

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

Date: 6/30/21

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 6/30/21 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.

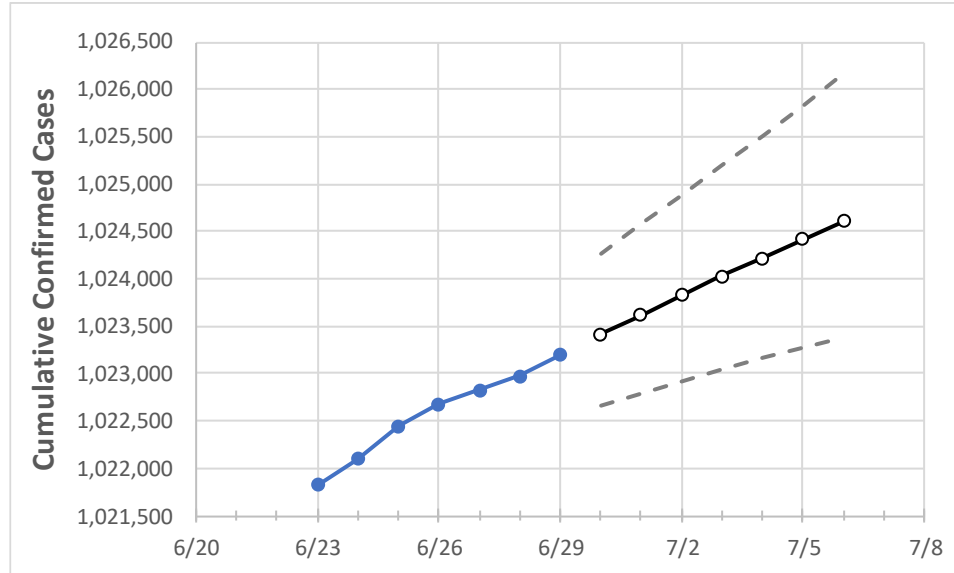
IEM's Modeling Lead

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:						
	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6
New Jersey	1,022,680	1,022,830	1,022,977	1,023,200	1,023,412	1,023,619	1,023,823	1,024,023	1,024,222	1,024,419	1,024,610

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:						
	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6
Bergen	104,885	104,908	104,921	104,955	104,977	105,001	105,025	105,048	105,072	105,097	105,120
Burlington	44,370	44,375	44,389	44,392	44,398	44,405	44,411	44,417	44,423	44,429	44,435
Camden	55,893	55,901	55,911	55,925	55,935	55,946	55,956	55,965	55,975	55,985	55,995
Essex	94,489	94,482	94,494	94,505	94,517	94,528	94,539	94,550	94,561	94,571	94,581
Gloucester	30,693	30,695	30,696	30,718	30,725	30,732	30,739	30,747	30,754	30,762	30,770
Hudson	88,363	88,370	88,372	88,379	88,386	88,392	88,398	88,404	88,409	88,414	88,419
Hunterdon	9,877	9,883	9,884	9,888	9,892	9,897	9,901	9,905	9,910	9,914	9,919
Mercer	34,180	34,183	34,186	34,193	34,198	34,203	34,207	34,212	34,217	34,221	34,226
Middlesex	92,685	92,689	92,701	92,703	92,716	92,729	92,742	92,754	92,766	92,778	92,790
Monmouth	75,977	76,019	76,038	76,066	76,100	76,135	76,170	76,207	76,244	76,283	76,322
Morris	50,357	50,363	50,375	50,386	50,395	50,404	50,413	50,421	50,430	50,439	50,448
Ocean	76,381	76,397	76,417	76,443	76,467	76,491	76,515	76,539	76,562	76,586	76,610
Passaic	73,372	73,380	73,384	73,397	73,410	73,423	73,436	73,449	73,461	73,472	73,483
Somerset	30,218	30,221	30,233	30,240	30,250	30,259	30,269	30,279	30,288	30,298	30,307
Sussex	14,101	14,108	14,112	14,116	14,121	14,125	14,130	14,135	14,140	14,145	14,150
Union	71,734	71,738	71,741	71,760	71,768	71,776	71,784	71,792	71,799	71,806	71,813
Warren	10,021	10,024	10,031	10,034	10,037	10,039	10,042	10,045	10,047	10,050	10,053

