

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/27/21**

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 12/27/21 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.

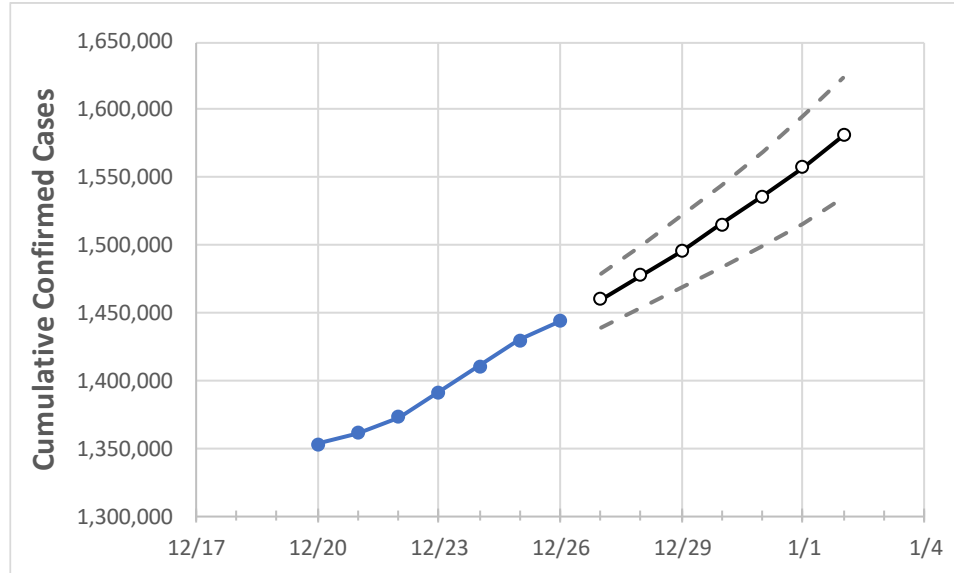
IEM's Modeling Lead

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:						
	12/23	12/24	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2

New Jersey 1,391,334 1,410,275 1,429,756 1,443,915 1,460,217 1,477,835 1,495,818 1,515,555 1,535,968 1,557,833 1,580,892

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:						
	12/23	12/24	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2
Bergen	137,350	139,544	141,877	143,393	145,323	147,415	149,639	152,047	154,651	157,417	160,367
Burlington	65,001	65,590	66,261	66,822	67,471	68,174	68,935	69,762	70,641	71,571	72,551
Camden	79,065	79,725	80,343	80,944	81,588	82,262	82,975	83,729	84,506	85,324	86,149
Essex	125,770	128,827	132,320	134,967	138,397	142,052	146,067	150,517	155,347	160,600	166,301
Gloucester	45,631	45,980	46,334	46,618	46,927	47,247	47,573	47,906	48,248	48,598	48,964
Hudson	108,668	110,066	111,588	112,653	114,020	115,505	117,083	118,813	120,647	122,650	124,802
Hunterdon	14,698	14,870	15,049	15,160	15,297	15,435	15,579	15,731	15,886	16,041	16,212
Mercer	46,062	46,601	47,018	47,355	47,750	48,152	48,588	49,037	49,488	49,989	50,498
Middlesex	121,682	123,320	124,879	126,032	127,352	128,771	130,277	131,861	133,534	135,291	137,159
Monmouth	109,721	110,867	112,299	113,105	114,156	115,255	116,380	117,568	118,822	120,121	121,456
Morris	70,254	71,386	72,492	73,425	74,371	75,364	76,407	77,514	78,637	79,842	81,093
Ocean	111,738	112,784	113,709	114,369	115,082	115,836	116,614	117,413	118,235	119,074	119,922
Passaic	92,075	93,425	94,680	95,596	96,691	97,840	99,077	100,395	101,812	103,342	104,933
Somerset	40,858	41,559	42,274	42,720	43,326	43,994	44,683	45,424	46,235	47,101	48,002
Sussex	21,835	22,103	22,414	22,617	22,839	23,076	23,317	23,561	23,821	24,076	24,346
Union	90,695	92,275	93,777	94,945	96,383	97,933	99,587	101,378	103,326	105,438	107,672
Warren	15,286	15,440	15,618	15,766	15,918	16,079	16,242	16,412	16,586	16,762	16,946

