

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/13/21**

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 10/13/21 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.

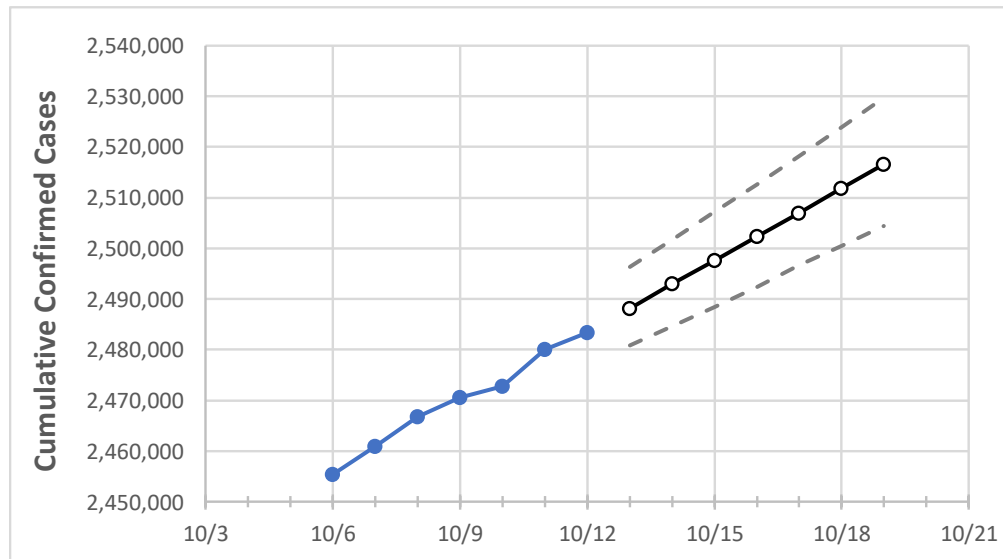
IEM's Modeling Lead

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:							
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	
New York	2,470,550	2,472,757	2,480,082	2,483,362	2,488,135	2,492,958	2,497,532	2,502,315	2,506,983	2,511,840	2,516,570	

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:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
Albany	29,852	29,893	29,993	30,035	30,116	30,196	30,277	30,356	30,438	30,518	30,602
Bronx	205,790	205,958	206,126	206,258	206,455	206,646	206,841	207,035	207,228	207,417	207,604
Dutchess	34,935	34,946	35,033	35,094	35,160	35,225	35,290	35,351	35,417	35,484	35,547
Erie	103,449	103,604	103,881	104,039	104,299	104,560	104,821	105,084	105,354	105,626	105,890
Kings	328,270	328,792	329,313	329,648	330,185	330,707	331,240	331,768	332,295	332,819	333,352
Monroe	81,720	81,834	82,091	82,258	82,471	82,691	82,907	83,126	83,345	83,567	83,789
Nassau	211,636	211,797	212,062	212,296	212,540	212,780	213,023	213,257	213,494	213,731	213,961
New York	165,883	166,013	166,253	166,413	166,610	166,804	166,999	167,189	167,375	167,564	167,747
Niagara	23,271	23,309	23,390	23,424	23,494	23,564	23,630	23,700	23,773	23,844	23,918
Onondaga	49,737	49,878	50,137	50,231	50,477	50,719	50,964	51,210	51,460	51,716	51,970
Orange	56,299	56,364	56,489	56,557	56,658	56,758	56,857	56,955	57,055	57,156	57,254
Putnam	12,239	12,244	12,275	12,290	12,312	12,334	12,355	12,377	12,399	12,421	12,441
Queens	312,011	312,328	312,646	312,876	313,191	313,514	313,829	314,143	314,458	314,770	315,078
Rensselaer	14,209	14,239	14,324	14,358	14,414	14,472	14,528	14,587	14,646	14,705	14,765
Richmond	87,696	87,794	87,892	87,964	88,061	88,155	88,251	88,341	88,434	88,527	88,614
Rockland	52,270	52,312	52,412	52,466	52,545	52,623	52,704	52,783	52,862	52,941	53,022
Saratoga	19,498	19,549	19,616	19,655	19,721	19,788	19,854	19,922	19,991	20,059	20,127
Schenectady	16,070	16,089	16,171	16,204	16,253	16,302	16,349	16,400	16,449	16,503	16,554
Suffolk	235,189	235,484	235,833	236,248	236,638	237,022	237,396	237,772	238,154	238,530	238,891
Sullivan	8,190	8,208	8,221	8,241	8,263	8,284	8,306	8,328	8,350	8,373	8,395
Tompkins	6,315	6,335	6,343	6,348	6,365	6,380	6,396	6,411	6,427	6,443	6,458
Ulster	16,922	16,933	16,974	17,005	17,036	17,066	17,095	17,125	17,154	17,184	17,212
Westchester	142,649	142,697	142,836	142,926	143,019	143,110	143,199	143,289	143,378	143,465	143,552

