

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

Date: 4/12/21

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 4/12/21 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.

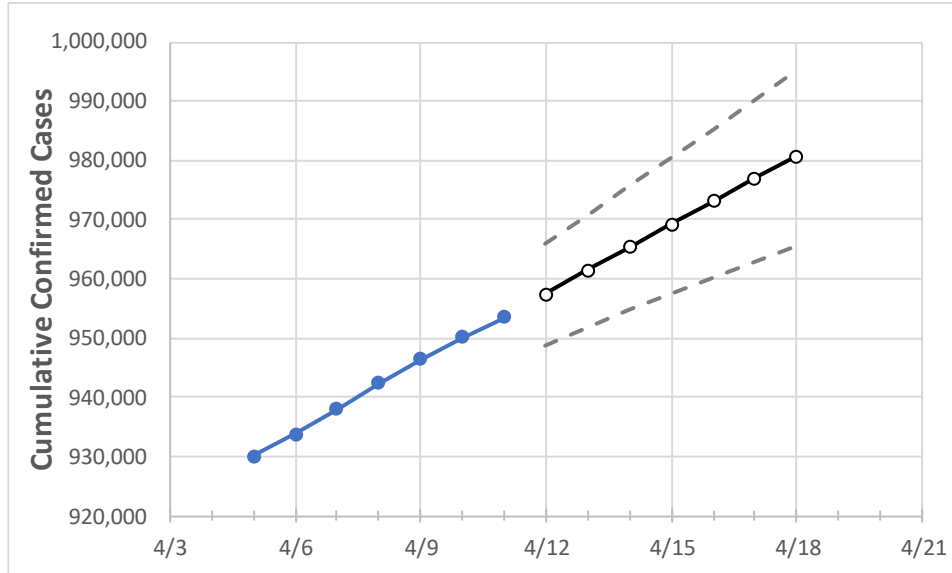
IEM's Modeling Lead

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:					
	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18

New Jersey 942,311 946,504 950,103 953,490 957,448 961,421 965,325 969,199 973,143 976,970 980,745

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:						
	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18
Bergen	95,067	95,466	95,842	96,164	96,570	96,969	97,364	97,750	98,138	98,513	98,880
Burlington	41,277	41,460	41,621	41,771	41,952	42,132	42,315	42,492	42,670	42,849	43,024
Camden	50,353	50,540	50,750	50,927	51,130	51,338	51,539	51,749	51,955	52,159	52,369
Essex	88,674	89,101	89,447	89,823	90,271	90,726	91,181	91,621	92,080	92,542	92,998
Gloucester	27,785	27,861	27,976	28,088	28,197	28,310	28,421	28,532	28,643	28,755	28,868
Hudson	82,594	82,940	83,219	83,500	83,829	84,150	84,482	84,802	85,114	85,427	85,743
Hunterdon	8,797	8,855	8,904	8,940	8,994	9,046	9,100	9,152	9,203	9,254	9,305
Mercer	31,738	31,845	31,947	32,041	32,150	32,259	32,366	32,474	32,582	32,688	32,794
Middlesex	86,471	86,962	87,310	87,582	87,955	88,325	88,696	89,065	89,431	89,808	90,181
Monmouth	70,418	70,788	71,096	71,353	71,634	71,911	72,192	72,464	72,730	72,991	73,244
Morris	46,694	46,886	47,040	47,243	47,438	47,630	47,819	48,006	48,194	48,377	48,555
Ocean	70,941	71,264	71,523	71,768	72,059	72,344	72,626	72,909	73,190	73,468	73,743
Passaic	66,665	66,943	67,167	67,353	67,623	67,906	68,176	68,452	68,730	69,001	69,254
Somerset	27,734	27,870	28,007	28,088	28,204	28,321	28,436	28,550	28,663	28,774	28,886
Sussex	12,361	12,423	12,507	12,600	12,691	12,781	12,872	12,963	13,053	13,144	13,233
Union	66,310	66,609	66,826	67,048	67,301	67,559	67,821	68,074	68,324	68,581	68,833
Warren	8,793	8,836	8,907	8,961	9,007	9,053	9,098	9,144	9,188	9,235	9,281