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:											
	12/23	12/24	12/25	12/26	12/28				12/30				1/1			
Bergen	137,350	139,544	141,877	143,393	147,415	(29,483)	[7,076]	{3,538}	152,047	(30,409)	[7,298]	{3,649}	157,417	(31,483)	[7,556]	{3,778}
Burlington	65,001	65,590	66,261	66,822	68,174	(13,635)	[3,272]	{1,636}	69,762	(13,952)	[3,349]	{1,674}	71,571	(14,314)	[3,435]	{1,718}
Camden	79,065	79,725	80,343	80,944	82,262	(16,452)	[3,949]	{1,974}	83,729	(16,746)	[4,019]	{2,010}	85,324	(17,065)	[4,096]	{2,048}
Essex	125,770	128,827	132,320	134,967	142,052	(28,410)	[6,818]	{3,409}	150,517	(30,103)	[7,225]	{3,612}	160,600	(32,120)	[7,709]	{3,854}
Gloucester	45,631	45,980	46,334	46,618	47,247	(9,449)	[2,268]	{1,134}	47,906	(9,581)	[2,299]	{1,150}	48,598	(9,720)	[2,333]	{1,166}
Hudson	108,668	110,066	111,588	112,653	115,505	(23,101)	[5,544]	{2,772}	118,813	(23,763)	[5,703]	{2,852}	122,650	(24,530)	[5,887]	{2,944}
Hunterdon	14,698	14,870	15,049	15,160	15,435	(3,087)	[741]	{370}	15,731	(3,146)	[755]	{378}	16,041	(3,208)	[770]	{385}
Mercer	46,062	46,601	47,018	47,355	48,152	(9,630)	[2,311]	{1,156}	49,037	(9,807)	[2,354]	{1,177}	49,989	(9,998)	[2,399]	{1,200}
Middlesex	121,682	123,320	124,879	126,032	128,771	(25,754)	[6,181]	{3,090}	131,861	(26,372)	[6,329]	{3,165}	135,291	(27,058)	[6,494]	{3,247}
Monmouth	109,721	110,867	112,299	113,105	115,255	(23,051)	[5,532]	{2,766}	117,568	(23,514)	[5,643]	{2,822}	120,121	(24,024)	[5,766]	{2,883}
Morris	70,254	71,386	72,492	73,425	75,364	(15,073)	[3,617]	{1,809}	77,514	(15,503)	[3,721]	{1,860}	79,842	(15,968)	[3,832]	{1,916}
Ocean	111,738	112,784	113,709	114,369	115,836	(23,167)	[5,560]	{2,780}	117,413	(23,483)	[5,636]	{2,818}	119,074	(23,815)	[5,716]	{2,858}
Passaic	92,075	93,425	94,680	95,596	97,840	(19,568)	[4,696]	{2,348}	100,395	(20,079)	[4,819]	{2,409}	103,342	(20,668)	[4,960]	{2,480}
Somerset	40,858	41,559	42,274	42,720	43,994	(8,799)	[2,112]	{1,056}	45,424	(9,085)	[2,180]	{1,090}	47,101	(9,420)	[2,261]	{1,130}
Sussex	21,835	22,103	22,414	22,617	23,076	(4,615)	[1,108]	{554}	23,561	(4,712)	[1,131]	{565}	24,076	(4,815)	[1,156]	{578}
Union	90,695	92,275	93,777	94,945	97,933	(19,587)	[4,701]	{2,350}	101,378	(20,276)	[4,866]	{2,433}	105,438	(21,088)	[5,061]	{2,531}
Warren	15,286	15,440	15,618	15,766	16,079	(3,216)	[772]	{386}	16,412	(3,282)	[788]	{394}	16,762	(3,352)	[805]	{402}

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.