

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

**Date: 7/7/21**

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 7/7/21 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.**

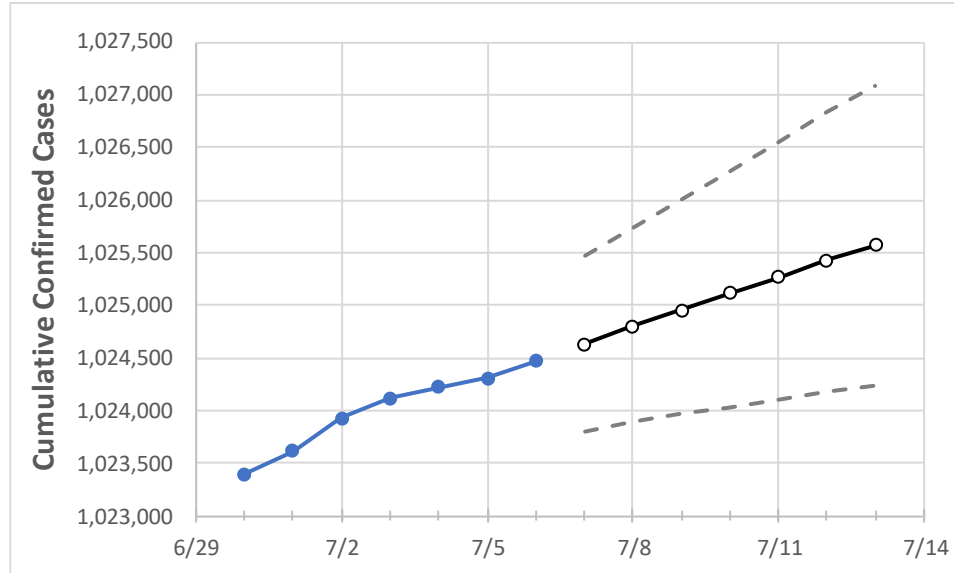
### **IEM's Modeling Lead**

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:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
New Jersey	1,024,113	1,024,225	1,024,311	1,024,465	1,024,631	1,024,797	1,024,955	1,025,117	1,025,269	1,025,424	1,025,574

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:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
Bergen	105,080	105,086	105,095	105,108	105,127	105,144	105,161	105,178	105,193	105,209	105,223
Burlington	44,441	44,450	44,455	44,462	44,472	44,481	44,491	44,501	44,510	44,520	44,530
Camden	55,985	55,984	55,979	55,981	55,992	56,004	56,015	56,027	56,038	56,049	56,060
Essex	94,506	94,513	94,514	94,521	94,527	94,533	94,539	94,545	94,550	94,555	94,560
Gloucester	30,745	30,746	30,748	30,749	30,754	30,758	30,763	30,768	30,773	30,777	30,782
Hudson	88,435	88,452	88,461	88,462	88,469	88,476	88,483	88,490	88,497	88,503	88,509
Hunterdon	9,906	9,908	9,910	9,912	9,916	9,920	9,924	9,928	9,931	9,935	9,939
Mercer	34,214	34,215	34,215	34,219	34,223	34,226	34,230	34,233	34,236	34,239	34,242
Middlesex	92,713	92,709	92,721	92,733	92,741	92,749	92,757	92,763	92,770	92,777	92,784
Monmouth	76,210	76,242	76,258	76,279	76,310	76,342	76,374	76,406	76,438	76,470	76,502
Morris	50,419	50,417	50,413	50,415	50,425	50,435	50,445	50,455	50,466	50,476	50,486
Ocean	76,561	76,585	76,603	76,627	76,652	76,677	76,702	76,728	76,753	76,778	76,802
Passaic	73,453	73,461	73,465	73,473	73,481	73,489	73,496	73,503	73,510	73,517	73,523
Somerset	30,270	30,279	30,277	30,285	30,292	30,300	30,307	30,315	30,322	30,329	30,337
Sussex	14,126	14,130	14,132	14,133	14,135	14,137	14,139	14,141	14,143	14,145	14,146
Union	71,823	71,825	71,841	71,854	71,866	71,878	71,891	71,903	71,915	71,928	71,940
Warren	10,045	10,047	10,049	10,051	10,054	10,056	10,058	10,061	10,063	10,066	10,068

