

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/17/21**

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 12/17/21 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.**

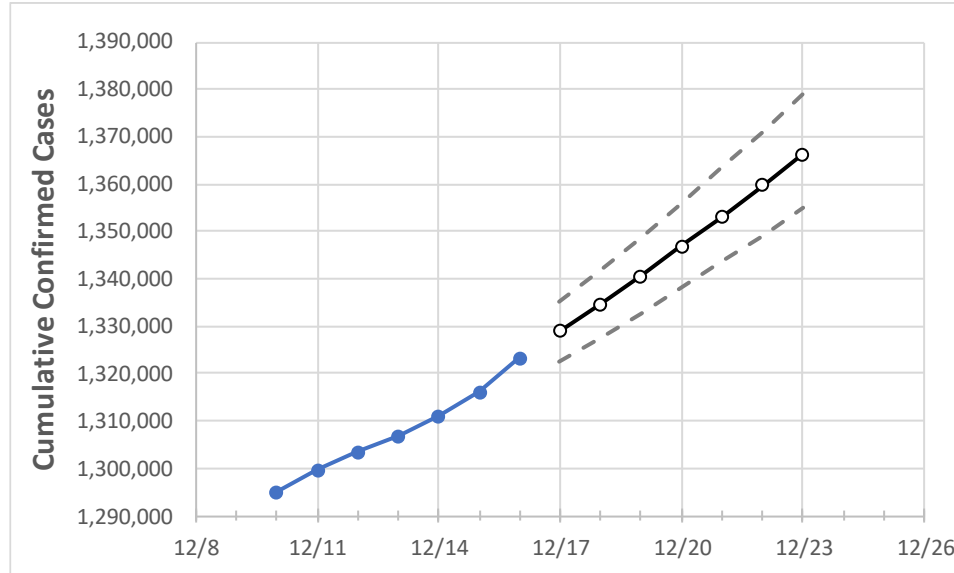
**IEM's Modeling Lead**

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:						
12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	12/23	

New Jersey 1,306,722 1,311,119 1,316,108 1,323,331 1,328,968 1,334,682 1,340,653 1,346,801 1,353,086 1,359,733 1,366,277

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:						
	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	12/23
Bergen	128,759	129,112	129,676	130,341	130,843	131,359	131,890	132,450	133,030	133,639	134,259
Burlington	61,679	61,875	62,115	62,452	62,719	62,980	63,247	63,519	63,802	64,086	64,372
Camden	75,320	75,534	75,817	76,223	76,531	76,842	77,165	77,494	77,834	78,180	78,528
Essex	113,555	113,901	114,324	115,110	115,603	116,116	116,651	117,219	117,809	118,426	119,080
Gloucester	43,308	43,475	43,690	43,922	44,136	44,344	44,560	44,780	45,010	45,243	45,478
Hudson	102,736	102,974	103,247	103,683	103,998	104,324	104,660	105,005	105,369	105,754	106,145
Hunterdon	13,765	13,826	13,878	13,963	14,033	14,103	14,174	14,247	14,321	14,399	14,472
Mercer	43,619	43,744	43,918	44,148	44,332	44,520	44,709	44,909	45,107	45,314	45,528
Middlesex	114,769	115,163	115,599	116,196	116,684	117,199	117,717	118,279	118,843	119,446	120,050
Monmouth	103,060	103,450	103,901	104,535	105,032	105,540	106,059	106,596	107,152	107,717	108,294
Morris	65,153	65,435	65,725	66,137	66,511	66,898	67,288	67,692	68,115	68,544	68,988
Ocean	106,506	106,929	107,299	107,946	108,431	108,932	109,429	109,958	110,485	111,022	111,588
Passaic	87,187	87,393	87,679	88,081	88,390	88,711	89,044	89,385	89,738	90,111	90,497
Somerset	37,968	38,120	38,267	38,449	38,613	38,782	38,957	39,133	39,315	39,512	39,715
Sussex	20,402	20,508	20,600	20,754	20,883	21,013	21,147	21,283	21,423	21,567	21,709
Union	84,798	85,079	85,337	85,745	86,053	86,374	86,707	87,053	87,414	87,791	88,177
Warren	14,271	14,359	14,449	14,558	14,659	14,757	14,861	14,965	15,073	15,188	15,300

