

## IEM's AI Modeling: Short-term COVID-19 Projections

Date: 1/31/22

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 1/31/22 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.**

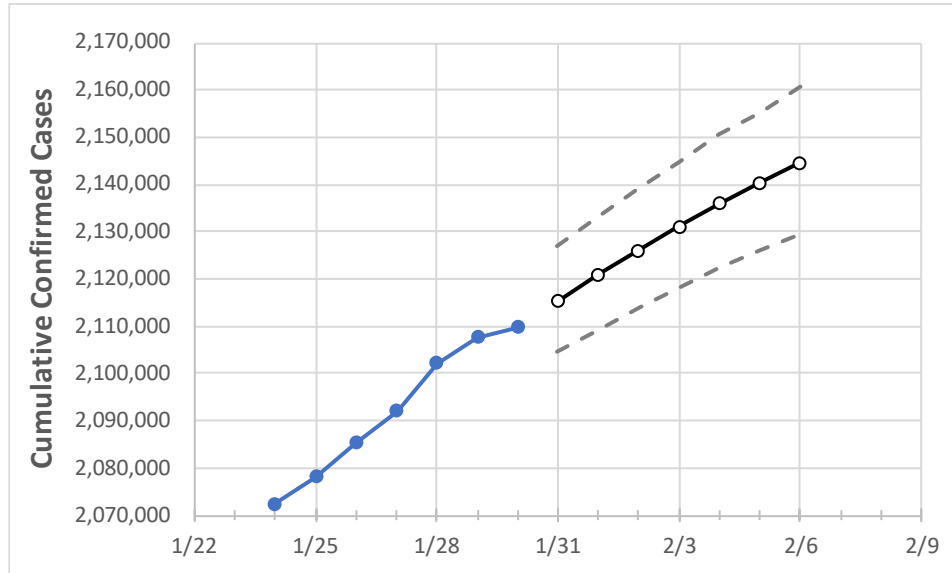
### IEM's Modeling Lead

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 Jersey State Projections



	Actual Confirmed Cases On:				Projected Cases For:							
	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	

New Jersey 2,092,109 2,102,227 2,107,606 2,109,783 2,115,396 2,120,984 2,125,984 2,131,162 2,135,905 2,140,488 2,144,672

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 Jersey Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	
Bergen	211,102	211,874	212,402	212,554	213,101	213,618	214,126	214,589	215,037	215,487	215,884	
Burlington	96,250	96,617	96,970	97,192	97,522	97,856	98,176	98,480	98,759	99,055	99,325	
Camden	119,743	120,137	120,511	120,706	121,155	121,552	121,955	122,316	122,697	123,047	123,367	
Essex	204,254	204,653	205,016	205,097	205,441	205,748	206,033	206,309	206,564	206,810	207,026	
Gloucester	66,218	66,465	66,705	66,819	67,056	67,285	67,503	67,714	67,918	68,126	68,309	
Hudson	163,217	163,680	163,953	164,048	164,431	164,796	165,124	165,444	165,752	166,036	166,314	
Hunterdon	23,093	23,191	23,299	23,346	23,425	23,503	23,575	23,646	23,711	23,778	23,842	
Mercer	71,604	71,915	72,111	72,207	72,450	72,685	72,903	73,121	73,315	73,523	73,702	
Middlesex	179,551	182,691	183,149	183,324	183,935	184,556	185,129	185,680	186,224	186,816	187,254	
Monmouth	156,224	156,965	157,361	157,558	157,971	158,371	158,741	159,101	159,442	159,789	160,101	
Morris	112,553	112,855	113,118	113,215	113,516	113,793	114,051	114,301	114,529	114,761	114,972	
Ocean	154,550	155,068	155,506	155,722	156,193	156,653	157,088	157,502	157,915	158,297	158,681	
Passaic	138,439	139,158	139,423	139,479	139,794	140,096	140,375	140,676	140,917	141,165	141,398	
Somerset	64,175	64,399	64,566	64,625	64,780	64,919	65,050	65,178	65,296	65,412	65,517	
Sussex	32,287	32,395	32,476	32,522	32,614	32,701	32,785	32,864	32,938	33,010	33,080	
Union	136,582	136,917	137,171	137,232	137,490	137,728	137,959	138,188	138,381	138,582	138,758	
Warren	22,692	22,763	22,832	22,860	22,928	22,992	23,052	23,110	23,168	23,219	23,269	

