

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 7/13/20**

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 7/13/20 11 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.**

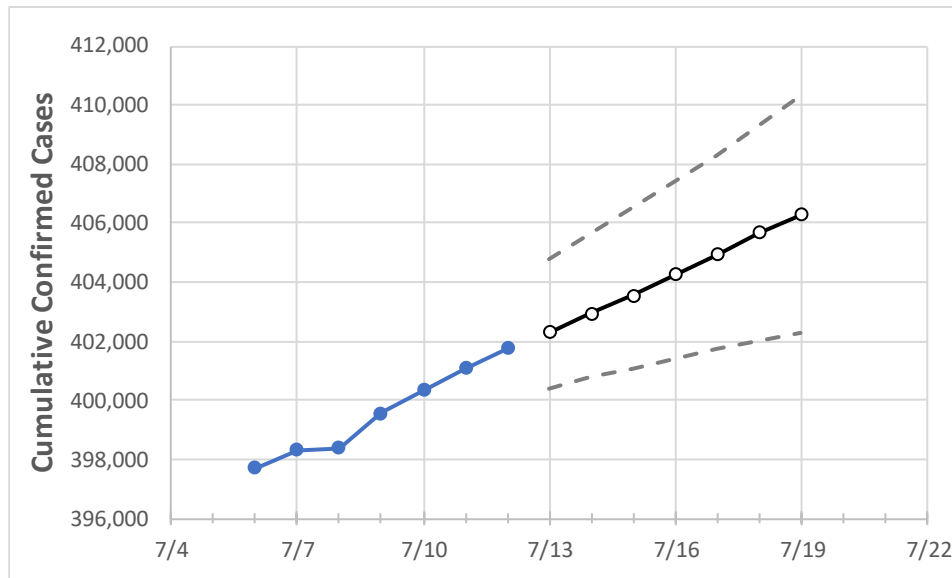
**IEM's Modeling Lead**

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:						
	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19
New York	399,575	400,358	401,098	401,775	402,314	402,927	403,540	404,264	404,947	405,661	406,301

*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 20%, and are often within 10%, of actual confirmed cases.*

## New York Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19
Albany	2,183	2,190	2,208	2,219	2,232	2,245	2,259	2,274	2,290	2,307	2,325
Bronx	48,126	48,208	48,267	48,327	48,377	48,425	48,474	48,521	48,568	48,615	48,661
Dutchess	4,255	4,262	4,269	4,276	4,280	4,284	4,288	4,292	4,296	4,300	4,304
Erie	7,624	7,660	7,711	7,742	7,777	7,812	7,847	7,882	7,918	7,954	7,991
Kings	60,461	60,560	60,647	60,748	60,828	60,906	60,985	61,062	61,140	61,216	61,292
Monroe	4,074	4,120	4,153	4,177	4,210	4,244	4,278	4,313	4,348	4,384	4,420
Nassau	42,164	42,232	42,267	42,307	42,346	42,384	42,423	42,462	42,501	42,540	42,580
New York	29,029	29,109	29,165	29,237	29,299	29,362	29,426	29,491	29,556	29,623	29,690
Niagara	1,315	1,327	1,334	1,340	1,349	1,358	1,367	1,377	1,387	1,398	1,408
Onondaga	3,050	3,078	3,100	3,124	3,149	3,174	3,200	3,226	3,253	3,281	3,309
Orange	10,810	10,820	10,830	10,835	10,843	10,850	10,858	10,866	10,873	10,881	10,889
Putnam	1,348	1,355	1,361	1,361	1,365	1,368	1,372	1,377	1,381	1,386	1,391
Queens	66,174	66,241	66,323	66,410	66,482	66,553	66,624	66,694	66,763	66,832	66,900
Rensselaer	586	588	593	616	622	629	636	643	652	661	670
Richmond	14,262	14,285	14,308	14,329	14,348	14,368	14,388	14,408	14,428	14,449	14,471
Rockland	13,683	13,691	13,700	13,716	13,726	13,736	13,746	13,756	13,766	13,776	13,786
Saratoga	585	587	595	602	607	613	619	626	633	641	650
Schenectady	848	852	856	864	868	872	876	881	885	889	893
Suffolk	41,849	41,911	41,987	42,028	42,083	42,138	42,194	42,251	42,309	42,367	42,427
Sullivan	1,460	1,464	1,465	1,465	1,466	1,466	1,467	1,468	1,468	1,469	1,470
Tompkins	180	181	183	186	187	188	188	189	190	191	193
Ulster	1,851	1,853	1,855	1,859	1,863	1,867	1,872	1,876	1,880	1,885	1,889
Westchester	35,183	35,226	35,260	35,297	35,334	35,371	35,408	35,446	35,484	35,523	35,562

