

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/29/21**

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 12/29/21 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.**

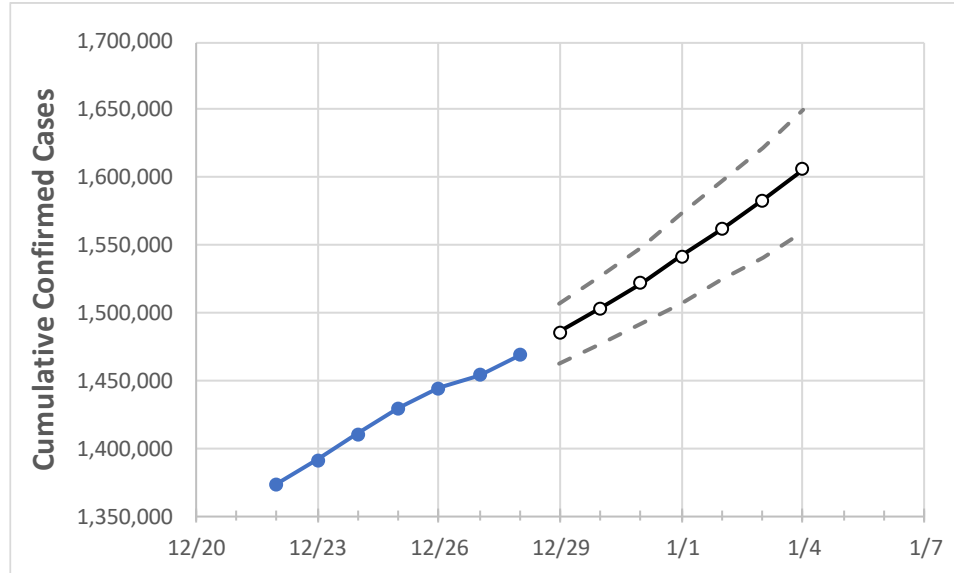
**IEM's Modeling Lead**

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 Jersey State Projections



Actual Confirmed Cases On:					Projected Cases For:						
12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4	

New Jersey 1,429,756 1,443,915 1,453,647 1,468,881 1,485,571 1,503,111 1,521,728 1,541,464 1,561,421 1,582,929 1,605,811

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:						
	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4
Bergen	141,877	143,393	144,576	146,477	148,523	150,656	152,958	155,464	158,104	160,912	163,921
Burlington	66,261	66,822	67,221	67,769	68,314	68,869	69,454	70,053	70,673	71,307	71,970
Camden	80,343	80,944	81,514	82,176	82,818	83,500	84,200	84,924	85,684	86,469	87,281
Essex	132,320	134,967	136,288	138,474	141,747	145,219	148,983	152,978	157,420	162,204	167,286
Gloucester	46,334	46,618	46,845	47,270	47,598	47,927	48,270	48,620	48,983	49,352	49,736
Hudson	111,588	112,653	113,481	114,383	115,733	117,153	118,693	120,338	122,093	123,969	125,972
Hunterdon	15,049	15,160	15,279	15,413	15,562	15,709	15,866	16,029	16,195	16,367	16,546
Mercer	47,018	47,355	47,645	48,073	48,490	48,924	49,376	49,843	50,327	50,848	51,376
Middlesex	124,879	126,032	126,884	128,358	129,773	131,271	132,810	134,452	136,182	138,055	139,975
Monmouth	112,299	113,105	113,623	114,570	115,613	116,680	117,806	118,945	120,117	121,359	122,622
Morris	72,492	73,425	73,905	74,630	75,537	76,479	77,460	78,464	79,532	80,640	81,803
Ocean	113,709	114,369	114,859	115,729	116,479	117,254	118,045	118,847	119,700	120,545	121,424
Passaic	94,680	95,596	96,311	97,340	98,486	99,671	100,956	102,299	103,744	105,260	106,833
Somerset	42,274	42,720	43,076	43,783	44,442	45,136	45,876	46,660	47,498	48,393	49,339
Sussex	22,414	22,617	22,730	22,911	23,113	23,320	23,531	23,748	23,970	24,201	24,428
Union	93,777	94,945	95,672	96,835	98,256	99,791	101,417	103,125	104,999	106,988	109,097
Warren	15,618	15,766	15,825	15,924	16,050	16,178	16,304	16,433	16,569	16,708	16,845

