

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 1/14/22**

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 1/14/22 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.**

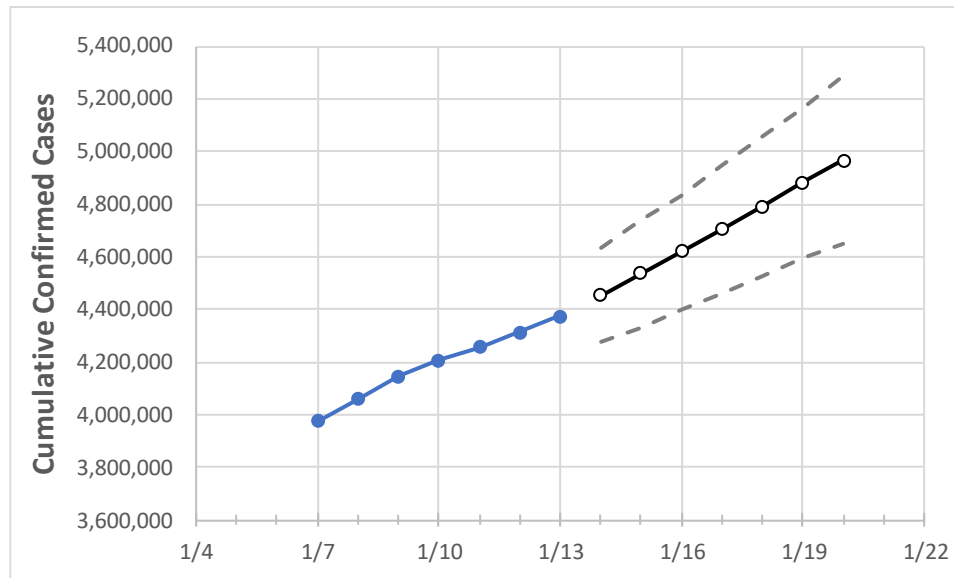
**IEM's Modeling Lead**

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:						
	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19	1/20
New York	4,205,019	4,257,408	4,312,866	4,374,042	4,452,584	4,536,728	4,622,106	4,702,701	4,790,494	4,881,022	4,965,964

*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:						
	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19	1/20
Albany	47,555	48,065	48,640	49,387	50,225	51,093	52,021	52,968	53,945	54,976	56,027
Bronx	349,768	355,068	359,858	366,719	374,758	383,100	391,438	399,912	408,384	417,309	425,794
Dutchess	53,846	54,355	55,009	55,713	56,778	57,837	58,961	60,103	61,309	62,567	63,871
Erie	172,693	174,624	177,332	179,275	182,436	185,592	188,895	192,452	195,964	199,844	203,700
Kings	585,423	593,574	600,905	611,331	622,913	634,229	645,858	657,329	668,806	680,651	692,308
Monroe	128,760	129,691	131,209	132,654	134,696	136,719	138,854	141,043	143,311	145,741	148,210
Nassau	354,032	357,439	361,426	365,524	371,260	377,210	382,960	388,790	394,640	400,389	406,231
New York	341,008	345,520	350,849	355,776	362,439	369,203	375,955	382,588	389,489	396,276	402,997
Niagara	39,586	40,148	40,675	41,190	41,927	42,697	43,508	44,341	45,221	46,136	47,089
Onondaga	84,975	85,964	87,307	88,707	90,672	92,701	94,762	96,920	99,258	101,647	104,134
Orange	90,372	94,410	94,410	94,410	96,902	99,466	102,135	104,885	107,726	110,683	113,761
Putnam	20,268	20,439	20,671	20,931	21,250	21,578	21,893	22,207	22,516	22,838	23,157
Queens	539,095	547,905	557,789	567,611	580,811	593,846	607,481	621,309	635,059	649,344	663,484
Rensselaer	24,707	25,022	25,358	25,800	26,295	26,820	27,351	27,910	28,508	29,119	29,750
Richmond	144,076	145,814	147,531	149,436	152,107	154,756	157,472	160,144	162,951	165,624	168,346
Rockland	79,119	79,971	80,991	82,015	83,447	84,929	86,371	87,840	89,407	90,983	92,543
Saratoga	36,475	36,834	37,305	37,866	38,559	39,264	39,996	40,769	41,536	42,369	43,200
Schenectady	26,312	26,574	26,871	27,282	27,767	28,264	28,775	29,312	29,868	30,450	31,043
Suffolk	376,745	379,874	383,816	388,229	394,322	400,264	406,430	412,765	418,992	425,675	431,877
Sullivan	14,908	15,073	15,355	15,636	15,960	16,289	16,614	16,964	17,315	17,692	18,055
Tompkins	13,432	13,502	13,721	14,013	14,240	14,471	14,716	14,965	15,206	15,479	15,731
Ulster	25,526	25,719	26,093	26,406	26,820	27,269	27,716	28,195	28,684	29,210	29,746
Westchester	218,229	220,258	222,732	225,086	229,306	233,704	238,139	242,654	247,196	252,021	256,803

