

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 3/29/22**

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 3/29/22 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.

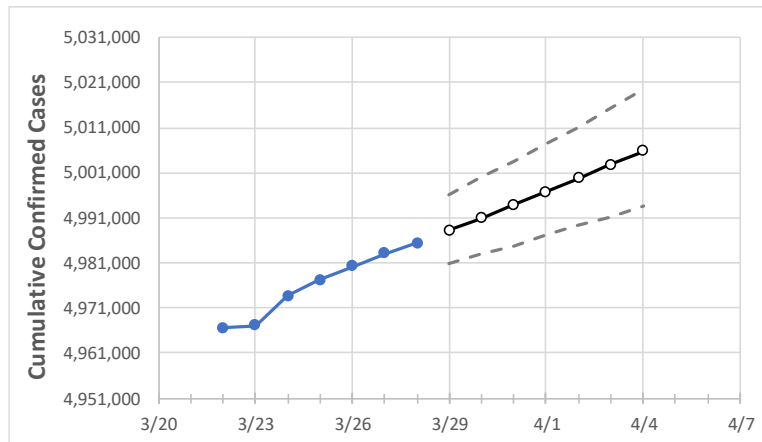
IEM's Modeling Lead

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
New York	4,977,256	4,980,210	4,983,164	4,985,450	4,988,172	4,990,982	4,993,863	4,996,732	4,999,843	5,002,871	5,005,792

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Albany	58,625	58,658	58,691	58,719	58,749	58,779	58,809	58,840	58,870	58,902	58,933
Bronx	406,297	406,410	406,523	406,626	406,734	406,844	406,953	407,065	407,180	407,297	407,414
Dutchess	63,669	63,698	63,726	63,747	63,770	63,793	63,815	63,839	63,862	63,886	63,909
Erie	207,516	207,609	207,702	207,777	207,862	207,948	208,035	208,121	208,209	208,298	208,389
Kings	692,762	693,193	693,624	693,982	694,412	694,851	695,290	695,740	696,199	696,679	697,155
Monroe	150,623	150,727	150,830	150,903	150,986	151,072	151,157	151,244	151,334	151,426	151,524
Nassau	401,433	401,643	401,853	401,999	402,184	402,372	402,564	402,758	402,960	403,165	403,371
New York	409,960	410,447	410,933	411,190	411,660	412,139	412,599	413,107	413,609	414,125	414,646
Niagara	47,645	47,666	47,687	47,706	47,726	47,747	47,768	47,789	47,810	47,831	47,853
Onondaga	110,775	110,968	111,161	111,323	111,565	111,817	112,057	112,317	112,589	112,860	113,138
Orange	109,638	109,706	109,775	109,843	109,889	109,933	109,980	110,029	110,074	110,123	110,171
Putnam	23,482	23,494	23,505	23,516	23,526	23,537	23,547	23,558	23,568	23,579	23,591
Queens	638,319	638,556	638,792	638,973	639,180	639,398	639,617	639,837	640,059	640,291	640,521
Rensselaer	31,177	31,194	31,210	31,219	31,231	31,243	31,255	31,266	31,278	31,290	31,301
Richmond	165,095	165,161	165,226	165,273	165,325	165,375	165,426	165,477	165,529	165,582	165,635
Rockland	91,871	91,909	91,947	91,979	92,019	92,060	92,100	92,141	92,184	92,228	92,272
Saratoga	45,802	45,828	45,854	45,873	45,900	45,928	45,954	45,981	46,008	46,035	46,061
Schenectady	32,705	32,730	32,755	32,777	32,797	32,816	32,836	32,856	32,876	32,898	32,919
Suffolk	424,974	425,121	425,268	425,373	425,492	425,610	425,732	425,851	425,975	426,096	426,218
Sullivan	18,309	18,315	18,320	18,321	18,325	18,329	18,333	18,337	18,341	18,345	18,349
Tompkins	18,272	18,345	18,417	18,423	18,486	18,548	18,610	18,676	18,746	18,817	18,891
Ulster	31,463	31,492	31,520	31,531	31,569	31,605	31,645	31,683	31,721	31,765	31,808
Westchester	249,290	249,429	249,567	249,661	249,800	249,937	250,072	250,215	250,354	250,501	250,643

