

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 6/23/21**

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 6/23/21 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.

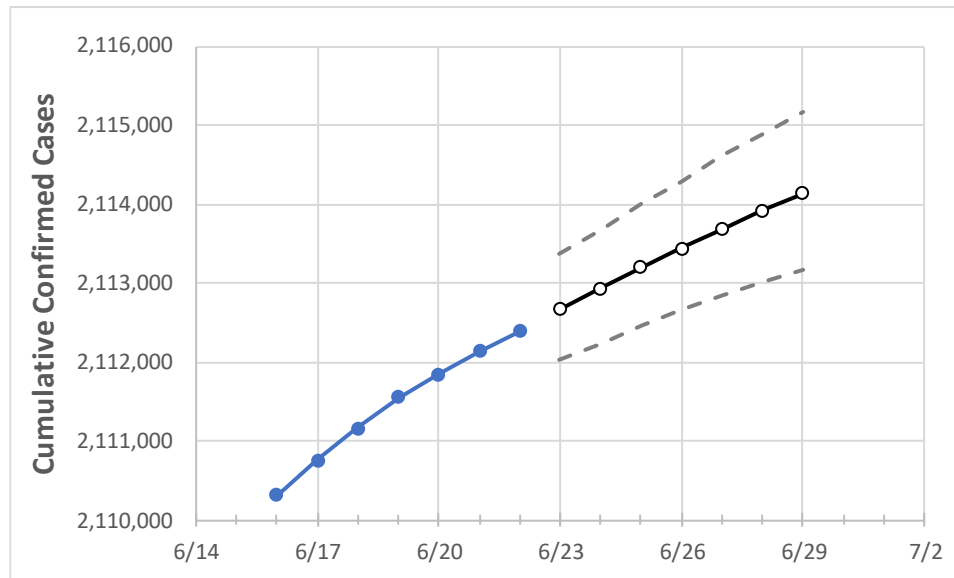
IEM's Modeling Lead

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:						
	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29
New York	2,111,556	2,111,845	2,112,129	2,112,388	2,112,669	2,112,937	2,113,193	2,113,445	2,113,686	2,113,915	2,114,131

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:						
	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29
Albany	24,712	24,716	24,718	24,719	24,721	24,723	24,724	24,726	24,727	24,729	24,730
Bronx	183,695	183,729	183,752	183,769	183,809	183,849	183,887	183,923	183,960	183,995	184,028
Dutchess	29,483	29,485	29,488	29,491	29,493	29,494	29,496	29,497	29,498	29,500	29,501
Erie	89,604	89,607	89,614	89,617	89,622	89,626	89,630	89,634	89,637	89,640	89,642
Kings	280,794	280,849	280,905	280,940	280,982	281,021	281,062	281,099	281,136	281,170	281,204
Monroe	69,054	69,063	69,069	69,079	69,090	69,101	69,110	69,119	69,127	69,136	69,143
Nassau	183,753	183,768	183,787	183,809	183,829	183,849	183,869	183,887	183,906	183,924	183,941
New York	138,404	138,429	138,450	138,471	138,498	138,525	138,550	138,575	138,599	138,623	138,646
Niagara	20,046	20,047	20,048	20,050	20,051	20,053	20,054	20,055	20,056	20,057	20,058
Onondaga	38,970	38,976	38,980	38,990	38,996	39,003	39,009	39,014	39,020	39,025	39,029
Orange	48,337	48,345	48,354	48,360	48,366	48,372	48,377	48,382	48,388	48,392	48,397
Putnam	10,622	10,622	10,623	10,623	10,624	10,626	10,627	10,628	10,630	10,631	10,632
Queens	277,494	277,547	277,588	277,620	277,658	277,696	277,732	277,766	277,799	277,831	277,861
Rensselaer	11,235	11,238	11,239	11,239	11,240	11,242	11,243	11,244	11,245	11,246	11,247
Richmond	75,059	75,079	75,112	75,132	75,151	75,169	75,188	75,205	75,223	75,240	75,257
Rockland	46,965	46,969	46,975	46,981	46,985	46,990	46,994	46,998	47,002	47,006	47,010
Saratoga	15,389	15,391	15,393	15,396	15,399	15,401	15,403	15,406	15,408	15,410	15,412
Schenectady	13,208	13,208	13,209	13,210	13,211	13,212	13,213	13,214	13,215	13,216	13,217
Suffolk	201,168	201,193	201,219	201,237	201,263	201,287	201,310	201,333	201,355	201,377	201,399
Sullivan	6,679	6,681	6,683	6,684	6,685	6,686	6,687	6,688	6,689	6,690	6,691
Tompkins	4,350	4,351	4,351	4,352	4,353	4,353	4,354	4,355	4,355	4,356	4,356
Ulster	13,916	13,916	13,917	13,917	13,918	13,919	13,921	13,922	13,923	13,924	13,925
Westchester	129,728	129,731	129,737	129,746	129,757	129,768	129,779	129,789	129,798	129,808	129,817

