

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

**Date: 5/24/21**

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 5/24/21 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.**

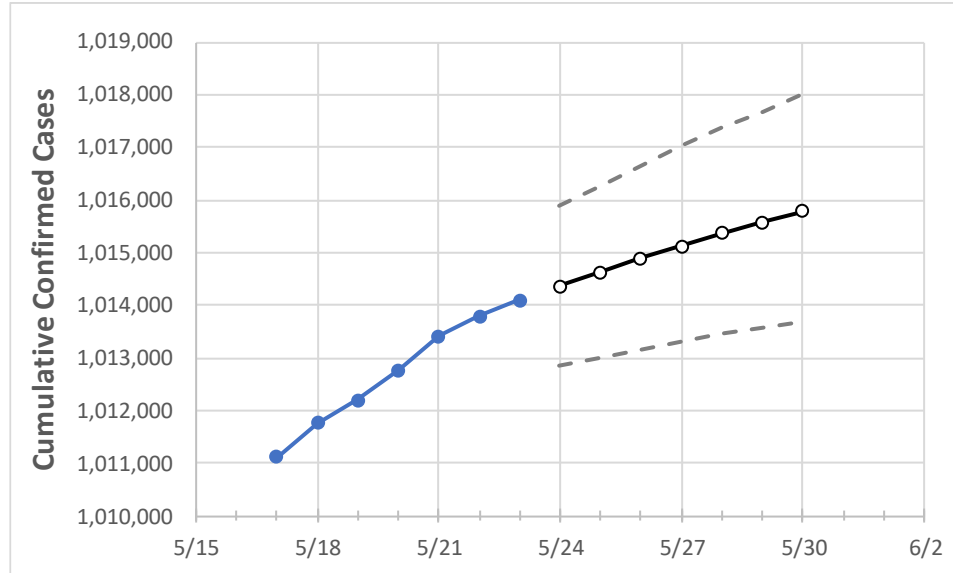
### **IEM's Modeling Lead**

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:						
5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	
New Jersey	1,012,757	1,013,409	1,013,787	1,014,088	1,014,363	1,014,632	1,014,886	1,015,129	1,015,359	1,015,578	1,015,776

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:						
	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30
Bergen	103,898	103,965	103,993	104,022	104,050	104,078	104,103	104,127	104,150	104,171	104,190
Burlington	44,041	44,020	44,012	44,042	44,059	44,075	44,090	44,105	44,119	44,132	44,144
Camden	55,229	55,277	55,311	55,339	55,372	55,404	55,434	55,462	55,489	55,515	55,540
Essex	93,739	93,811	93,800	93,798	93,822	93,844	93,865	93,883	93,900	93,918	93,934
Gloucester	30,362	30,391	30,406	30,423	30,440	30,455	30,470	30,484	30,498	30,510	30,522
Hudson	87,693	87,746	87,760	87,773	87,794	87,814	87,832	87,849	87,863	87,878	87,892
Hunterdon	9,730	9,740	9,748	9,754	9,760	9,766	9,771	9,776	9,781	9,786	9,790
Mercer	33,768	33,794	33,820	33,841	33,857	33,872	33,887	33,901	33,914	33,927	33,941
Middlesex	91,803	91,873	91,907	91,931	91,955	91,978	91,998	92,019	92,037	92,054	92,071
Monmouth	75,218	75,260	75,297	75,315	75,337	75,360	75,381	75,402	75,420	75,440	75,457
Morris	49,911	49,934	49,951	49,954	49,967	49,979	49,991	50,002	50,012	50,022	50,032
Ocean	75,498	75,538	75,569	75,596	75,619	75,641	75,662	75,683	75,702	75,722	75,740
Passaic	72,532	72,607	72,652	72,673	72,697	72,720	72,741	72,762	72,782	72,801	72,818
Somerset	29,919	29,933	29,956	29,967	29,976	29,985	29,993	30,001	30,008	30,015	30,021
Sussex	13,902	13,920	13,937	13,945	13,952	13,959	13,966	13,972	13,978	13,984	13,989
Union	71,157	71,198	71,221	71,236	71,251	71,266	71,279	71,291	71,302	71,312	71,322
Warren	9,907	9,913	9,919	9,923	9,929	9,934	9,940	9,945	9,950	9,954	9,959

