

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

**Date: 6/1/21**

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 6/1/21 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.**

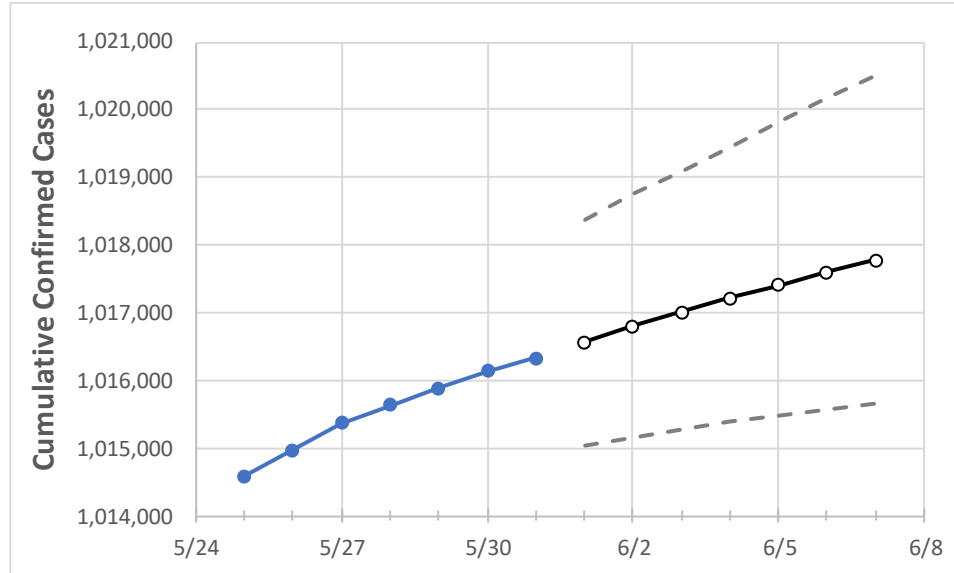
### **IEM's Modeling Lead**

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:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7
New Jersey	1,015,634	1,015,889	1,016,135	1,016,332	1,016,570	1,016,798	1,017,010	1,017,216	1,017,412	1,017,596	1,017,777

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:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7
Bergen	104,206	104,225	104,237	104,255	104,275	104,293	104,310	104,326	104,341	104,356	104,369
Burlington	44,129	44,147	44,159	44,169	44,182	44,195	44,206	44,216	44,226	44,236	44,245
Camden	55,510	55,537	55,559	55,569	55,594	55,617	55,639	55,660	55,680	55,699	55,717
Essex	93,933	93,952	93,970	93,990	94,019	94,046	94,073	94,100	94,125	94,151	94,175
Gloucester	30,470	30,475	30,487	30,494	30,502	30,510	30,518	30,524	30,530	30,536	30,541
Hudson	87,840	87,858	87,881	87,886	87,897	87,907	87,916	87,924	87,932	87,939	87,945
Hunterdon	9,773	9,777	9,781	9,784	9,788	9,791	9,794	9,797	9,801	9,803	9,806
Mercer	33,937	33,947	33,964	33,981	33,997	34,012	34,027	34,042	34,056	34,071	34,085
Middlesex	92,058	92,080	92,110	92,138	92,162	92,186	92,209	92,230	92,253	92,273	92,294
Monmouth	75,426	75,436	75,451	75,464	75,483	75,501	75,518	75,535	75,551	75,566	75,581
Morris	50,038	50,051	50,064	50,071	50,085	50,097	50,109	50,122	50,133	50,145	50,156
Ocean	75,682	75,709	75,722	75,743	75,760	75,774	75,789	75,804	75,817	75,830	75,842
Passaic	72,780	72,799	72,818	72,827	72,850	72,873	72,895	72,915	72,935	72,956	72,974
Somerset	30,007	30,016	30,024	30,023	30,031	30,038	30,044	30,050	30,056	30,062	30,068
Sussex	13,963	13,967	13,973	13,980	13,985	13,990	13,994	13,998	14,002	14,006	14,010
Union	71,298	71,305	71,313	71,325	71,338	71,349	71,361	71,371	71,380	71,389	71,397
Warren	9,953	9,958	9,961	9,961	9,966	9,970	9,974	9,978	9,982	9,986	9,989

