}	8,509	(1,702)	[408]	{204}	8,568	(1,714)	[411]	{206}
Tompkins	6,385	6,403	6,425	6,463	6,499	(1,300)	[312]	{156}	6,536	(1,307)	[314]	{157}	6,572	(1,314)	[315]	{158}
Ulster	17,091	17,120	17,148	17,179	17,243	(3,449)	[828]	{414}	17,306	(3,461)	[831]	{415}	17,370	(3,474)	[834]	{417}
Westchester	143,100	143,201	143,310	143,388	143,572	(28,714)	[6,891]	{3,446}	143,752	(28,750)	[6,900]	{3,450}	143,933	(28,787)	[6,909]	{3,454}

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.