

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 2/23/21**

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 2/23/21 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.**

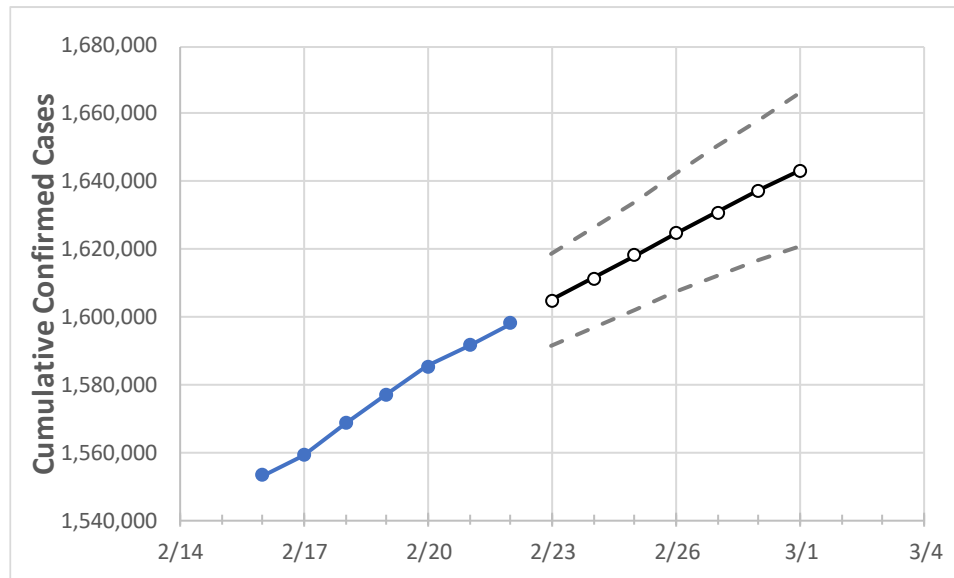
**IEM's Modeling Lead**

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:						
	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1
New York	1,577,197	1,585,435	1,591,672	1,597,969	1,604,764	1,611,504	1,618,074	1,624,563	1,630,877	1,637,338	1,643,285

*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:						
	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1
Albany	20,272	20,336	20,392	20,441	20,490	20,536	20,582	20,625	20,666	20,706	20,746
Bronx	136,615	137,641	138,191	138,924	139,743	140,555	141,354	142,145	142,948	143,742	144,518
Dutchess	21,344	21,452	21,565	21,656	21,752	21,847	21,939	22,030	22,118	22,203	22,289
Erie	62,962	63,248	63,468	63,678	63,915	64,149	64,378	64,603	64,818	65,030	65,240
Kings	199,125	200,493	201,409	202,392	203,528	204,675	205,779	206,880	208,003	209,091	210,174
Monroe	51,255	51,423	51,564	51,674	51,794	51,912	52,028	52,141	52,251	52,356	52,459
Nassau	142,467	143,069	143,615	144,131	144,688	145,228	145,748	146,262	146,762	147,250	147,721
New York	97,677	98,438	98,989	99,552	100,145	100,735	101,348	101,946	102,537	103,111	103,691
Niagara	14,920	14,957	14,984	15,012	15,043	15,073	15,102	15,130	15,155	15,182	15,207
Onondaga	31,793	31,848	31,909	31,954	32,013	32,069	32,123	32,176	32,228	32,277	32,324
Orange	35,355	35,496	35,648	35,755	35,891	36,024	36,155	36,284	36,407	36,532	36,655
Putnam	8,059	8,085	8,116	8,135	8,164	8,193	8,221	8,248	8,274	8,299	8,324
Queens	200,984	202,250	203,097	204,066	205,146	206,226	207,261	208,308	209,371	210,416	211,435
Rensselaer	8,733	8,760	8,788	8,810	8,836	8,860	8,884	8,907	8,930	8,952	8,973
Richmond	54,749	55,023	55,168	55,424	55,667	55,907	56,148	56,381	56,620	56,853	57,085
Rockland	37,320	37,478	37,579	37,674	37,790	37,904	38,018	38,129	38,235	38,341	38,446
Saratoga	11,517	11,560	11,604	11,642	11,674	11,705	11,735	11,763	11,791	11,817	11,843
Schenectady	10,573	10,593	10,624	10,645	10,668	10,689	10,709	10,728	10,748	10,765	10,782
Suffolk	156,914	157,516	158,029	158,592	159,103	159,606	160,098	160,577	161,047	161,497	161,938
Sullivan	4,576	4,594	4,616	4,629	4,645	4,660	4,675	4,690	4,705	4,719	4,734
Tompkins	3,367	3,376	3,389	3,398	3,407	3,416	3,424	3,432	3,440	3,446	3,453
Ulster	9,658	9,698	9,754	9,780	9,816	9,851	9,885	9,920	9,953	9,985	10,016
Westchester	103,506	103,990	104,400	104,777	105,173	105,559	105,935	106,305	106,669	107,033	107,387

