

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

Date: 5/25/21

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 5/25/21 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.

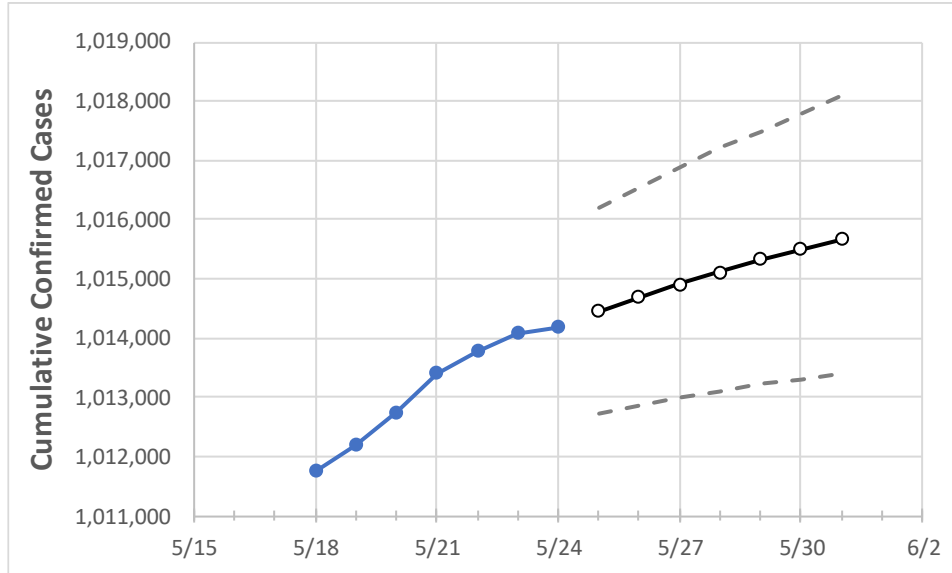
IEM's Modeling Lead

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:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31

New Jersey 1,013,409 1,013,787 1,014,088 1,014,190 1,014,449 1,014,695 1,014,912 1,015,119 1,015,325 1,015,503 1,015,677

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:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31
Bergen	103,965	103,993	104,022	104,054	104,084	104,112	104,139	104,162	104,182	104,202	104,221
Burlington	44,020	44,012	44,042	44,063	44,080	44,097	44,114	44,129	44,143	44,157	44,170
Camden	55,277	55,311	55,339	55,359	55,392	55,423	55,453	55,481	55,507	55,531	55,556
Essex	93,811	93,800	93,798	93,782	93,804	93,825	93,845	93,864	93,881	93,896	93,911
Gloucester	30,391	30,406	30,423	30,423	30,440	30,457	30,471	30,485	30,499	30,513	30,525
Hudson	87,746	87,760	87,773	87,773	87,793	87,813	87,831	87,847	87,862	87,876	87,888
Hunterdon	9,740	9,748	9,754	9,758	9,763	9,769	9,774	9,779	9,784	9,788	9,792
Mercer	33,794	33,820	33,841	33,845	33,861	33,876	33,890	33,903	33,916	33,928	33,941
Middlesex	91,873	91,907	91,931	91,934	91,956	91,976	91,995	92,013	92,029	92,045	92,060
Monmouth	75,260	75,297	75,315	75,329	75,353	75,375	75,397	75,419	75,439	75,457	75,475
Morris	49,934	49,951	49,954	49,954	49,967	49,980	49,993	50,004	50,015	50,025	50,034
Ocean	75,538	75,569	75,596	75,597	75,615	75,632	75,649	75,665	75,679	75,693	75,706
Passaic	72,607	72,652	72,673	72,668	72,693	72,717	72,738	72,760	72,781	72,800	72,818
Somerset	29,933	29,956	29,967	29,975	29,985	29,994	30,002	30,010	30,018	30,025	30,032
Sussex	13,920	13,937	13,945	13,946	13,953	13,960	13,967	13,973	13,978	13,984	13,989
Union	71,198	71,221	71,236	71,229	71,244	71,258	71,273	71,285	71,298	71,310	71,320
Warren	9,913	9,919	9,923	9,925	9,930	9,936	9,940	9,945	9,950	9,955	9,959