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 Jersey Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:								
	1/27	1/28	1/29	1/30	2/1		2/3		2/5				
Bergen	211,102	211,874	212,402	212,554	213,618 (42,724)	[10,254]	{5,127}	214,589 (42,918)	[10,300]	{5,150}	215,487 (43,097)	[10,343]	{5,172}
Burlington	96,250	96,617	96,970	97,192	97,856 (19,571)	[4,697]	{2,349}	98,480 (19,696)	[4,727]	{2,364}	99,055 (19,811)	[4,755]	{2,377}
Camden	119,743	120,137	120,511	120,706	121,552 (24,310)	[5,834]	{2,917}	122,316 (24,463)	[5,871]	{2,936}	123,047 (24,609)	[5,906]	{2,953}
Essex	204,254	204,653	205,016	205,097	205,748 (41,150)	[9,876]	{4,938}	206,309 (41,262)	[9,903]	{4,951}	206,810 (41,362)	[9,927]	{4,963}
Gloucester	66,218	66,465	66,705	66,819	67,285 (13,457)	[3,230]	{1,615}	67,714 (13,543)	[3,250]	{1,625}	68,126 (13,625)	[3,270]	{1,635}
Hudson	163,217	163,680	163,953	164,048	164,796 (32,959)	[7,910]	{3,955}	165,444 (33,089)	[7,941]	{3,971}	166,036 (33,207)	[7,970]	{3,985}
Hunterdon	23,093	23,191	23,299	23,346	23,503 (4,701)	[1,128]	{564}	23,646 (4,729)	[1,135]	{568}	23,778 (4,756)	[1,141]	{571}
Mercer	71,604	71,915	72,111	72,207	72,685 (14,537)	[3,489]	{1,744}	73,121 (14,624)	[3,510]	{1,755}	73,523 (14,705)	[3,529]	{1,765}
Middlesex	179,551	182,691	183,149	183,324	184,556 (36,911)	[8,859]	{4,429}	185,680 (37,136)	[8,913]	{4,456}	186,816 (37,363)	[8,967]	{4,484}
Monmouth	156,224	156,965	157,361	157,558	158,371 (31,674)	[7,602]	{3,801}	159,101 (31,820)	[7,637]	{3,818}	159,789 (31,958)	[7,670]	{3,835}
Morris	112,553	112,855	113,118	113,215	113,793 (22,759)	[5,462]	{2,731}	114,301 (22,860)	[5,486]	{2,743}	114,761 (22,952)	[5,509]	{2,754}
Ocean	154,550	155,068	155,506	155,722	156,653 (31,331)	[7,519]	{3,760}	157,502 (31,500)	[7,560]	{3,780}	158,297 (31,659)	[7,598]	{3,799}
Passaic	138,439	139,158	139,423	139,479	140,096 (28,019)	[6,725]	{3,362}	140,676 (28,135)	[6,752]	{3,376}	141,165 (28,233)	[6,776]	{3,388}
Somerset	64,175	64,399	64,566	64,625	64,919 (12,984)	[3,116]	{1,558}	65,178 (13,036)	[3,129]	{1,564}	65,412 (13,082)	[3,140]	{1,570}
Sussex	32,287	32,395	32,476	32,522	32,701 (6,540)	[1,570]	{785}	32,864 (6,573)	[1,577]	{789}	33,010 (6,602)	[1,584]	{792}
Union	136,582	136,917	137,171	137,232	137,728 (27,546)	[6,611]	{3,305}	138,188 (27,638)	[6,633]	{3,317}	138,582 (27,716)	[6,652]	{3,326}
Warren	22,692	22,763	22,832	22,860	22,992 (4,598)	[1,104]	{552}	23,110 (4,622)	[1,109]	{555}	23,219 (4,644)	[1,115]	{557}

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.