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:											
	10/9	10/10	10/11	10/12	10/14				10/16				10/18			
Albany	29,852	29,893	29,993	30,035	30,196	(6,039)	[1,449]	{725}	30,356	(6,071)	[1,457]	{729}	30,518	(6,104)	[1,465]	{732}
Bronx	205,790	205,958	206,126	206,258	206,646	(41,329)	[9,919]	{4,959}	207,035	(41,407)	[9,938]	{4,969}	207,417	(41,483)	[9,956]	{4,978}
Dutchess	34,935	34,946	35,033	35,094	35,225	(7,045)	[1,691]	{845}	35,351	(7,070)	[1,697]	{848}	35,484	(7,097)	[1,703]	{852}
Erie	103,449	103,604	103,881	104,039	104,560	(20,912)	[5,019]	{2,509}	105,084	(21,017)	[5,044]	{2,522}	105,626	(21,125)	[5,070]	{2,535}
Kings	328,270	328,792	329,313	329,648	330,707	(66,141)	[15,874]	{7,937}	331,768	(66,354)	[15,925]	{7,962}	332,819	(66,564)	[15,975]	{7,988}
Monroe	81,720	81,834	82,091	82,258	82,691	(16,538)	[3,969]	{1,985}	83,126	(16,625)	[3,990]	{1,995}	83,567	(16,713)	[4,011]	{2,006}
Nassau	211,636	211,797	212,062	212,296	212,780	(42,556)	[10,213]	{5,107}	213,257	(42,651)	[10,236]	{5,118}	213,731	(42,746)	[10,259]	{5,130}
New York	165,883	166,013	166,253	166,413	166,804	(33,361)	[8,007]	{4,003}	167,189	(33,438)	[8,025]	{4,013}	167,564	(33,513)	[8,043]	{4,022}
Niagara	23,271	23,309	23,390	23,424	23,564	(4,713)	[1,131]	{566}	23,700	(4,740)	[1,138]	{569}	23,844	(4,769)	[1,145]	{572}
Onondaga	49,737	49,878	50,137	50,231	50,719	(10,144)	[2,435]	{1,217}	51,210	(10,242)	[2,458]	{1,229}	51,716	(10,343)	[2,482]	{1,241}
Orange	56,299	56,364	56,489	56,557	56,758	(11,352)	[2,724]	{1,362}	56,955	(11,391)	[2,734]	{1,367}	57,156	(11,431)	[2,743]	{1,372}
Putnam	12,239	12,244	12,275	12,290	12,334	(2,467)	[592]	{296}	12,377	(2,475)	[594]	{297}	12,421	(2,484)	[596]	{298}
Queens	312,011	312,328	312,646	312,876	313,514	(62,703)	[15,049]	{7,524}	314,143	(62,829)	[15,079]	{7,539}	314,770	(62,954)	[15,109]	{7,554}
Rensselaer	14,209	14,239	14,324	14,358	14,472	(2,894)	[695]	{347}	14,587	(2,917)	[700]	{350}	14,705	(2,941)	[706]	{353}
Richmond	87,696	87,794	87,892	87,964	88,155	(17,631)	[4,231]	{2,116}	88,341	(17,668)	[4,240]	{2,120}	88,527	(17,705)	[4,249]	{2,125}
Rockland	52,270	52,312	52,412	52,466	52,623	(10,525)	[2,526]	{1,263}	52,783	(10,557)	[2,534]	{1,267}	52,941	(10,588)	[2,541]	{1,271}
Saratoga	19,498	19,549	19,616	19,655	19,788	(3,958)	[950]	{475}	19,922	(3,984)	[956]	{478}	20,059	(4,012)	[963]	{481}
Schenectady	16,070	16,089	16,171	16,204	16,302	(3,260)	[782]	{391}	16,400	(3,280)	[787]	{394}	16,503	(3,301)	[792]	{396}
Suffolk	235,189	235,484	235,833	236,248	237,022	(47,404)	[11,377]	{5,689}	237,772	(47,554)	[11,413]	{5,707}	238,530	(47,706)	[11,449]	{5,725}
Sullivan	8,190	8,208	8,221	8,241	8,284	(1,657)	[398]	{199}	8,328	(1,666)	[400]	{200}	8,373	(1,675)	[402]	{201}
Tompkins	6,315	6,335	6,343	6,348	6,380	(1,276)	[306]	{153}	6,411	(1,282)	[308]	{154}	6,443	(1,289)	[309]	{155}
Ulster	16,922	16,933	16,974	17,005	17,066	(3,413)	[819]	{410}	17,125	(3,425)	[822]	{411}	17,184	(3,437)	[825]	{412}
Westchester	142,649	142,697	142,836	142,926	143,110	(28,622)	[6,869]	{3,435}	143,289	(28,658)	[6,878]	{3,439}	143,465	(28,693)	[6,886]	{3,443}

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.