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:											
	2/19	2/20	2/21	2/22	2/24				2/26				2/28			
Albany	20,272	20,336	20,392	20,441	20,536	(4,107)	[986]	{493}	20,625	(4,125)	[990]	{495}	20,706	(4,141)	[994]	{497}
Bronx	136,615	137,641	138,191	138,924	140,555	(28,111)	[6,747]	{3,373}	142,145	(28,429)	[6,823]	{3,411}	143,742	(28,748)	[6,900]	{3,450}
Dutchess	21,344	21,452	21,565	21,656	21,847	(4,369)	[1,049]	{524}	22,030	(4,406)	[1,057]	{529}	22,203	(4,441)	[1,066]	{533}
Erie	62,962	63,248	63,468	63,678	64,149	(12,830)	[3,079]	{1,540}	64,603	(12,921)	[3,101]	{1,550}	65,030	(13,006)	[3,121]	{1,561}
Kings	199,125	200,493	201,409	202,392	204,675	(40,935)	[9,824]	{4,912}	206,880	(41,376)	[9,930]	{4,965}	209,091	(41,818)	[10,036]	{5,018}
Monroe	51,255	51,423	51,564	51,674	51,912	(10,382)	[2,492]	{1,246}	52,141	(10,428)	[2,503]	{1,251}	52,356	(10,471)	[2,513]	{1,257}
Nassau	142,467	143,069	143,615	144,131	145,228	(29,046)	[6,971]	{3,485}	146,262	(29,252)	[7,021]	{3,510}	147,250	(29,450)	[7,068]	{3,534}
New York	97,677	98,438	98,989	99,552	100,735	(20,147)	[4,835]	{2,418}	101,946	(20,389)	[4,893]	{2,447}	103,111	(20,622)	[4,949]	{2,475}
Niagara	14,920	14,957	14,984	15,012	15,073	(3,015)	[724]	{362}	15,130	(3,026)	[726]	{363}	15,182	(3,036)	[729]	{364}
Onondaga	31,793	31,848	31,909	31,954	32,069	(6,414)	[1,539]	{770}	32,176	(6,435)	[1,544]	{772}	32,277	(6,455)	[1,549]	{775}
Orange	35,355	35,496	35,648	35,755	36,024	(7,205)	[1,729]	{865}	36,284	(7,257)	[1,742]	{871}	36,532	(7,306)	[1,754]	{877}
Putnam	8,059	8,085	8,116	8,135	8,193	(1,639)	[393]	{197}	8,248	(1,650)	[396]	{198}	8,299	(1,660)	[398]	{199}
Queens	200,984	202,250	203,097	204,066	206,226	(41,245)	[9,899]	{4,949}	208,308	(41,662)	[9,999]	{4,999}	210,416	(42,083)	[10,100]	{5,050}
Rensselaer	8,733	8,760	8,788	8,810	8,860	(1,772)	[425]	{213}	8,907	(1,781)	[428]	{214}	8,952	(1,790)	[430]	{215}
Richmond	54,749	55,023	55,168	55,424	55,907	(11,181)	[2,684]	{1,342}	56,381	(11,276)	[2,706]	{1,353}	56,853	(11,371)	[2,729]	{1,364}
Rockland	37,320	37,478	37,579	37,674	37,904	(7,581)	[1,819]	{910}	38,129	(7,626)	[1,830]	{915}	38,341	(7,668)	[1,840]	{920}
Saratoga	11,517	11,560	11,604	11,642	11,705	(2,341)	[562]	{281}	11,763	(2,353)	[565]	{282}	11,817	(2,363)	[567]	{284}
Schenectady	10,573	10,593	10,624	10,645	10,689	(2,138)	[513]	{257}	10,728	(2,146)	[515]	{257}	10,765	(2,153)	[517]	{258}
Suffolk	156,914	157,516	158,029	158,592	159,606	(31,921)	[7,661]	{3,831}	160,577	(32,115)	[7,708]	{3,854}	161,497	(32,299)	[7,752]	{3,876}
Sullivan	4,576	4,594	4,616	4,629	4,660	(932)	[224]	{112}	4,690	(938)	[225]	{113}	4,719	(944)	[227]	{113}
Tompkins	3,367	3,376	3,389	3,398	3,416	(683)	[164]	{82}	3,432	(686)	[165]	{82}	3,446	(689)	[165]	{83}
Ulster	9,658	9,698	9,754	9,780	9,851	(1,970)	[473]	{236}	9,920	(1,984)	[476]	{238}	9,985	(1,997)	[479]	{240}
Westchester	103,506	103,990	104,400	104,777	105,559	(21,112)	[5,067]	{2,533}	106,305	(21,261)	[5,103]	{2,551}	107,033	(21,407)	[5,138]	{2,569}

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.