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:											
	5/20	5/21	5/22	5/23	5/25				5/27				5/29			
Bergen	103,898	103,965	103,993	104,022	104,078	(20,816)	[4,996]	{2,498}	104,127	(20,825)	[4,998]	{2,499}	104,171	(20,834)	[5,000]	{2,500}
Burlington	44,041	44,020	44,012	44,042	44,075	(8,815)	[2,116]	{1,058}	44,105	(8,821)	[2,117]	{1,059}	44,132	(8,826)	[2,118]	{1,059}
Camden	55,229	55,277	55,311	55,339	55,404	(11,081)	[2,659]	{1,330}	55,462	(11,092)	[2,662]	{1,331}	55,515	(11,103)	[2,665]	{1,332}
Essex	93,739	93,811	93,800	93,798	93,844	(18,769)	[4,505]	{2,252}	93,883	(18,777)	[4,506]	{2,253}	93,918	(18,784)	[4,508]	{2,254}
Gloucester	30,362	30,391	30,406	30,423	30,455	(6,091)	[1,462]	{731}	30,484	(6,097)	[1,463]	{732}	30,510	(6,102)	[1,464]	{732}
Hudson	87,693	87,746	87,760	87,773	87,814	(17,563)	[4,215]	{2,108}	87,849	(17,570)	[4,217]	{2,108}	87,878	(17,576)	[4,218]	{2,109}
Hunterdon	9,730	9,740	9,748	9,754	9,766	(1,953)	[469]	{234}	9,776	(1,955)	[469]	{235}	9,786	(1,957)	[470]	{235}
Mercer	33,768	33,794	33,820	33,841	33,872	(6,774)	[1,626]	{813}	33,901	(6,780)	[1,627]	{814}	33,927	(6,785)	[1,629]	{814}
Middlesex	91,803	91,873	91,907	91,931	91,978	(18,396)	[4,415]	{2,207}	92,019	(18,404)	[4,417]	{2,208}	92,054	(18,411)	[4,419]	{2,209}
Monmouth	75,218	75,260	75,297	75,315	75,360	(15,072)	[3,617]	{1,809}	75,402	(15,080)	[3,619]	{1,810}	75,440	(15,088)	[3,621]	{1,811}
Morris	49,911	49,934	49,951	49,954	49,979	(9,996)	[2,399]	{1,200}	50,002	(10,000)	[2,400]	{1,200}	50,022	(10,004)	[2,401]	{1,201}
Ocean	75,498	75,538	75,569	75,596	75,641	(15,128)	[3,631]	{1,815}	75,683	(15,137)	[3,633]	{1,816}	75,722	(15,144)	[3,635]	{1,817}
Passaic	72,532	72,607	72,652	72,673	72,720	(14,544)	[3,491]	{1,745}	72,762	(14,552)	[3,493]	{1,746}	72,801	(14,560)	[3,494]	{1,747}
Somerset	29,919	29,933	29,956	29,967	29,985	(5,997)	[1,439]	{720}	30,001	(6,000)	[1,440]	{720}	30,015	(6,003)	[1,441]	{720}
Sussex	13,902	13,920	13,937	13,945	13,959	(2,792)	[670]	{335}	13,972	(2,794)	[671]	{335}	13,984	(2,797)	[671]	{336}
Union	71,157	71,198	71,221	71,236	71,266	(14,253)	[3,421]	{1,710}	71,291	(14,258)	[3,422]	{1,711}	71,312	(14,262)	[3,423]	{1,711}
Warren	9,907	9,913	9,919	9,923	9,934	(1,987)	[477]	{238}	9,945	(1,989)	[477]	{239}	9,954	(1,991)	[478]	{239}

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.