

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

Date: 6/24/21

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 6/24/21 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.

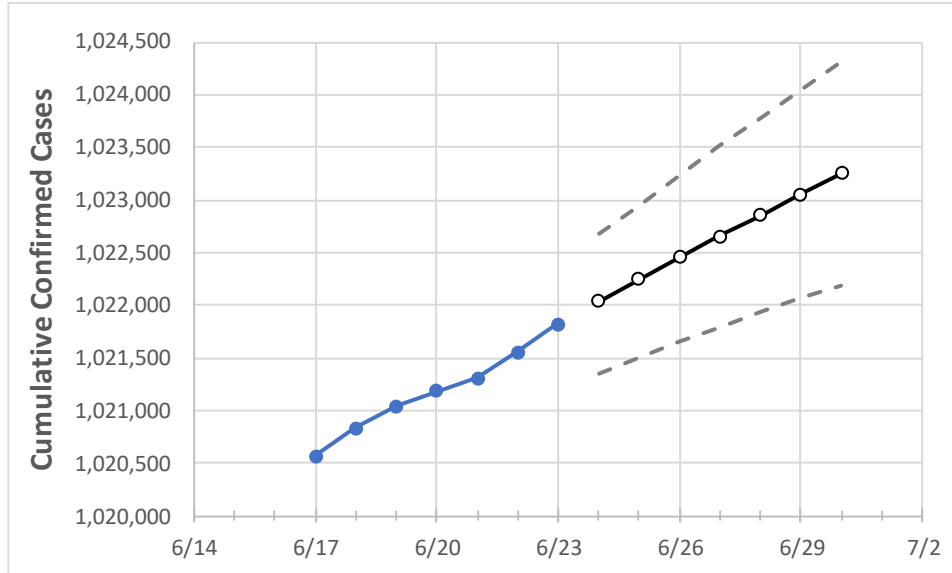
IEM's Modeling Lead

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:						
	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30

New Jersey 1,021,182 1,021,308 1,021,554 1,021,822 1,022,037 1,022,248 1,022,453 1,022,660 1,022,859 1,023,058 1,023,255

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:						
	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30
Bergen	104,711	104,720	104,751	104,791	104,814	104,836	104,858	104,881	104,903	104,925	104,947
Burlington	44,319	44,322	44,335	44,348	44,355	44,362	44,369	44,376	44,383	44,389	44,395
Camden	55,823	55,832	55,843	55,854	55,863	55,872	55,880	55,889	55,897	55,905	55,912
Essex	94,402	94,418	94,435	94,451	94,465	94,478	94,492	94,505	94,518	94,530	94,542
Gloucester	30,649	30,651	30,657	30,666	30,671	30,677	30,681	30,686	30,691	30,696	30,700
Hudson	88,303	88,311	88,316	88,337	88,356	88,374	88,392	88,410	88,428	88,447	88,465
Hunterdon	9,849	9,854	9,856	9,861	9,865	9,868	9,872	9,876	9,880	9,884	9,888
Mercer	34,136	34,144	34,150	34,151	34,156	34,161	34,166	34,171	34,175	34,179	34,184
Middlesex	92,559	92,567	92,591	92,608	92,624	92,640	92,656	92,670	92,685	92,700	92,714
Monmouth	75,795	75,814	75,839	75,863	75,890	75,917	75,944	75,972	76,001	76,030	76,059
Morris	50,293	50,296	50,307	50,311	50,319	50,326	50,333	50,340	50,346	50,353	50,359
Ocean	76,220	76,229	76,260	76,284	76,310	76,337	76,362	76,389	76,415	76,442	76,469
Passaic	73,267	73,274	73,295	73,316	73,335	73,353	73,371	73,389	73,407	73,425	73,443
Somerset	30,166	30,165	30,171	30,181	30,191	30,201	30,212	30,222	30,232	30,243	30,255
Sussex	14,072	14,082	14,088	14,094	14,100	14,107	14,113	14,120	14,127	14,134	14,141
Union	71,655	71,658	71,670	71,691	71,703	71,714	71,725	71,736	71,747	71,757	71,767
Warren	10,014	10,012	10,014	10,015	10,017	10,019	10,021	10,022	10,024	10,026	10,028

