

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

**Date: 5/6/21**

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 5/6/21 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.**

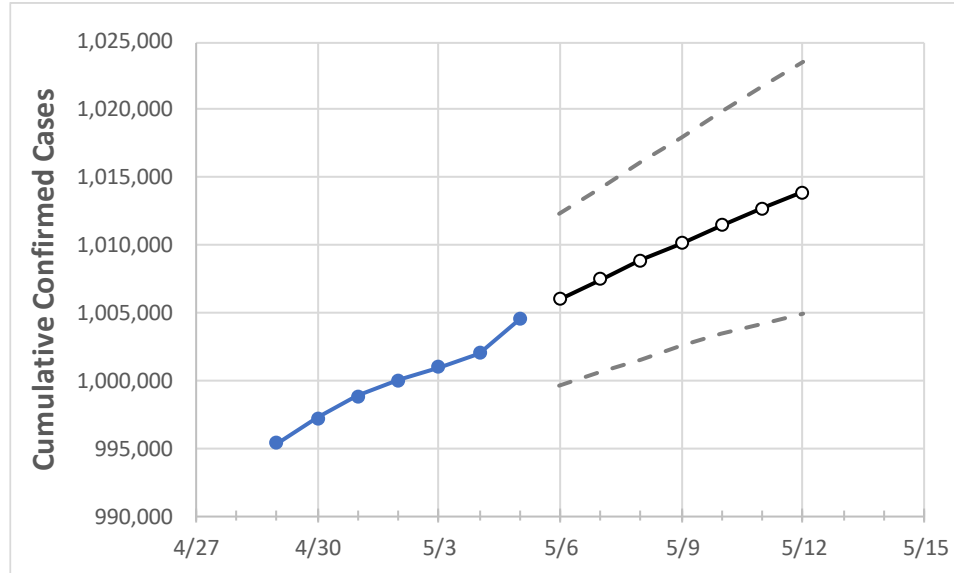
### **IEM's Modeling Lead**

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:						
	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12

New Jersey 1,000,010 1,000,993 1,001,997 1,004,525 1,005,997 1,007,457 1,008,846 1,010,139 1,011,469 1,012,718 1,013,896

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:						
	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12
Bergen	101,198	101,287	101,383	102,678	102,914	103,154	103,393	103,633	103,869	104,117	104,354
Burlington	43,902	43,966	43,996	44,060	44,118	44,173	44,224	44,274	44,320	44,363	44,406
Camden	54,072	54,163	54,259	54,355	54,461	54,563	54,663	54,762	54,856	54,945	55,033
Essex	93,273	93,367	93,438	93,491	93,628	93,751	93,874	93,992	94,098	94,200	94,296
Gloucester	29,770	29,801	29,877	29,927	29,985	30,042	30,097	30,149	30,200	30,250	30,298
Hudson	87,000	87,080	87,121	87,261	87,380	87,495	87,604	87,709	87,810	87,905	87,995
Hunterdon	9,523	9,528	9,556	9,582	9,594	9,605	9,615	9,625	9,635	9,643	9,652
Mercer	33,352	33,385	33,421	33,439	33,482	33,524	33,564	33,602	33,638	33,674	33,709
Middlesex	91,143	91,225	91,255	91,298	91,415	91,525	91,632	91,728	91,821	91,911	91,993
Monmouth	74,446	74,507	74,553	74,656	74,734	74,810	74,875	74,939	74,999	75,058	75,111
Morris	49,534	49,590	49,652	49,696	49,750	49,802	49,853	49,901	49,944	49,988	50,030
Ocean	74,742	74,792	74,859	74,951	75,024	75,092	75,155	75,216	75,275	75,329	75,380
Passaic	71,630	71,673	71,767	71,953	72,077	72,193	72,309	72,418	72,521	72,625	72,723
Somerset	29,489	29,515	29,557	29,609	29,649	29,689	29,726	29,761	29,797	29,829	29,860
Sussex	13,620	13,648	13,680	13,707	13,735	13,762	13,787	13,811	13,836	13,858	13,880
Union	70,399	70,453	70,513	70,626	70,736	70,837	70,936	71,031	71,124	71,210	71,299
Warren	9,684	9,694	9,708	9,725	9,741	9,758	9,773	9,787	9,801	9,814	9,826