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:											
	7/3	7/4	7/5	7/6	7/8				7/10				7/12			
Bergen	105,080	105,086	105,095	105,108	105,144	(21,029)	[5,047]	{2,523}	105,178	(21,036)	[5,049]	{2,524}	105,209	(21,042)	[5,050]	{2,525}
Burlington	44,441	44,450	44,455	44,462	44,481	(8,896)	[2,135]	{1,068}	44,501	(8,900)	[2,136]	{1,068}	44,520	(8,904)	[2,137]	{1,068}
Camden	55,985	55,984	55,979	55,981	56,004	(11,201)	[2,688]	{1,344}	56,027	(11,205)	[2,689]	{1,345}	56,049	(11,210)	[2,690]	{1,345}
Essex	94,506	94,513	94,514	94,521	94,533	(18,907)	[4,538]	{2,269}	94,545	(18,909)	[4,538]	{2,269}	94,555	(18,911)	[4,539]	{2,269}
Gloucester	30,745	30,746	30,748	30,749	30,758	(6,152)	[1,476]	{738}	30,768	(6,154)	[1,477]	{738}	30,777	(6,155)	[1,477]	{739}
Hudson	88,435	88,452	88,461	88,462	88,476	(17,695)	[4,247]	{2,123}	88,490	(17,698)	[4,248]	{2,124}	88,503	(17,701)	[4,248]	{2,124}
Hunterdon	9,906	9,908	9,910	9,912	9,920	(1,984)	[476]	{238}	9,928	(1,986)	[477]	{238}	9,935	(1,987)	[477]	{238}
Mercer	34,214	34,215	34,215	34,219	34,226	(6,845)	[1,643]	{821}	34,233	(6,847)	[1,643]	{822}	34,239	(6,848)	[1,643]	{822}
Middlesex	92,713	92,709	92,721	92,733	92,749	(18,550)	[4,452]	{2,226}	92,763	(18,553)	[4,453]	{2,226}	92,777	(18,555)	[4,453]	{2,227}
Monmouth	76,210	76,242	76,258	76,279	76,342	(15,268)	[3,664]	{1,832}	76,406	(15,281)	[3,667]	{1,834}	76,470	(15,294)	[3,671]	{1,835}
Morris	50,419	50,417	50,413	50,415	50,435	(10,087)	[2,421]	{1,210}	50,455	(10,091)	[2,422]	{1,211}	50,476	(10,095)	[2,423]	{1,211}
Ocean	76,561	76,585	76,603	76,627	76,677	(15,335)	[3,681]	{1,840}	76,728	(15,346)	[3,683]	{1,841}	76,778	(15,356)	[3,685]	{1,843}
Passaic	73,453	73,461	73,465	73,473	73,489	(14,698)	[3,527]	{1,764}	73,503	(14,701)	[3,528]	{1,764}	73,517	(14,703)	[3,529]	{1,764}
Somerset	30,270	30,279	30,277	30,285	30,300	(6,060)	[1,454]	{727}	30,315	(6,063)	[1,455]	{728}	30,329	(6,066)	[1,456]	{728}
Sussex	14,126	14,130	14,132	14,133	14,137	(2,827)	[679]	{339}	14,141	(2,828)	[679]	{339}	14,145	(2,829)	[679]	{339}
Union	71,823	71,825	71,841	71,854	71,878	(14,376)	[3,450]	{1,725}	71,903	(14,381)	[3,451]	{1,726}	71,928	(14,386)	[3,453]	{1,726}
Warren	10,045	10,047	10,049	10,051	10,056	(2,011)	[483]	{241}	10,061	(2,012)	[483]	{241}	10,066	(2,013)	[483]	{242}

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.