

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 4/19/21**

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 4/19/21 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.

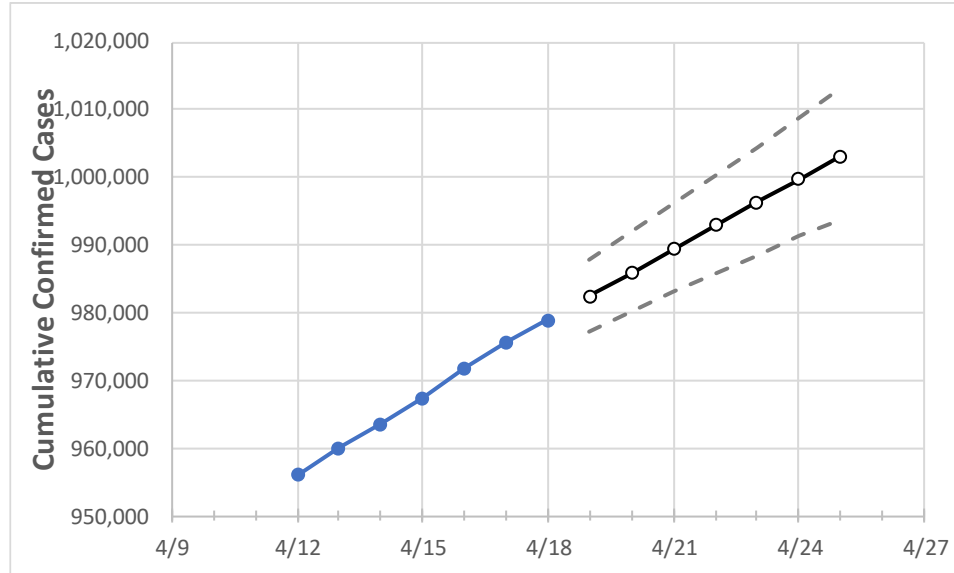
IEM's Modeling Lead

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:						
	4/15	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25
New Jersey	967,442	971,782	975,704	978,853	982,380	985,913	989,395	992,881	996,328	999,740	1,003,134

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:						
	4/15	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25
Bergen	97,483	97,885	98,258	98,483	98,783	99,081	99,370	99,651	99,919	100,181	100,445
Burlington	42,374	42,539	42,701	42,825	42,965	43,103	43,239	43,377	43,510	43,642	43,774
Camden	51,655	51,929	52,121	52,289	52,486	52,680	52,876	53,073	53,273	53,471	53,668
Essex	91,404	91,903	92,333	92,705	93,110	93,523	93,928	94,323	94,718	95,131	95,530
Gloucester	28,587	28,721	28,837	28,909	29,023	29,137	29,252	29,369	29,485	29,603	29,721
Hudson	84,598	85,025	85,384	85,684	85,976	86,277	86,574	86,868	87,168	87,462	87,758
Hunterdon	9,113	9,163	9,205	9,243	9,284	9,325	9,364	9,404	9,442	9,480	9,518
Mercer	32,427	32,550	32,664	32,737	32,834	32,930	33,026	33,124	33,219	33,315	33,409
Middlesex	88,926	89,348	89,737	90,031	90,374	90,714	91,064	91,404	91,748	92,081	92,410
Monmouth	72,295	72,594	72,910	73,105	73,349	73,589	73,825	74,057	74,283	74,509	74,731
Morris	47,951	48,174	48,371	48,521	48,689	48,857	49,023	49,187	49,348	49,504	49,658
Ocean	72,553	72,798	73,030	73,180	73,373	73,556	73,734	73,906	74,073	74,232	74,388
Passaic	68,533	68,894	69,152	69,502	69,802	70,105	70,408	70,714	71,030	71,348	71,669
Somerset	28,485	28,597	28,703	28,803	28,899	28,991	29,083	29,174	29,262	29,349	29,434
Sussex	12,906	13,003	13,085	13,133	13,202	13,269	13,335	13,404	13,469	13,533	13,597
Union	67,936	68,224	68,498	68,754	68,989	69,221	69,450	69,676	69,904	70,127	70,351
Warren	9,174	9,215	9,272	9,308	9,360	9,413	9,466	9,520	9,574	9,629	9,683