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:											
	1/10	1/11	1/12	1/13	1/15			1/17			1/19					
Albany	47,555	48,065	48,640	49,387	51,093	(10,219)	[2,452]	{1,226}	52,968	(10,594)	[2,542]	{1,271}	54,976	(10,995)	[2,639]	{1,319}
Bronx	349,768	355,068	359,858	366,719	383,100	(76,620)	[18,389]	{9,194}	399,912	(79,982)	[19,196]	{9,598}	417,309	(83,462)	[20,031]	{10,015}
Dutchess	53,846	54,355	55,009	55,713	57,837	(11,567)	[2,776]	{1,388}	60,103	(12,021)	[2,885]	{1,442}	62,567	(12,513)	[3,003]	{1,502}
Erie	172,693	174,624	177,332	179,275	185,592	(37,118)	[8,908]	{4,454}	192,452	(38,490)	[9,238]	{4,619}	199,844	(39,969)	[9,593]	{4,796}
Kings	585,423	593,574	600,905	611,331	534,229	(126,846)	[30,443]	{15,221}	57,329	(131,466)	[31,552]	{15,776}	80,651	(136,130)	[32,671]	{16,336}
Monroe	128,760	129,691	131,209	132,654	136,719	(27,344)	[6,563]	{3,281}	141,043	(28,209)	[6,770]	{3,385}	145,741	(29,148)	[6,996]	{3,498}
Nassau	354,032	357,439	361,426	365,524	377,210	(75,442)	[18,106]	{9,053}	388,790	(77,758)	[18,662]	{9,331}	400,389	(80,078)	[19,219]	{9,609}
New York	341,008	345,520	350,849	355,776	369,203	(73,841)	[17,722]	{8,861}	382,588	(76,518)	[18,364]	{9,182}	396,276	(79,255)	[19,021]	{9,511}
Niagara	39,586	40,148	40,675	41,190	42,697	(8,539)	[2,049]	{1,025}	44,341	(8,868)	[2,128]	{1,064}	46,136	(9,227)	[2,215]	{1,107}
Onondaga	84,975	85,964	87,307	88,707	92,701	(18,540)	[4,450]	{2,225}	96,920	(19,384)	[4,652]	{2,326}	101,647	(20,329)	[4,879]	{2,440}
Orange	90,372	94,410	94,410	94,410	99,466	(19,893)	[4,774]	{2,387}	104,885	(20,977)	[5,034]	{2,517}	110,683	(22,137)	[5,313]	{2,656}
Putnam	20,268	20,439	20,671	20,931	21,578	(4,316)	[1,036]	{518}	22,207	(4,441)	[1,066]	{533}	22,838	(4,568)	[1,096]	{548}
Queens	539,095	547,905	557,789	567,611	593,846	(118,769)	[28,505]	{14,252}	521,309	(124,262)	[29,823]	{14,911}	549,344	(129,869)	[31,169]	{15,584}
Rensselaer	24,707	25,022	25,358	25,800	26,820	(5,364)	[1,287]	{644}	27,910	(5,582)	[1,340]	{670}	29,119	(5,824)	[1,398]	{699}
Richmond	144,076	145,814	147,531	149,436	154,756	(30,951)	[7,428]	{3,714}	160,144	(32,029)	[7,687]	{3,843}	165,624	(33,125)	[7,950]	{3,975}
Rockland	79,119	79,971	80,991	82,015	84,929	(16,986)	[4,077]	{2,038}	87,840	(17,568)	[4,216]	{2,108}	90,983	(18,197)	[4,367]	{2,184}
Saratoga	36,475	36,834	37,305	37,866	39,264	(7,853)	[1,885]	{942}	40,769	(8,154)	[1,957]	{978}	42,369	(8,474)	[2,034]	{1,017}
Schenectady	26,312	26,574	26,871	27,282	28,264	(5,653)	[1,357]	{678}	29,312	(5,862)	[1,407]	{703}	30,450	(6,090)	[1,462]	{731}
Suffolk	376,745	379,874	383,816	388,229	400,264	(80,053)	[19,213]	{9,606}	412,765	(82,553)	[19,813]	{9,906}	425,675	(85,135)	[20,432]	{10,216}
Sullivan	14,908	15,073	15,355	15,636	16,289	(3,258)	[782]	{391}	16,964	(3,393)	[814]	{407}	17,692	(3,538)	[849]	{425}
Tompkins	13,432	13,502	13,721	14,013	14,471	(2,894)	[695]	{347}	14,965	(2,993)	[718]	{359}	15,479	(3,096)	[743]	{372}
Ulster	25,526	25,719	26,093	26,406	27,269	(5,454)	[1,309]	{654}	28,195	(5,639)	[1,353]	{677}	29,210	(5,842)	[1,402]	{701}
Westchester	218,229	220,258	222,732	225,086	233,704	(46,741)	[11,218]	{5,609}	242,654	(48,531)	[11,647]	{5,824}	252,021	(50,404)	[12,097]	{6,048}

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.