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:											
	6/20	6/21	6/22	6/23	6/25			6/27			6/29					
Bergen	104,711	104,720	104,751	104,791	104,836	(20,967)	[5,032]	{2,516}	104,881	(20,976)	[5,034]	{2,517}	104,925	(20,985)	[5,036]	{2,518}
Burlington	44,319	44,322	44,335	44,348	44,362	(8,872)	[2,129]	{1,065}	44,376	(8,875)	[2,130]	{1,065}	44,389	(8,878)	[2,131]	{1,065}
Camden	55,823	55,832	55,843	55,854	55,872	(11,174)	[2,682]	{1,341}	55,889	(11,178)	[2,683]	{1,341}	55,905	(11,181)	[2,683]	{1,342}
Essex	94,402	94,418	94,435	94,451	94,478	(18,896)	[4,535]	{2,267}	94,505	(18,901)	[4,536]	{2,268}	94,530	(18,906)	[4,537]	{2,269}
Gloucester	30,649	30,651	30,657	30,666	30,677	(6,135)	[1,472]	{736}	30,686	(6,137)	[1,473]	{736}	30,696	(6,139)	[1,473]	{737}
Hudson	88,303	88,311	88,316	88,337	88,374	(17,675)	[4,242]	{2,121}	88,410	(17,682)	[4,244]	{2,122}	88,447	(17,689)	[4,245]	{2,123}
Hunterdon	9,849	9,854	9,856	9,861	9,868	(1,974)	[474]	{237}	9,876	(1,975)	[474]	{237}	9,884	(1,977)	[474]	{237}
Mercer	34,136	34,144	34,150	34,151	34,161	(6,832)	[1,640]	{820}	34,171	(6,834)	[1,640]	{820}	34,179	(6,836)	[1,641]	{820}
Middlesex	92,559	92,567	92,591	92,608	92,640	(18,528)	[4,447]	{2,223}	92,670	(18,534)	[4,448]	{2,224}	92,700	(18,540)	[4,450]	{2,225}
Monmouth	75,795	75,814	75,839	75,863	75,917	(15,183)	[3,644]	{1,822}	75,972	(15,194)	[3,647]	{1,823}	76,030	(15,206)	[3,649]	{1,825}
Morris	50,293	50,296	50,307	50,311	50,326	(10,065)	[2,416]	{1,208}	50,340	(10,068)	[2,416]	{1,208}	50,353	(10,071)	[2,417]	{1,208}
Ocean	76,220	76,229	76,260	76,284	76,337	(15,267)	[3,664]	{1,832}	76,389	(15,278)	[3,667]	{1,833}	76,442	(15,288)	[3,669]	{1,835}
Passaic	73,267	73,274	73,295	73,316	73,353	(14,671)	[3,521]	{1,760}	73,389	(14,678)	[3,523]	{1,761}	73,425	(14,685)	[3,524]	{1,762}
Somerset	30,166	30,165	30,171	30,181	30,201	(6,040)	[1,450]	{725}	30,222	(6,044)	[1,451]	{725}	30,243	(6,049)	[1,452]	{726}
Sussex	14,072	14,082	14,088	14,094	14,107	(2,821)	[677]	{339}	14,120	(2,824)	[678]	{339}	14,134	(2,827)	[678]	{339}
Union	71,655	71,658	71,670	71,691	71,714	(14,343)	[3,442]	{1,721}	71,736	(14,347)	[3,443]	{1,722}	71,757	(14,351)	[3,444]	{1,722}
Warren	10,014	10,012	10,014	10,015	10,019	(2,004)	[481]	{240}	10,022	(2,004)	[481]	{241}	10,026	(2,005)	[481]	{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.