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:											
	4/15	4/16	4/17	4/18	4/20				4/22				4/24			
Bergen	97,483	97,885	98,258	98,483	99,081	(19,816)	[4,756]	{2,378}	99,651	(19,930)	[4,783]	{2,392}	100,181	(20,036)	[4,809]	{2,404}
Burlington	42,374	42,539	42,701	42,825	43,103	(8,621)	[2,069]	{1,034}	43,377	(8,675)	[2,082]	{1,041}	43,642	(8,728)	[2,095]	{1,047}
Camden	51,655	51,929	52,121	52,289	52,680	(10,536)	[2,529]	{1,264}	53,073	(10,615)	[2,548]	{1,274}	53,471	(10,694)	[2,567]	{1,283}
Essex	91,404	91,903	92,333	92,705	93,523	(18,705)	[4,489]	{2,245}	94,323	(18,865)	[4,527]	{2,264}	95,131	(19,026)	[4,566]	{2,283}
Gloucester	28,587	28,721	28,837	28,909	29,137	(5,827)	[1,399]	{699}	29,369	(5,874)	[1,410]	{705}	29,603	(5,921)	[1,421]	{710}
Hudson	84,598	85,025	85,384	85,684	86,277	(17,255)	[4,141]	{2,071}	86,868	(17,374)	[4,170]	{2,085}	87,462	(17,492)	[4,198]	{2,099}
Hunterdon	9,113	9,163	9,205	9,243	9,325	(1,865)	[448]	{224}	9,404	(1,881)	[451]	{226}	9,480	(1,896)	[455]	{228}
Mercer	32,427	32,550	32,664	32,737	32,930	(6,586)	[1,581]	{790}	33,124	(6,625)	[1,590]	{795}	33,315	(6,663)	[1,599]	{800}
Middlesex	88,926	89,348	89,737	90,031	90,714	(18,143)	[4,354]	{2,177}	91,404	(18,281)	[4,387]	{2,194}	92,081	(18,416)	[4,420]	{2,210}
Monmouth	72,295	72,594	72,910	73,105	73,589	(14,718)	[3,532]	{1,766}	74,057	(14,811)	[3,555]	{1,777}	74,509	(14,902)	[3,576]	{1,788}
Morris	47,951	48,174	48,371	48,521	48,857	(9,771)	[2,345]	{1,173}	49,187	(9,837)	[2,361]	{1,180}	49,504	(9,901)	[2,376]	{1,188}
Ocean	72,553	72,798	73,030	73,180	73,556	(14,711)	[3,531]	{1,765}	73,906	(14,781)	[3,547]	{1,774}	74,232	(14,846)	[3,563]	{1,782}
Passaic	68,533	68,894	69,152	69,502	70,105	(14,021)	[3,365]	{1,683}	70,714	(14,143)	[3,394]	{1,697}	71,348	(14,270)	[3,425]	{1,712}
Somerset	28,485	28,597	28,703	28,803	28,991	(5,798)	[1,392]	{696}	29,174	(5,835)	[1,400]	{700}	29,349	(5,870)	[1,409]	{704}
Sussex	12,906	13,003	13,085	13,133	13,269	(2,654)	[637]	{318}	13,404	(2,681)	[643]	{322}	13,533	(2,707)	[650]	{325}
Union	67,936	68,224	68,498	68,754	69,221	(13,844)	[3,323]	{1,661}	69,676	(13,935)	[3,344]	{1,672}	70,127	(14,025)	[3,366]	{1,683}
Warren	9,174	9,215	9,272	9,308	9,413	(1,883)	[452]	{226}	9,520	(1,904)	[457]	{228}	9,629	(1,926)	[462]	{231}

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.