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:											
	4/8	4/9	4/10	4/11	4/13			4/15			4/17					
Bergen	95,067	95,466	95,842	96,164	96,969	(19,394)	[4,655]	{2,327}	97,750	(19,550)	[4,692]	{2,346}	98,513	(19,703)	[4,729]	{2,364}
Burlington	41,277	41,460	41,621	41,771	42,132	(8,426)	[2,022]	{1,011}	42,492	(8,498)	[2,040]	{1,020}	42,849	(8,570)	[2,057]	{1,028}
Camden	50,353	50,540	50,750	50,927	51,338	(10,268)	[2,464]	{1,232}	51,749	(10,350)	[2,484]	{1,242}	52,159	(10,432)	[2,504]	{1,252}
Essex	88,674	89,101	89,447	89,823	90,726	(18,145)	[4,355]	{2,177}	91,621	(18,324)	[4,398]	{2,199}	92,542	(18,508)	[4,442]	{2,221}
Gloucester	27,785	27,861	27,976	28,088	28,310	(5,662)	[1,359]	{679}	28,532	(5,706)	[1,370]	{685}	28,755	(5,751)	[1,380]	{690}
Hudson	82,594	82,940	83,219	83,500	84,150	(16,830)	[4,039]	{2,020}	84,802	(16,960)	[4,070]	{2,035}	85,427	(17,085)	[4,101]	{2,050}
Hunterdon	8,797	8,855	8,904	8,940	9,046	(1,809)	[434]	{217}	9,152	(1,830)	[439]	{220}	9,254	(1,851)	[444]	{222}
Mercer	31,738	31,845	31,947	32,041	32,259	(6,452)	[1,548]	{774}	32,474	(6,495)	[1,559]	{779}	32,688	(6,538)	[1,569]	{785}
Middlesex	86,471	86,962	87,310	87,582	88,325	(17,665)	[4,240]	{2,120}	89,065	(17,813)	[4,275]	{2,138}	89,808	(17,962)	[4,311]	{2,155}
Monmouth	70,418	70,788	71,096	71,353	71,911	(14,382)	[3,452]	{1,726}	72,464	(14,493)	[3,478]	{1,739}	72,991	(14,598)	[3,504]	{1,752}
Morris	46,694	46,886	47,040	47,243	47,630	(9,526)	[2,286]	{1,143}	48,006	(9,601)	[2,304]	{1,152}	48,377	(9,675)	[2,322]	{1,161}
Ocean	70,941	71,264	71,523	71,768	72,344	(14,469)	[3,473]	{1,736}	72,909	(14,582)	[3,500]	{1,750}	73,468	(14,694)	[3,526]	{1,763}
Passaic	66,665	66,943	67,167	67,353	67,906	(13,581)	[3,259]	{1,630}	68,452	(13,690)	[3,286]	{1,643}	69,001	(13,800)	[3,312]	{1,656}
Somerset	27,734	27,870	28,007	28,088	28,321	(5,664)	[1,359]	{680}	28,550	(5,710)	[1,370]	{685}	28,774	(5,755)	[1,381]	{691}
Sussex	12,361	12,423	12,507	12,600	12,781	(2,556)	[613]	{307}	12,963	(2,593)	[622]	{311}	13,144	(2,629)	[631]	{315}
Union	66,310	66,609	66,826	67,048	67,559	(13,512)	[3,243]	{1,621}	68,074	(13,615)	[3,268]	{1,634}	68,581	(13,716)	[3,292]	{1,646}
Warren	8,793	8,836	8,907	8,961	9,053	(1,811)	[435]	{217}	9,144	(1,829)	[439]	{219}	9,235	(1,847)	[443]	{222}

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.