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:											
	3/25	3/26	3/27	3/28	3/30				4/1				4/3			
Albany	58,625	58,658	58,691	58,719	58,779	(11,756)	[2,821]	{1,411}	58,840	(11,768)	[2,824]	{1,412}	58,902	(11,780)	[2,827]	{1,414}
Bronx	406,297	406,410	406,523	406,626	406,844	(81,369)	[19,529]	{9,764}	407,065	(81,413)	[19,539]	{9,770}	407,297	(81,459)	[19,550]	{9,775}
Dutchess	63,669	63,698	63,726	63,747	63,793	(12,759)	[3,062]	{1,531}	63,839	(12,768)	[3,064]	{1,532}	63,886	(12,777)	[3,067]	{1,533}
Erie	207,516	207,609	207,702	207,777	207,948	(41,590)	[9,982]	{4,991}	208,121	(41,624)	[9,990]	{4,995}	208,298	(41,660)	[9,998]	{4,999}
Kings	692,762	693,193	693,624	693,982	694,851	(138,970)	[33,353]	{16,676}	695,740	(139,148)	[33,396]	{16,698}	696,679	(139,336)	[33,441]	{16,720}
Monroe	150,623	150,727	150,830	150,903	151,072	(30,214)	[7,251]	{3,626}	151,244	(30,249)	[7,260]	{3,630}	151,426	(30,285)	[7,268]	{3,634}
Nassau	401,433	401,643	401,853	401,999	402,372	(80,474)	[19,314]	{9,657}	402,758	(80,552)	[19,332]	{9,666}	403,165	(80,633)	[19,352]	{9,676}
New York	409,960	410,447	410,933	411,190	412,139	(82,428)	[19,783]	{9,891}	413,107	(82,621)	[19,829]	{9,915}	414,125	(82,825)	[19,878]	{9,939}
Niagara	47,645	47,666	47,687	47,706	47,747	(9,549)	[2,292]	{1,146}	47,789	(9,558)	[2,294]	{1,147}	47,831	(9,566)	[2,296]	{1,148}
Onondaga	110,775	110,968	111,161	111,323	111,817	(22,363)	[5,367]	{2,684}	112,317	(22,463)	[5,391]	{2,696}	112,860	(22,572)	[5,417]	{2,709}
Orange	109,638	109,706	109,775	109,843	109,933	(21,987)	[5,277]	{2,638}	110,029	(22,006)	[5,281]	{2,641}	110,123	(22,025)	[5,286]	{2,643}
Putnam	23,482	23,494	23,505	23,516	23,537	(4,707)	[1,130]	{565}	23,558	(4,712)	[1,131]	{565}	23,579	(4,716)	[1,132]	{566}
Queens	638,319	638,556	638,792	638,973	639,398	(127,880)	[30,691]	{15,346}	639,837	(127,967)	[30,712]	{15,356}	640,291	(128,058)	[30,734]	{15,367}
Rensselaer	31,177	31,194	31,210	31,219	31,243	(6,249)	[1,500]	{750}	31,266	(6,253)	[1,501]	{750}	31,290	(6,258)	[1,502]	{751}
Richmond	165,095	165,161	165,226	165,273	165,375	(33,075)	[7,938]	{3,969}	165,477	(33,095)	[7,943]	{3,971}	165,582	(33,116)	[7,948]	{3,974}
Rockland	91,871	91,909	91,947	91,979	92,060	(18,412)	[4,419]	{2,209}	92,141	(18,428)	[4,423]	{2,211}	92,228	(18,446)	[4,427]	{2,213}
Saratoga	45,802	45,828	45,854	45,873	45,928	(9,186)	[2,205]	{1,102}	45,981	(9,196)	[2,207]	{1,104}	46,035	(9,207)	[2,210]	{1,105}
Schenectady	32,705	32,730	32,755	32,777	32,816	(6,563)	[1,575]	{788}	32,856	(6,571)	[1,577]	{789}	32,898	(6,580)	[1,579]	{790}
Suffolk	424,974	425,121	425,268	425,373	425,610	(85,122)	[20,429]	{10,215}	425,851	(85,170)	[20,441]	{10,220}	426,096	(85,219)	[20,453]	{10,226}
Sullivan	18,309	18,315	18,320	18,321	18,329	(3,666)	[880]	{440}	18,337	(3,667)	[880]	{440}	18,345	(3,669)	[881]	{440}
Tompkins	18,272	18,345	18,417	18,423	18,548	(3,710)	[890]	{445}	18,676	(3,735)	[896]	{448}	18,817	(3,763)	[903]	{452}
Ulster	31,463	31,492	31,520	31,531	31,605	(6,321)	[1,517]	{759}	31,683	(6,337)	[1,521]	{760}	31,765	(6,353)	[1,525]	{762}
Westchester	249,290	249,429	249,567	249,661	249,937	(49,987)	[11,997]	{5,998}	250,215	(50,043)	[12,010]	{6,005}	250,501	(50,100)	[12,024]	{6,012}

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.