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:											
	12/13	12/14	12/15	12/16	12/18				12/20				12/22			
Bergen	128,759	129,112	129,676	130,341	131,359	(26,272)	[6,305]	{3,153}	132,450	(26,490)	[6,358]	{3,179}	133,639	(26,728)	[6,415]	{3,207}
Burlington	61,679	61,875	62,115	62,452	62,980	(12,596)	[3,023]	{1,512}	63,519	(12,704)	[3,049]	{1,524}	64,086	(12,817)	[3,076]	{1,538}
Camden	75,320	75,534	75,817	76,223	76,842	(15,368)	[3,688]	{1,844}	77,494	(15,499)	[3,720]	{1,860}	78,180	(15,636)	[3,753]	{1,876}
Essex	113,555	113,901	114,324	115,110	116,116	(23,223)	[5,574]	{2,787}	117,219	(23,444)	[5,627]	{2,813}	118,426	(23,685)	[5,684]	{2,842}
Gloucester	43,308	43,475	43,690	43,922	44,344	(8,869)	[2,128]	{1,064}	44,780	(8,956)	[2,149]	{1,075}	45,243	(9,049)	[2,172]	{1,086}
Hudson	102,736	102,974	103,247	103,683	104,324	(20,865)	[5,008]	{2,504}	105,005	(21,001)	[5,040]	{2,520}	105,754	(21,151)	[5,076]	{2,538}
Hunterdon	13,765	13,826	13,878	13,963	14,103	(2,821)	[677]	{338}	14,247	(2,849)	[684]	{342}	14,399	(2,880)	[691]	{346}
Mercer	43,619	43,744	43,918	44,148	44,520	(8,904)	[2,137]	{1,068}	44,909	(8,982)	[2,156]	{1,078}	45,314	(9,063)	[2,175]	{1,088}
Middlesex	114,769	115,163	115,599	116,196	117,199	(23,440)	[5,626]	{2,813}	118,279	(23,656)	[5,677]	{2,839}	119,446	(23,889)	[5,733]	{2,867}
Monmouth	103,060	103,450	103,901	104,535	105,540	(21,108)	[5,066]	{2,533}	106,596	(21,319)	[5,117]	{2,558}	107,717	(21,543)	[5,170]	{2,585}
Morris	65,153	65,435	65,725	66,137	66,898	(13,380)	[3,211]	{1,606}	67,692	(13,538)	[3,249]	{1,625}	68,544	(13,709)	[3,290]	{1,645}
Ocean	106,506	106,929	107,299	107,946	108,932	(21,786)	[5,229]	{2,614}	109,958	(21,992)	[5,278]	{2,639}	111,022	(22,204)	[5,329]	{2,665}
Passaic	87,187	87,393	87,679	88,081	88,711	(17,742)	[4,258]	{2,129}	89,385	(17,877)	[4,290]	{2,145}	90,111	(18,022)	[4,325]	{2,163}
Somerset	37,968	38,120	38,267	38,449	38,782	(7,756)	[1,862]	{931}	39,133	(7,827)	[1,878]	{939}	39,512	(7,902)	[1,897]	{948}
Sussex	20,402	20,508	20,600	20,754	21,013	(4,203)	[1,009]	{504}	21,283	(4,257)	[1,022]	{511}	21,567	(4,313)	[1,035]	{518}
Union	84,798	85,079	85,337	85,745	86,374	(17,275)	[4,146]	{2,073}	87,053	(17,411)	[4,179]	{2,089}	87,791	(17,558)	[4,214]	{2,107}
Warren	14,271	14,359	14,449	14,558	14,757	(2,951)	[708]	{354}	14,965	(2,993)	[718]	{359}	15,188	(3,038)	[729]	{365}

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.