

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

**Date: 12/1/21**

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 12/1/21 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.**

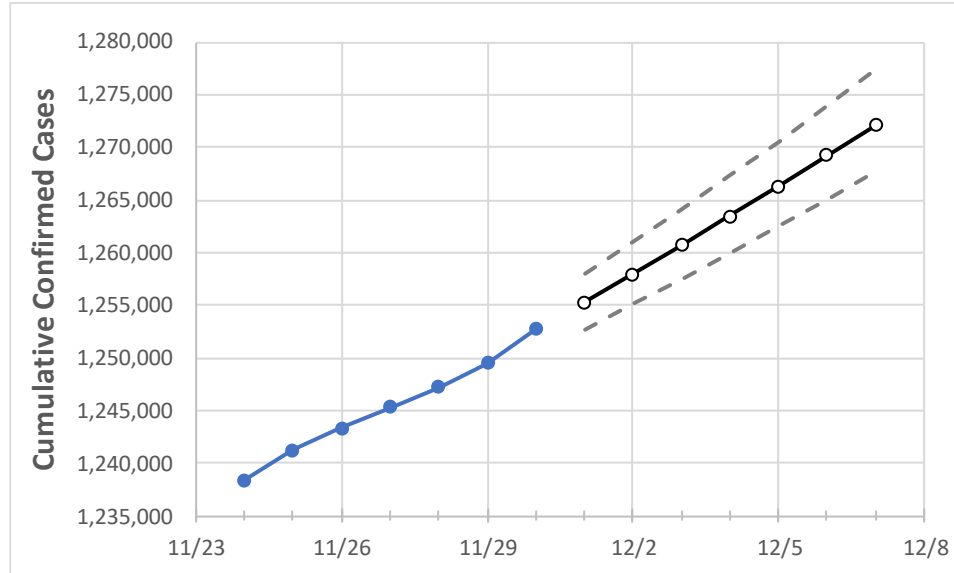
### **IEM's Modeling Lead**

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:						
	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7
New Jersey	1,245,344	1,247,213	1,249,454	1,252,705	1,255,311	1,257,988	1,260,670	1,263,439	1,266,283	1,269,229	1,272,135

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:							
	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7	
Bergen	123,821	123,973	124,132	124,405	124,629	124,855	125,083	125,323	125,564	125,815	126,068	
Burlington	58,182	58,253	58,417	58,592	58,763	58,937	59,116	59,295	59,478	59,667	59,856	
Camden	71,601	71,710	71,874	72,042	72,207	72,380	72,552	72,728	72,909	73,097	73,282	
Essex	109,335	109,465	109,589	109,761	109,928	110,102	110,279	110,461	110,643	110,836	111,033	
Gloucester	40,743	40,823	40,937	41,064	41,175	41,294	41,414	41,534	41,655	41,784	41,909	
Hudson	99,724	99,801	99,902	100,041	100,167	100,297	100,428	100,565	100,705	100,849	100,994	
Hunterdon	12,850	12,884	12,938	12,998	13,049	13,101	13,155	13,211	13,268	13,326	13,387	
Mercer	41,426	41,502	41,585	41,725	41,831	41,941	42,051	42,165	42,287	42,408	42,530	
Middlesex	109,814	109,969	110,133	110,405	110,599	110,798	111,003	111,210	111,423	111,642	111,865	
Monmouth	97,353	97,561	97,773	98,046	98,284	98,524	98,765	99,016	99,266	99,519	99,778	
Morris	60,883	61,007	61,163	61,370	61,540	61,711	61,886	62,068	62,257	62,447	62,648	
Ocean	100,729	100,941	101,195	101,488	101,742	101,999	102,259	102,527	102,794	103,073	103,351	
Passaic	83,971	84,082	84,176	84,370	84,503	84,638	84,778	84,923	85,069	85,221	85,376	
Somerset	36,185	36,249	36,294	36,441	36,517	36,597	36,677	36,759	36,850	36,936	37,030	
Sussex	18,714	18,760	18,814	18,926	18,992	19,059	19,126	19,194	19,265	19,336	19,410	
Union	81,803	81,879	81,953	82,114	82,234	82,356	82,482	82,610	82,745	82,879	83,018	
Warren	13,072	13,099	13,158	13,238	13,294	13,352	13,410	13,472	13,535	13,601	13,668	

