

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

Date: 8/25/21

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 8/25/21 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.

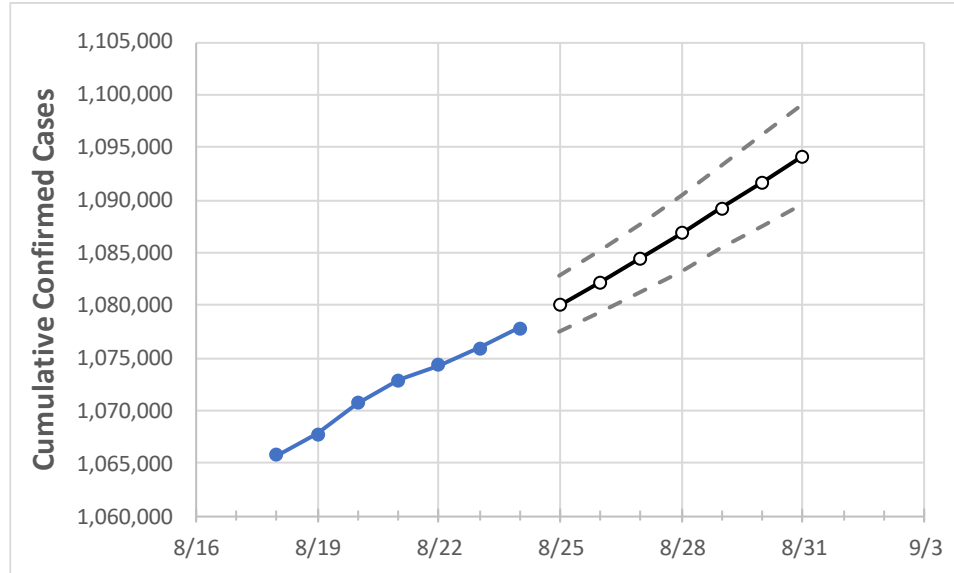
IEM's Modeling Lead

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:						
	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31
New Jersey	1,072,856	1,074,306	1,075,930	1,077,787	1,079,985	1,082,206	1,084,463	1,086,823	1,089,201	1,091,640	1,094,183

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:						
	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31
Bergen	109,524	109,664	109,793	109,953	110,140	110,319	110,513	110,708	110,903	111,103	111,305
Burlington	47,201	47,300	47,392	47,514	47,645	47,779	47,918	48,061	48,206	48,356	48,507
Camden	58,924	59,016	59,168	59,280	59,428	59,575	59,733	59,891	60,049	60,223	60,393
Essex	98,735	98,806	98,936	99,067	99,233	99,400	99,568	99,743	99,915	100,094	100,277
Gloucester	32,499	32,544	32,631	32,702	32,797	32,893	32,993	33,095	33,199	33,311	33,427
Hudson	91,632	91,752	91,822	91,959	92,093	92,225	92,359	92,498	92,638	92,785	92,926
Hunterdon	10,488	10,512	10,526	10,533	10,557	10,582	10,607	10,632	10,658	10,682	10,711
Mercer	35,633	35,684	35,736	35,787	35,862	35,935	36,015	36,095	36,178	36,264	36,350
Middlesex	96,651	96,753	96,898	97,072	97,241	97,421	97,603	97,786	97,972	98,166	98,363
Monmouth	81,580	81,703	81,875	82,067	82,260	82,452	82,654	82,855	83,060	83,268	83,478
Morris	52,525	52,574	52,630	52,736	52,829	52,922	53,020	53,119	53,220	53,324	53,429
Ocean	81,100	81,222	81,380	81,532	81,722	81,912	82,108	82,310	82,518	82,729	82,949
Passaic	75,859	75,920	75,989	76,051	76,156	76,266	76,376	76,493	76,608	76,732	76,855
Somerset	31,739	31,780	31,811	31,862	31,926	31,989	32,054	32,120	32,187	32,255	32,326
Sussex	14,710	14,732	14,752	14,771	14,796	14,822	14,848	14,875	14,902	14,930	14,959
Union	74,533	74,625	74,712	74,806	74,928	75,050	75,176	75,304	75,437	75,573	75,710
Warren	10,431	10,450	10,478	10,498	10,527	10,557	10,588	10,621	10,657	10,693	10,731