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:											
	7/9	7/10	7/11	7/12	7/14				7/16				7/18			
Albany	2,183	2,190	2,208	2,219	2,245	(449)	[108]	{54}	2,274	(455)	[109]	{55}	2,307	(461)	[111]	{55}
Bronx	48,126	48,208	48,267	48,327	48,425	(9,685)	[2,324]	{1,162}	48,521	(9,704)	[2,329]	{1,165}	48,615	(9,723)	[2,334]	{1,167}
Dutchess	4,255	4,262	4,269	4,276	4,284	(857)	[206]	{103}	4,292	(858)	[206]	{103}	4,300	(860)	[206]	{103}
Erie	7,624	7,660	7,711	7,742	7,812	(1,562)	[375]	{187}	7,882	(1,576)	[378]	{189}	7,954	(1,591)	[382]	{191}
Kings	60,461	60,560	60,647	60,748	60,906	(12,181)	[2,924]	{1,462}	61,062	(12,212)	[2,931]	{1,465}	61,216	(12,243)	[2,938]	{1,469}
Monroe	4,074	4,120	4,153	4,177	4,244	(849)	[204]	{102}	4,313	(863)	[207]	{104}	4,384	(877)	[210]	{105}
Nassau	42,164	42,232	42,267	42,307	42,384	(8,477)	[2,034]	{1,017}	42,462	(8,492)	[2,038]	{1,019}	42,540	(8,508)	[2,042]	{1,021}
New York	29,029	29,109	29,165	29,237	29,362	(5,872)	[1,409]	{705}	29,491	(5,898)	[1,416]	{708}	29,623	(5,925)	[1,422]	{711}
Niagara	1,315	1,327	1,334	1,340	1,358	(272)	[65]	{33}	1,377	(275)	[66]	{33}	1,398	(280)	[67]	{34}
Onondaga	3,050	3,078	3,100	3,124	3,174	(635)	[152]	{76}	3,226	(645)	[155]	{77}	3,281	(656)	[157]	{79}
Orange	10,810	10,820	10,830	10,835	10,850	(2,170)	[521]	{260}	10,866	(2,173)	[522]	{261}	10,881	(2,176)	[522]	{261}
Putnam	1,348	1,355	1,361	1,361	1,368	(274)	[66]	{33}	1,377	(275)	[66]	{33}	1,386	(277)	[67]	{33}
Queens	66,174	66,241	66,323	66,410	66,553	(13,311)	[3,195]	{1,597}	66,694	(13,339)	[3,201]	{1,601}	66,832	(13,366)	[3,208]	{1,604}
Rensselaer	586	588	593	616	629	(126)	[30]	{15}	643	(129)	[31]	{15}	661	(132)	[32]	{16}
Richmond	14,262	14,285	14,308	14,329	14,368	(2,874)	[690]	{345}	14,408	(2,882)	[692]	{346}	14,449	(2,890)	[694]	{347}
Rockland	13,683	13,691	13,700	13,716	13,736	(2,747)	[659]	{330}	13,756	(2,751)	[660]	{330}	13,776	(2,755)	[661]	{331}
Saratoga	585	587	595	602	613	(123)	[29]	{15}	626	(125)	[30]	{15}	641	(128)	[31]	{15}
Schenectady	848	852	856	864	872	(174)	[42]	{21}	881	(176)	[42]	{21}	889	(178)	[43]	{21}
Suffolk	41,849	41,911	41,987	42,028	42,138	(8,428)	[2,023]	{1,011}	42,251	(8,450)	[2,028]	{1,014}	42,367	(8,473)	[2,034]	{1,017}
Sullivan	1,460	1,464	1,465	1,465	1,466	(293)	[70]	{35}	1,468	(294)	[70]	{35}	1,469	(294)	[71]	{35}
Tompkins	180	181	183	186	188	(38)	[9]	{5}	189	(38)	[9]	{5}	191	(38)	[9]	{5}
Ulster	1,851	1,853	1,855	1,859	1,867	(373)	[90]	{45}	1,876	(375)	[90]	{45}	1,885	(377)	[90]	{45}
Westchester	35,183	35,226	35,260	35,297	35,371	(7,074)	[1,698]	{849}	35,446	(7,089)	[1,701]	{851}	35,523	(7,105)	[1,705]	{853}

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.