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:											
	6/19	6/20	6/21	6/22	6/24				6/26				6/28			
Albany	24,712	24,716	24,718	24,719	24,723	(4,945)	[1,187]	{593}	24,726	(4,945)	[1,187]	{593}	24,729	(4,946)	[1,187]	{593}
Bronx	183,695	183,729	183,752	183,769	183,849	(36,770)	[8,825]	{4,412}	183,923	(36,785)	[8,828]	{4,414}	183,995	(36,799)	[8,832]	{4,416}
Dutchess	29,483	29,485	29,488	29,491	29,494	(5,899)	[1,416]	{708}	29,497	(5,899)	[1,416]	{708}	29,500	(5,900)	[1,416]	{708}
Erie	89,604	89,607	89,614	89,617	89,626	(17,925)	[4,302]	{2,151}	89,634	(17,927)	[4,302]	{2,151}	89,640	(17,928)	[4,303]	{2,151}
Kings	280,794	280,849	280,905	280,940	281,021	(56,204)	[13,489]	{6,745}	281,099	(56,220)	[13,493]	{6,746}	281,170	(56,234)	[13,496]	{6,748}
Monroe	69,054	69,063	69,069	69,079	69,101	(13,820)	[3,317]	{1,658}	69,119	(13,824)	[3,318]	{1,659}	69,136	(13,827)	[3,319]	{1,659}
Nassau	183,753	183,768	183,787	183,809	183,849	(36,770)	[8,825]	{4,412}	183,887	(36,777)	[8,827]	{4,413}	183,924	(36,785)	[8,828]	{4,414}
New York	138,404	138,429	138,450	138,471	138,525	(27,705)	[6,649]	{3,325}	138,575	(27,715)	[6,652]	{3,326}	138,623	(27,725)	[6,654]	{3,327}
Niagara	20,046	20,047	20,048	20,050	20,053	(4,011)	[963]	{481}	20,055	(4,011)	[963]	{481}	20,057	(4,011)	[963]	{481}
Onondaga	38,970	38,976	38,980	38,990	39,003	(7,801)	[1,872]	{936}	39,014	(7,803)	[1,873]	{936}	39,025	(7,805)	[1,873]	{937}
Orange	48,337	48,345	48,354	48,360	48,372	(9,674)	[2,322]	{1,161}	48,382	(9,676)	[2,322]	{1,161}	48,392	(9,678)	[2,323]	{1,161}
Putnam	10,622	10,622	10,623	10,623	10,626	(2,125)	[510]	{255}	10,628	(2,126)	[510]	{255}	10,631	(2,126)	[510]	{255}
Queens	277,494	277,547	277,588	277,620	277,696	(55,539)	[13,329]	{6,665}	277,766	(55,553)	[13,333]	{6,666}	277,831	(55,566)	[13,336]	{6,668}
Rensselaer	11,235	11,238	11,239	11,239	11,242	(2,248)	[540]	{270}	11,244	(2,249)	[540]	{270}	11,246	(2,249)	[540]	{270}
Richmond	75,059	75,079	75,112	75,132	75,169	(15,034)	[3,608]	{1,804}	75,205	(15,041)	[3,610]	{1,805}	75,240	(15,048)	[3,612]	{1,806}
Rockland	46,965	46,969	46,975	46,981	46,990	(9,398)	[2,255]	{1,128}	46,998	(9,400)	[2,256]	{1,128}	47,006	(9,401)	[2,256]	{1,128}
Saratoga	15,389	15,391	15,393	15,396	15,401	(3,080)	[739]	{370}	15,406	(3,081)	[739]	{370}	15,410	(3,082)	[740]	{370}
Schenectady	13,208	13,208	13,209	13,210	13,212	(2,642)	[634]	{317}	13,214	(2,643)	[634]	{317}	13,216	(2,643)	[634]	{317}
Suffolk	201,168	201,193	201,219	201,237	201,287	(40,257)	[9,662]	{4,831}	201,333	(40,267)	[9,664]	{4,832}	201,377	(40,275)	[9,666]	{4,833}
Sullivan	6,679	6,681	6,683	6,684	6,686	(1,337)	[321]	{160}	6,688	(1,338)	[321]	{161}	6,690	(1,338)	[321]	{161}
Tompkins	4,350	4,351	4,351	4,352	4,353	(871)	[209]	{104}	4,355	(871)	[209]	{105}	4,356	(871)	[209]	{105}
Ulster	13,916	13,916	13,917	13,917	13,919	(2,784)	[668]	{334}	13,922	(2,784)	[668]	{334}	13,924	(2,785)	[668]	{334}
Westchester	129,728	129,731	129,737	129,746	129,768	(25,954)	[6,229]	{3,114}	129,789	(25,958)	[6,230]	{3,115}	129,808	(25,962)	[6,231]	{3,115}

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.