

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/27/21**

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 8/27/21 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.

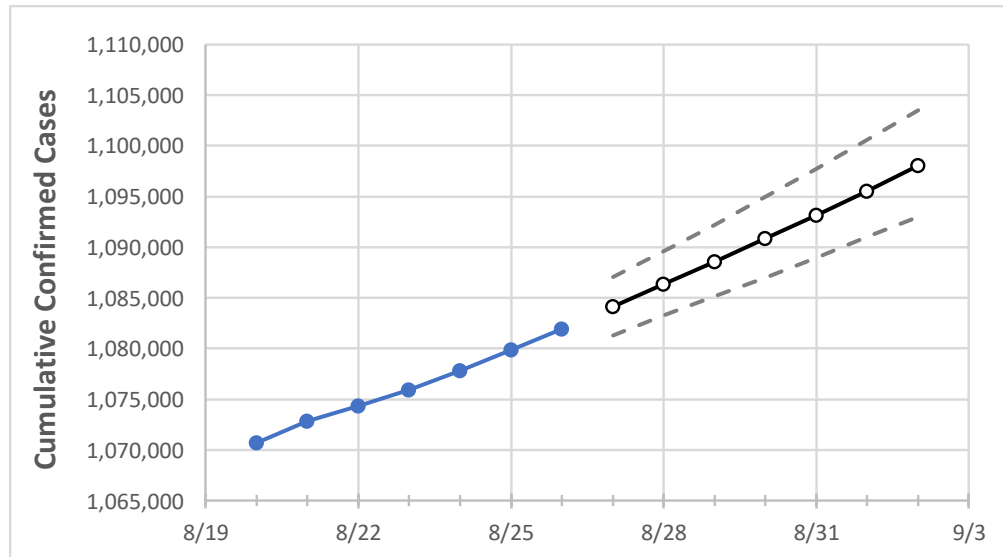
IEM's Modeling Lead

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
New Jersey	1,075,930	1,077,787	1,079,900	1,081,954	1,084,108	1,086,346	1,088,548	1,090,836	1,093,153	1,095,519	1,098,013

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Bergen	109,793	109,953	110,157	110,336	110,526	110,720	110,916	111,122	111,332	111,548	111,757
Burlington	47,392	47,514	47,649	47,787	47,918	48,056	48,191	48,331	48,476	48,622	48,772
Camden	59,168	59,280	59,417	59,534	59,673	59,816	59,955	60,103	60,252	60,405	60,558
Essex	98,936	99,067	99,248	99,394	99,558	99,718	99,881	100,046	100,215	100,389	100,562
Gloucester	32,631	32,702	32,801	32,900	33,003	33,112	33,220	33,331	33,446	33,575	33,696
Hudson	91,822	91,959	92,066	92,166	92,287	92,409	92,533	92,657	92,786	92,917	93,044
Hunterdon	10,526	10,533	10,567	10,589	10,614	10,638	10,663	10,689	10,715	10,743	10,770
Mercer	35,736	35,787	35,864	35,929	36,003	36,076	36,149	36,225	36,305	36,386	36,470
Middlesex	96,898	97,072	97,214	97,380	97,551	97,722	97,893	98,074	98,254	98,443	98,627
Monmouth	81,875	82,067	82,303	82,500	82,704	82,915	83,122	83,337	83,557	83,781	84,012
Morris	52,630	52,736	52,829	52,920	53,010	53,103	53,197	53,293	53,391	53,493	53,595
Ocean	81,380	81,532	81,718	81,890	82,089	82,289	82,498	82,707	82,927	83,156	83,387
Passaic	75,989	76,051	76,155	76,273	76,391	76,510	76,639	76,768	76,905	77,040	77,186
Somerset	31,811	31,862	31,921	31,981	32,040	32,099	32,158	32,218	32,279	32,339	32,404
Sussex	14,752	14,771	14,790	14,830	14,860	14,891	14,923	14,957	14,991	15,026	15,064
Union	74,712	74,806	74,922	75,067	75,191	75,320	75,449	75,582	75,721	75,863	76,007
Warren	10,478	10,498	10,522	10,546	10,576	10,608	10,641	10,675	10,712	10,749	10,789