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:											
	11/27	11/28	11/29	11/30	12/2			12/4			12/6					
Bergen	123,821	123,973	124,132	124,405	124,855	(24,971)	[5,993]	{2,997}	125,323	(25,065)	[6,015]	{3,008}	125,815	(25,163)	[6,039]	{3,020}
Burlington	58,182	58,253	58,417	58,592	58,937	(11,787)	[2,829]	{1,414}	59,295	(11,859)	[2,846]	{1,423}	59,667	(11,933)	[2,864]	{1,432}
Camden	71,601	71,710	71,874	72,042	72,380	(14,476)	[3,474]	{1,737}	72,728	(14,546)	[3,491]	{1,745}	73,097	(14,619)	[3,509]	{1,754}
Essex	109,335	109,465	109,589	109,761	110,102	(22,020)	[5,285]	{2,642}	110,461	(22,092)	[5,302]	{2,651}	110,836	(22,167)	[5,320]	{2,660}
Gloucester	40,743	40,823	40,937	41,064	41,294	(8,259)	[1,982]	{991}	41,534	(8,307)	[1,994]	{997}	41,784	(8,357)	[2,006]	{1,003}
Hudson	99,724	99,801	99,902	100,041	100,297	(20,059)	[4,814]	{2,407}	100,565	(20,113)	[4,827]	{2,414}	100,849	(20,170)	[4,841]	{2,420}
Hunterdon	12,850	12,884	12,938	12,998	13,101	(2,620)	[629]	{314}	13,211	(2,642)	[634]	{317}	13,326	(2,665)	[640]	{320}
Mercer	41,426	41,502	41,585	41,725	41,941	(8,388)	[2,013]	{1,007}	42,165	(8,433)	[2,024]	{1,012}	42,408	(8,482)	[2,036]	{1,018}
Middlesex	109,814	109,969	110,133	110,405	110,798	(22,160)	[5,318]	{2,659}	111,210	(22,242)	[5,338]	{2,669}	111,642	(22,328)	[5,359]	{2,679}
Monmouth	97,353	97,561	97,773	98,046	98,524	(19,705)	[4,729]	{2,365}	99,016	(19,803)	[4,753]	{2,376}	99,519	(19,904)	[4,777]	{2,388}
Morris	60,883	61,007	61,163	61,370	61,711	(12,342)	[2,962]	{1,481}	62,068	(12,414)	[2,979]	{1,490}	62,447	(12,489)	[2,997]	{1,499}
Ocean	100,729	100,941	101,195	101,488	101,999	(20,400)	[4,896]	{2,448}	102,527	(20,505)	[4,921]	{2,461}	103,073	(20,615)	[4,947]	{2,474}
Passaic	83,971	84,082	84,176	84,370	84,638	(16,928)	[4,063]	{2,031}	84,923	(16,985)	[4,076]	{2,038}	85,221	(17,044)	[4,091]	{2,045}
Somerset	36,185	36,249	36,294	36,441	36,597	(7,319)	[1,757]	{878}	36,759	(7,352)	[1,764]	{882}	36,936	(7,387)	[1,773]	{886}
Sussex	18,714	18,760	18,814	18,926	19,059	(3,812)	[915]	{457}	19,194	(3,839)	[921]	{461}	19,336	(3,867)	[928]	{464}
Union	81,803	81,879	81,953	82,114	82,356	(16,471)	[3,953]	{1,977}	82,610	(16,522)	[3,965]	{1,983}	82,879	(16,576)	[3,978]	{1,989}
Warren	13,072	13,099	13,158	13,238	13,352	(2,670)	[641]	{320}	13,472	(2,694)	[647]	{323}	13,601	(2,720)	[653]	{326}

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.