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:											
	5/21	5/22	5/23	5/24	5/26			5/28			5/30					
Bergen	103,965	103,993	104,022	104,054	104,112	(20,822)	[4,997]	{2,499}	104,162	(20,832)	[5,000]	{2,500}	104,202	(20,840)	[5,002]	{2,501}
Burlington	44,020	44,012	44,042	44,063	44,097	(8,819)	[2,117]	{1,058}	44,129	(8,826)	[2,118]	{1,059}	44,157	(8,831)	[2,120]	{1,060}
Camden	55,277	55,311	55,339	55,359	55,423	(11,085)	[2,660]	{1,330}	55,481	(11,096)	[2,663]	{1,332}	55,531	(11,106)	[2,666]	{1,333}
Essex	93,811	93,800	93,798	93,782	93,825	(18,765)	[4,504]	{2,252}	93,864	(18,773)	[4,505]	{2,253}	93,896	(18,779)	[4,507]	{2,254}
Gloucester	30,391	30,406	30,423	30,423	30,457	(6,091)	[1,462]	{731}	30,485	(6,097)	[1,463]	{732}	30,513	(6,103)	[1,465]	{732}
Hudson	87,746	87,760	87,773	87,773	87,813	(17,563)	[4,215]	{2,108}	87,847	(17,569)	[4,217]	{2,108}	87,876	(17,575)	[4,218]	{2,109}
Hunterdon	9,740	9,748	9,754	9,758	9,769	(1,954)	[469]	{234}	9,779	(1,956)	[469]	{235}	9,788	(1,958)	[470]	{235}
Mercer	33,794	33,820	33,841	33,845	33,876	(6,775)	[1,626]	{813}	33,903	(6,781)	[1,627]	{814}	33,928	(6,786)	[1,629]	{814}
Middlesex	91,873	91,907	91,931	91,934	91,976	(18,395)	[4,415]	{2,207}	92,013	(18,403)	[4,417]	{2,208}	92,045	(18,409)	[4,418]	{2,209}
Monmouth	75,260	75,297	75,315	75,329	75,375	(15,075)	[3,618]	{1,809}	75,419	(15,084)	[3,620]	{1,810}	75,457	(15,091)	[3,622]	{1,811}
Morris	49,934	49,951	49,954	49,954	49,980	(9,996)	[2,399]	{1,200}	50,004	(10,001)	[2,400]	{1,200}	50,025	(10,005)	[2,401]	{1,201}
Ocean	75,538	75,569	75,596	75,597	75,632	(15,126)	[3,630]	{1,815}	75,665	(15,133)	[3,632]	{1,816}	75,693	(15,139)	[3,633]	{1,817}
Passaic	72,607	72,652	72,673	72,668	72,717	(14,543)	[3,490]	{1,745}	72,760	(14,552)	[3,492]	{1,746}	72,800	(14,560)	[3,494]	{1,747}
Somerset	29,933	29,956	29,967	29,975	29,994	(5,999)	[1,440]	{720}	30,010	(6,002)	[1,441]	{720}	30,025	(6,005)	[1,441]	{721}
Sussex	13,920	13,937	13,945	13,946	13,960	(2,792)	[670]	{335}	13,973	(2,795)	[671]	{335}	13,984	(2,797)	[671]	{336}
Union	71,198	71,221	71,236	71,229	71,258	(14,252)	[3,420]	{1,710}	71,285	(14,257)	[3,422]	{1,711}	71,310	(14,262)	[3,423]	{1,711}
Warren	9,913	9,919	9,923	9,925	9,936	(1,987)	[477]	{238}	9,945	(1,989)	[477]	{239}	9,955	(1,991)	[478]	{239}

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.