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:											
	8/23	8/24	8/25	8/26	8/28				8/30				9/1			
Bergen	109,793	109,953	110,157	110,336	110,720	(22,144)	[5,315]	{2,657}	111,122	(22,224)	[5,334]	{2,667}	111,548	(22,310)	[5,354]	{2,677}
Burlington	47,392	47,514	47,649	47,787	48,056	(9,611)	[2,307]	{1,153}	48,331	(9,666)	[2,320]	{1,160}	48,622	(9,724)	[2,334]	{1,167}
Camden	59,168	59,280	59,417	59,534	59,816	(11,963)	[2,871]	{1,436}	60,103	(12,021)	[2,885]	{1,442}	60,405	(12,081)	[2,899]	{1,450}
Essex	98,936	99,067	99,248	99,394	99,718	(19,944)	[4,786]	{2,393}	100,046	(20,009)	[4,802]	{2,401}	100,389	(20,078)	[4,819]	{2,409}
Gloucester	32,631	32,702	32,801	32,900	33,112	(6,622)	[1,589]	{795}	33,331	(6,666)	[1,600]	{800}	33,575	(6,715)	[1,612]	{806}
Hudson	91,822	91,959	92,066	92,166	92,409	(18,482)	[4,436]	{2,218}	92,657	(18,531)	[4,448]	{2,224}	92,917	(18,583)	[4,460]	{2,230}
Hunterdon	10,526	10,533	10,567	10,589	10,638	(2,128)	[511]	{255}	10,689	(2,138)	[513]	{257}	10,743	(2,149)	[516]	{258}
Mercer	35,736	35,787	35,864	35,929	36,076	(7,215)	[1,732]	{866}	36,225	(7,245)	[1,739]	{869}	36,386	(7,277)	[1,747]	{873}
Middlesex	96,898	97,072	97,214	97,380	97,722	(19,544)	[4,691]	{2,345}	98,074	(19,615)	[4,708]	{2,354}	98,443	(19,689)	[4,725]	{2,363}
Monmouth	81,875	82,067	82,303	82,500	82,915	(16,583)	[3,980]	{1,990}	83,337	(16,667)	[4,000]	{2,000}	83,781	(16,756)	[4,021]	{2,011}
Morris	52,630	52,736	52,829	52,920	53,103	(10,621)	[2,549]	{1,274}	53,293	(10,659)	[2,558]	{1,279}	53,493	(10,699)	[2,568]	{1,284}
Ocean	81,380	81,532	81,718	81,890	82,289	(16,458)	[3,950]	{1,975}	82,707	(16,541)	[3,970]	{1,985}	83,156	(16,631)	[3,991]	{1,996}
Passaic	75,989	76,051	76,155	76,273	76,510	(15,302)	[3,672]	{1,836}	76,768	(15,354)	[3,685]	{1,842}	77,040	(15,408)	[3,698]	{1,849}
Somerset	31,811	31,862	31,921	31,981	32,099	(6,420)	[1,541]	{770}	32,218	(6,444)	[1,546]	{773}	32,339	(6,468)	[1,552]	{776}
Sussex	14,752	14,771	14,790	14,830	14,891	(2,978)	[715]	{357}	14,957	(2,991)	[718]	{359}	15,026	(3,005)	[721]	{361}
Union	74,712	74,806	74,922	75,067	75,320	(15,064)	[3,615]	{1,808}	75,582	(15,116)	[3,628]	{1,814}	75,863	(15,173)	[3,641]	{1,821}
Warren	10,478	10,498	10,522	10,546	10,608	(2,122)	[509]	{255}	10,675	(2,135)	[512]	{256}	10,749	(2,150)	[516]	{258}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.