

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

Date: 6/14/21

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 6/14/21 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.

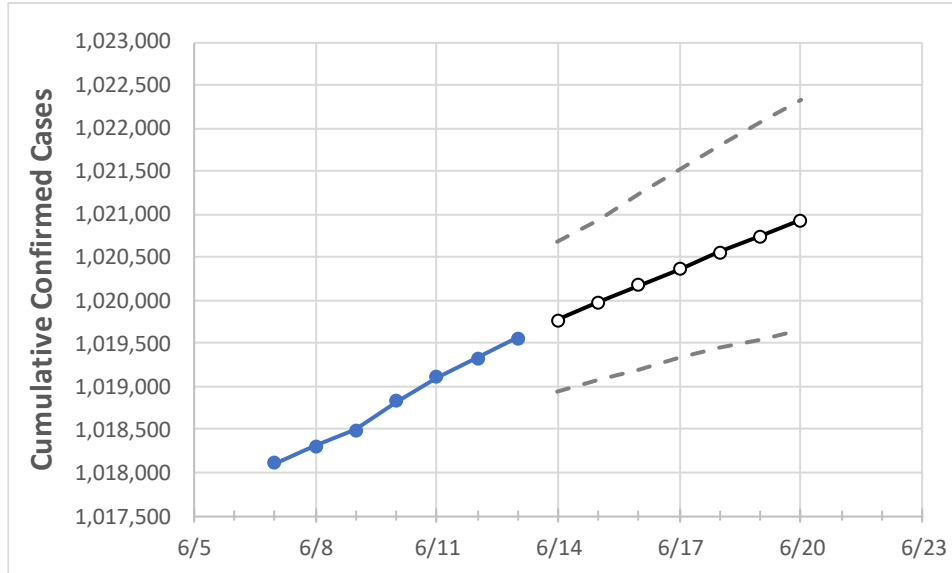
IEM's Modeling Lead

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:						
	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20

New Jersey 1,018,833 1,019,107 1,019,335 1,019,563 1,019,768 1,019,976 1,020,175 1,020,366 1,020,558 1,020,748 1,020,926

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:						
	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20
Bergen	104,476	104,508	104,531	104,553	104,573	104,593	104,613	104,633	104,652	104,671	104,689
Burlington	44,243	44,253	44,262	44,271	44,279	44,286	44,293	44,300	44,306	44,313	44,319
Camden	55,703	55,714	55,724	55,734	55,742	55,750	55,758	55,765	55,772	55,778	55,784
Essex	94,237	94,248	94,253	94,257	94,272	94,285	94,298	94,312	94,324	94,336	94,349
Gloucester	30,581	30,588	30,594	30,600	30,605	30,610	30,615	30,620	30,625	30,629	30,633
Hudson	88,085	88,116	88,139	88,161	88,179	88,197	88,216	88,233	88,252	88,269	88,286
Hunterdon	9,819	9,820	9,824	9,828	9,831	9,834	9,837	9,840	9,843	9,846	9,849
Mercer	34,063	34,079	34,085	34,090	34,097	34,103	34,109	34,115	34,121	34,127	34,132
Middlesex	92,367	92,392	92,408	92,423	92,440	92,456	92,473	92,489	92,504	92,519	92,534
Monmouth	75,635	75,661	75,688	75,715	75,732	75,748	75,765	75,780	75,796	75,811	75,827
Morris	50,197	50,210	50,220	50,230	50,240	50,249	50,259	50,269	50,279	50,288	50,297
Ocean	75,956	75,983	76,007	76,030	76,050	76,071	76,091	76,112	76,132	76,151	76,171
Passaic	73,045	73,063	73,085	73,107	73,124	73,141	73,158	73,174	73,189	73,205	73,221
Somerset	30,070	30,078	30,091	30,103	30,108	30,112	30,117	30,122	30,126	30,130	30,134
Sussex	14,024	14,031	14,035	14,039	14,043	14,046	14,050	14,053	14,057	14,060	14,063
Union	71,513	71,534	71,554	71,574	71,590	71,606	71,623	71,639	71,654	71,670	71,685
Warren	9,990	9,991	9,993	9,995	9,997	9,999	10,001	10,002	10,004	10,006	10,007