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:											
	6/26	6/27	6/28	6/29	7/1				7/3				7/5			
Bergen	104,885	104,908	104,921	104,955	105,001	(21,000)	[5,040]	{2,520}	105,048	(21,010)	[5,042]	{2,521}	105,097	(21,019)	[5,045]	{2,522}
Burlington	44,370	44,375	44,389	44,392	44,405	(8,881)	[2,131]	{1,066}	44,417	(8,883)	[2,132]	{1,066}	44,429	(8,886)	[2,133]	{1,066}
Camden	55,893	55,901	55,911	55,925	55,946	(11,189)	[2,685]	{1,343}	55,965	(11,193)	[2,686]	{1,343}	55,985	(11,197)	[2,687]	{1,344}
Essex	94,489	94,482	94,494	94,505	94,528	(18,906)	[4,537]	{2,269}	94,550	(18,910)	[4,538]	{2,269}	94,571	(18,914)	[4,539]	{2,270}
Gloucester	30,693	30,695	30,696	30,718	30,732	(6,146)	[1,475]	{738}	30,747	(6,149)	[1,476]	{738}	30,762	(6,152)	[1,477]	{738}
Hudson	88,363	88,370	88,372	88,379	88,392	(17,678)	[4,243]	{2,121}	88,404	(17,681)	[4,243]	{2,122}	88,414	(17,683)	[4,244]	{2,122}
Hunterdon	9,877	9,883	9,884	9,888	9,897	(1,979)	[475]	{238}	9,905	(1,981)	[475]	{238}	9,914	(1,983)	[476]	{238}
Mercer	34,180	34,183	34,186	34,193	34,203	(6,841)	[1,642]	{821}	34,212	(6,842)	[1,642]	{821}	34,221	(6,844)	[1,643]	{821}
Middlesex	92,685	92,689	92,701	92,703	92,729	(18,546)	[4,451]	{2,226}	92,754	(18,551)	[4,452]	{2,226}	92,778	(18,556)	[4,453]	{2,227}
Monmouth	75,977	76,019	76,038	76,066	76,135	(15,227)	[3,654]	{1,827}	76,207	(15,241)	[3,658]	{1,829}	76,283	(15,257)	[3,662]	{1,831}
Morris	50,357	50,363	50,375	50,386	50,404	(10,081)	[2,419]	{1,210}	50,421	(10,084)	[2,420]	{1,210}	50,439	(10,088)	[2,421]	{1,211}
Ocean	76,381	76,397	76,417	76,443	76,491	(15,298)	[3,672]	{1,836}	76,539	(15,308)	[3,674]	{1,837}	76,586	(15,317)	[3,676]	{1,838}
Passaic	73,372	73,380	73,384	73,397	73,423	(14,685)	[3,524]	{1,762}	73,449	(14,690)	[3,526]	{1,763}	73,472	(14,694)	[3,527]	{1,763}
Somerset	30,218	30,221	30,233	30,240	30,259	(6,052)	[1,452]	{726}	30,279	(6,056)	[1,453]	{727}	30,298	(6,060)	[1,454]	{727}
Sussex	14,101	14,108	14,112	14,116	14,125	(2,825)	[678]	{339}	14,135	(2,827)	[678]	{339}	14,145	(2,829)	[679]	{339}
Union	71,734	71,738	71,741	71,760	71,776	(14,355)	[3,445]	{1,723}	71,792	(14,358)	[3,446]	{1,723}	71,806	(14,361)	[3,447]	{1,723}
Warren	10,021	10,024	10,031	10,034	10,039	(2,008)	[482]	{241}	10,045	(2,009)	[482]	{241}	10,050	(2,010)	[482]	{241}

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.