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:											
	8/21	8/22	8/23	8/24	8/26			8/28			8/30					
Bergen	109,524	109,664	109,793	109,953	110,319	(22,064)	[5,295]	{2,648}	110,708	(22,142)	[5,314]	{2,657}	111,103	(22,221)	[5,333]	{2,666}
Burlington	47,201	47,300	47,392	47,514	47,779	(9,556)	[2,293]	{1,147}	48,061	(9,612)	[2,307]	{1,153}	48,356	(9,671)	[2,321]	{1,161}
Camden	58,924	59,016	59,168	59,280	59,575	(11,915)	[2,860]	{1,430}	59,891	(11,978)	[2,875]	{1,437}	60,223	(12,045)	[2,891]	{1,445}
Essex	98,735	98,806	98,936	99,067	99,400	(19,880)	[4,771]	{2,386}	99,743	(19,949)	[4,788]	{2,394}	100,094	(20,019)	[4,805]	{2,402}
Gloucester	32,499	32,544	32,631	32,702	32,893	(6,579)	[1,579]	{789}	33,095	(6,619)	[1,589]	{794}	33,311	(6,662)	[1,599]	{799}
Hudson	91,632	91,752	91,822	91,959	92,225	(18,445)	[4,427]	{2,213}	92,498	(18,500)	[4,440]	{2,220}	92,785	(18,557)	[4,454]	{2,227}
Hunterdon	10,488	10,512	10,526	10,533	10,582	(2,116)	[508]	{254}	10,632	(2,126)	[510]	{255}	10,682	(2,136)	[513]	{256}
Mercer	35,633	35,684	35,736	35,787	35,935	(7,187)	[1,725]	{862}	36,095	(7,219)	[1,733]	{866}	36,264	(7,253)	[1,741]	{870}
Middlesex	96,651	96,753	96,898	97,072	97,421	(19,484)	[4,676]	{2,338}	97,786	(19,557)	[4,694]	{2,347}	98,166	(19,633)	[4,712]	{2,356}
Monmouth	81,580	81,703	81,875	82,067	82,452	(16,490)	[3,958]	{1,979}	82,855	(16,571)	[3,977]	{1,989}	83,268	(16,654)	[3,997]	{1,998}
Morris	52,525	52,574	52,630	52,736	52,922	(10,584)	[2,540]	{1,270}	53,119	(10,624)	[2,550]	{1,275}	53,324	(10,665)	[2,560]	{1,280}
Ocean	81,100	81,222	81,380	81,532	81,912	(16,382)	[3,932]	{1,966}	82,310	(16,462)	[3,951]	{1,975}	82,729	(16,546)	[3,971]	{1,986}
Passaic	75,859	75,920	75,989	76,051	76,266	(15,253)	[3,661]	{1,830}	76,493	(15,299)	[3,672]	{1,836}	76,732	(15,346)	[3,683]	{1,842}
Somerset	31,739	31,780	31,811	31,862	31,989	(6,398)	[1,535]	{768}	32,120	(6,424)	[1,542]	{771}	32,255	(6,451)	[1,548]	{774}
Sussex	14,710	14,732	14,752	14,771	14,822	(2,964)	[711]	{356}	14,875	(2,975)	[714]	{357}	14,930	(2,986)	[717]	{358}
Union	74,533	74,625	74,712	74,806	75,050	(15,010)	[3,602]	{1,801}	75,304	(15,061)	[3,615]	{1,807}	75,573	(15,115)	[3,627]	{1,814}
Warren	10,431	10,450	10,478	10,498	10,557	(2,111)	[507]	{253}	10,621	(2,124)	[510]	{255}	10,693	(2,139)	[513]	{257}

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.