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:											
	6/10	6/11	6/12	6/13	6/15			6/17			6/19					
Bergen	104,476	104,508	104,531	104,553	104,593	(20,919)	[5,020]	{2,510}	104,633	(20,927)	[5,022]	{2,511}	104,671	(20,934)	[5,024]	{2,512}
Burlington	44,243	44,253	44,262	44,271	44,286	(8,857)	[2,126]	{1,063}	44,300	(8,860)	[2,126]	{1,063}	44,313	(8,863)	[2,127]	{1,064}
Camden	55,703	55,714	55,724	55,734	55,750	(11,150)	[2,676]	{1,338}	55,765	(11,153)	[2,677]	{1,338}	55,778	(11,156)	[2,677]	{1,339}
Essex	94,237	94,248	94,253	94,257	94,285	(18,857)	[4,526]	{2,263}	94,312	(18,862)	[4,527]	{2,263}	94,336	(18,867)	[4,528]	{2,264}
Gloucester	30,581	30,588	30,594	30,600	30,610	(6,122)	[1,469]	{735}	30,620	(6,124)	[1,470]	{735}	30,629	(6,126)	[1,470]	{735}
Hudson	88,085	88,116	88,139	88,161	88,197	(17,639)	[4,233]	{2,117}	88,233	(17,647)	[4,235]	{2,118}	88,269	(17,654)	[4,237]	{2,118}
Hunterdon	9,819	9,820	9,824	9,828	9,834	(1,967)	[472]	{236}	9,840	(1,968)	[472]	{236}	9,846	(1,969)	[473]	{236}
Mercer	34,063	34,079	34,085	34,090	34,103	(6,821)	[1,637]	{818}	34,115	(6,823)	[1,638]	{819}	34,127	(6,825)	[1,638]	{819}
Middlesex	92,367	92,392	92,408	92,423	92,456	(18,491)	[4,438]	{2,219}	92,489	(18,498)	[4,439]	{2,220}	92,519	(18,504)	[4,441]	{2,220}
Monmouth	75,635	75,661	75,688	75,715	75,748	(15,150)	[3,636]	{1,818}	75,780	(15,156)	[3,637]	{1,819}	75,811	(15,162)	[3,639]	{1,819}
Morris	50,197	50,210	50,220	50,230	50,249	(10,050)	[2,412]	{1,206}	50,269	(10,054)	[2,413]	{1,206}	50,288	(10,058)	[2,414]	{1,207}
Ocean	75,956	75,983	76,007	76,030	76,071	(15,214)	[3,651]	{1,826}	76,112	(15,222)	[3,653]	{1,827}	76,151	(15,230)	[3,655]	{1,828}
Passaic	73,045	73,063	73,085	73,107	73,141	(14,628)	[3,511]	{1,755}	73,174	(14,635)	[3,512]	{1,756}	73,205	(14,641)	[3,514]	{1,757}
Somerset	30,070	30,078	30,091	30,103	30,112	(6,022)	[1,445]	{723}	30,122	(6,024)	[1,446]	{723}	30,130	(6,026)	[1,446]	{723}
Sussex	14,024	14,031	14,035	14,039	14,046	(2,809)	[674]	{337}	14,053	(2,811)	[675]	{337}	14,060	(2,812)	[675]	{337}
Union	71,513	71,534	71,554	71,574	71,606	(14,321)	[3,437]	{1,719}	71,639	(14,328)	[3,439]	{1,719}	71,670	(14,334)	[3,440]	{1,720}
Warren	9,990	9,991	9,993	9,995	9,999	(2,000)	[480]	{240}	10,002	(2,000)	[480]	{240}	10,006	(2,001)	[480]	{240}

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.