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:											
	5/28	5/29	5/30	5/31	6/2				6/4				6/6			
Bergen	104,206	104,225	104,237	104,255	104,293	(20,859)	[5,006]	{2,503}	104,326	(20,865)	[5,008]	{2,504}	104,356	(20,871)	[5,009]	{2,505}
Burlington	44,129	44,147	44,159	44,169	44,195	(8,839)	[2,121]	{1,061}	44,216	(8,843)	[2,122]	{1,061}	44,236	(8,847)	[2,123]	{1,062}
Camden	55,510	55,537	55,559	55,569	55,617	(11,123)	[2,670]	{1,335}	55,660	(11,132)	[2,672]	{1,336}	55,699	(11,140)	[2,674]	{1,337}
Essex	93,933	93,952	93,970	93,990	94,046	(18,809)	[4,514]	{2,257}	94,100	(18,820)	[4,517]	{2,258}	94,151	(18,830)	[4,519]	{2,260}
Gloucester	30,470	30,475	30,487	30,494	30,510	(6,102)	[1,464]	{732}	30,524	(6,105)	[1,465]	{733}	30,536	(6,107)	[1,466]	{733}
Hudson	87,840	87,858	87,881	87,886	87,907	(17,581)	[4,220]	{2,110}	87,924	(17,585)	[4,220]	{2,110}	87,939	(17,588)	[4,221]	{2,111}
Hunterdon	9,773	9,777	9,781	9,784	9,791	(1,958)	[470]	{235}	9,797	(1,959)	[470]	{235}	9,803	(1,961)	[471]	{235}
Mercer	33,937	33,947	33,964	33,981	34,012	(6,802)	[1,633]	{816}	34,042	(6,808)	[1,634]	{817}	34,071	(6,814)	[1,635]	{818}
Middlesex	92,058	92,080	92,110	92,138	92,186	(18,437)	[4,425]	{2,212}	92,230	(18,446)	[4,427]	{2,214}	92,273	(18,455)	[4,429]	{2,215}
Monmouth	75,426	75,436	75,451	75,464	75,501	(15,100)	[3,624]	{1,812}	75,535	(15,107)	[3,626]	{1,813}	75,566	(15,113)	[3,627]	{1,814}
Morris	50,038	50,051	50,064	50,071	50,097	(10,019)	[2,405]	{1,202}	50,122	(10,024)	[2,406]	{1,203}	50,145	(10,029)	[2,407]	{1,203}
Ocean	75,682	75,709	75,722	75,743	75,774	(15,155)	[3,637]	{1,819}	75,804	(15,161)	[3,639]	{1,819}	75,830	(15,166)	[3,640]	{1,820}
Passaic	72,780	72,799	72,818	72,827	72,873	(14,575)	[3,498]	{1,749}	72,915	(14,583)	[3,500]	{1,750}	72,956	(14,591)	[3,502]	{1,751}
Somerset	30,007	30,016	30,024	30,023	30,038	(6,008)	[1,442]	{721}	30,050	(6,010)	[1,442]	{721}	30,062	(6,012)	[1,443]	{721}
Sussex	13,963	13,967	13,973	13,980	13,990	(2,798)	[672]	{336}	13,998	(2,800)	[672]	{336}	14,006	(2,801)	[672]	{336}
Union	71,298	71,305	71,313	71,325	71,349	(14,270)	[3,425]	{1,712}	71,371	(14,274)	[3,426]	{1,713}	71,389	(14,278)	[3,427]	{1,713}
Warren	9,953	9,958	9,961	9,961	9,970	(1,994)	[479]	{239}	9,978	(1,996)	[479]	{239}	9,986	(1,997)	[479]	{240}

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.