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:											
	5/2	5/3	5/4	5/5	5/7				5/9				5/11			
Bergen	101,198	101,287	101,383	102,678	103,154	(20,631)	[4,951]	{2,476}	103,633	(20,727)	[4,974]	{2,487}	104,117	(20,823)	[4,998]	{2,499}
Burlington	43,902	43,966	43,996	44,060	44,173	(8,835)	[2,120]	{1,060}	44,274	(8,855)	[2,125]	{1,063}	44,363	(8,873)	[2,129]	{1,065}
Camden	54,072	54,163	54,259	54,355	54,563	(10,913)	[2,619]	{1,310}	54,762	(10,952)	[2,629]	{1,314}	54,945	(10,989)	[2,637]	{1,319}
Essex	93,273	93,367	93,438	93,491	93,751	(18,750)	[4,500]	{2,250}	93,992	(18,798)	[4,512]	{2,256}	94,200	(18,840)	[4,522]	{2,261}
Gloucester	29,770	29,801	29,877	29,927	30,042	(6,008)	[1,442]	{721}	30,149	(6,030)	[1,447]	{724}	30,250	(6,050)	[1,452]	{726}
Hudson	87,000	87,080	87,121	87,261	87,495	(17,499)	[4,200]	{2,100}	87,709	(17,542)	[4,210]	{2,105}	87,905	(17,581)	[4,219]	{2,110}
Hunterdon	9,523	9,528	9,556	9,582	9,605	(1,921)	[461]	{231}	9,625	(1,925)	[462]	{231}	9,643	(1,929)	[463]	{231}
Mercer	33,352	33,385	33,421	33,439	33,524	(6,705)	[1,609]	{805}	33,602	(6,720)	[1,613]	{806}	33,674	(6,735)	[1,616]	{808}
Middlesex	91,143	91,225	91,255	91,298	91,525	(18,305)	[4,393]	{2,197}	91,728	(18,346)	[4,403]	{2,201}	91,911	(18,382)	[4,412]	{2,206}
Monmouth	74,446	74,507	74,553	74,656	74,810	(14,962)	[3,591]	{1,795}	74,939	(14,988)	[3,597]	{1,799}	75,058	(15,012)	[3,603]	{1,801}
Morris	49,534	49,590	49,652	49,696	49,802	(9,960)	[2,391]	{1,195}	49,901	(9,980)	[2,395]	{1,198}	49,988	(9,998)	[2,399]	{1,200}
Ocean	74,742	74,792	74,859	74,951	75,092	(15,018)	[3,604]	{1,802}	75,216	(15,043)	[3,610]	{1,805}	75,329	(15,066)	[3,616]	{1,808}
Passaic	71,630	71,673	71,767	71,953	72,193	(14,439)	[3,465]	{1,733}	72,418	(14,484)	[3,476]	{1,738}	72,625	(14,525)	[3,486]	{1,743}
Somerset	29,489	29,515	29,557	29,609	29,689	(5,938)	[1,425]	{713}	29,761	(5,952)	[1,429]	{714}	29,829	(5,966)	[1,432]	{716}
Sussex	13,620	13,648	13,680	13,707	13,762	(2,752)	[661]	{330}	13,811	(2,762)	[663]	{331}	13,858	(2,772)	[665]	{333}
Union	70,399	70,453	70,513	70,626	70,837	(14,167)	[3,400]	{1,700}	71,031	(14,206)	[3,410]	{1,705}	71,210	(14,242)	[3,418]	{1,709}
Warren	9,684	9,694	9,708	9,725	9,758	(1,952)	[468]	{234}	9,787	(1,957)	[470]	{235}	9,814	(1,963)	[471]	{236}

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.