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:											
	12/25	12/26	12/27	12/28	12/30			1/1			1/3					
Bergen	141,877	143,393	144,576	146,477	150,656	(30,131)	[7,231]	{3,616}	155,464	(31,093)	[7,462]	{3,731}	160,912	(32,182)	[7,724]	{3,862}
Burlington	66,261	66,822	67,221	67,769	68,869	(13,774)	[3,306]	{1,653}	70,053	(14,011)	[3,363]	{1,681}	71,307	(14,261)	[3,423]	{1,711}
Camden	80,343	80,944	81,514	82,176	83,500	(16,700)	[4,008]	{2,004}	84,924	(16,985)	[4,076]	{2,038}	86,469	(17,294)	[4,151]	{2,075}
Essex	132,320	134,967	136,288	138,474	145,219	(29,044)	[6,970]	{3,485}	152,978	(30,596)	[7,343]	{3,671}	162,204	(32,441)	[7,786]	{3,893}
Gloucester	46,334	46,618	46,845	47,270	47,927	(9,585)	[2,301]	{1,150}	48,620	(9,724)	[2,334]	{1,167}	49,352	(9,870)	[2,369]	{1,184}
Hudson	111,588	112,653	113,481	114,383	117,153	(23,431)	[5,623]	{2,812}	120,338	(24,068)	[5,776]	{2,888}	123,969	(24,794)	[5,951]	{2,975}
Hunterdon	15,049	15,160	15,279	15,413	15,709	(3,142)	[754]	{377}	16,029	(3,206)	[769]	{385}	16,367	(3,273)	[786]	{393}
Mercer	47,018	47,355	47,645	48,073	48,924	(9,785)	[2,348]	{1,174}	49,843	(9,969)	[2,392]	{1,196}	50,848	(10,170)	[2,441]	{1,220}
Middlesex	124,879	126,032	126,884	128,358	131,271	(26,254)	[6,301]	{3,151}	134,452	(26,890)	[6,454]	{3,227}	138,055	(27,611)	[6,627]	{3,313}
Monmouth	112,299	113,105	113,623	114,570	116,680	(23,336)	[5,601]	{2,800}	118,945	(23,789)	[5,709]	{2,855}	121,359	(24,272)	[5,825]	{2,913}
Morris	72,492	73,425	73,905	74,630	76,479	(15,296)	[3,671]	{1,835}	78,464	(15,693)	[3,766]	{1,883}	80,640	(16,128)	[3,871]	{1,935}
Ocean	113,709	114,369	114,859	115,729	117,254	(23,451)	[5,628]	{2,814}	118,847	(23,769)	[5,705]	{2,852}	120,545	(24,109)	[5,786]	{2,893}
Passaic	94,680	95,596	96,311	97,340	99,671	(19,934)	[4,784]	{2,392}	102,299	(20,460)	[4,910]	{2,455}	105,260	(21,052)	[5,052]	{2,526}
Somerset	42,274	42,720	43,076	43,783	45,136	(9,027)	[2,167]	{1,083}	46,660	(9,332)	[2,240]	{1,120}	48,393	(9,679)	[2,323]	{1,161}
Sussex	22,414	22,617	22,730	22,911	23,320	(4,664)	[1,119]	{560}	23,748	(4,750)	[1,140]	{570}	24,201	(4,840)	[1,162]	{581}
Union	93,777	94,945	95,672	96,835	99,791	(19,958)	[4,790]	{2,395}	103,125	(20,625)	[4,950]	{2,475}	106,988	(21,398)	[5,135]	{2,568}
Warren	15,618	15,766	15,825	15,924	16,178	(3,236)	[777]	{388}	16,433	(3,287)	[789]	{394}	16,708	(3,342)	[802]	{401}

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.