

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

Date: 2/16/22

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 2/16/22 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.

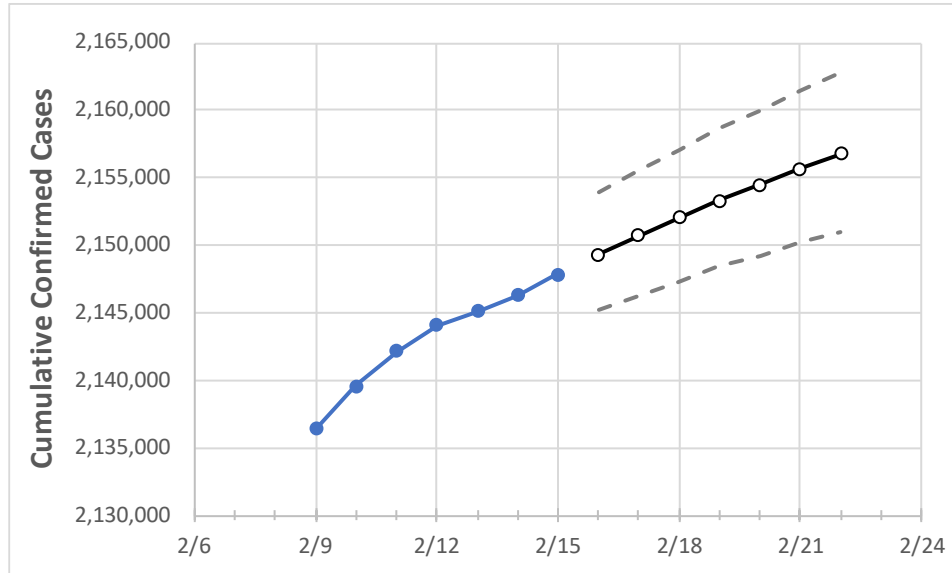
IEM's Modeling Lead

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:							
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	

New Jersey 2,144,050 2,145,147 2,146,285 2,147,857 2,149,313 2,150,729 2,152,065 2,153,341 2,154,487 2,155,667 2,156,767

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:							
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
Bergen	215,997	216,141	216,281	216,472	216,621	216,763	216,898	217,025	217,148	217,270	217,384	
Burlington	99,715	99,797	99,877	99,977	100,099	100,211	100,318	100,426	100,528	100,627	100,715	
Camden	123,075	123,162	123,220	123,276	123,378	123,470	123,555	123,640	123,725	123,801	123,874	
Essex	207,221	207,297	207,375	207,506	207,602	207,688	207,762	207,845	207,920	207,995	208,058	
Gloucester	68,322	68,353	68,399	68,462	68,525	68,586	68,642	68,696	68,748	68,800	68,845	
Hudson	166,062	166,112	166,172	166,285	166,370	166,449	166,523	166,588	166,664	166,726	166,789	
Hunterdon	23,838	23,858	23,866	23,884	23,905	23,925	23,944	23,963	23,980	23,997	24,012	
Mercer	73,744	73,805	73,851	73,931	74,000	74,067	74,126	74,184	74,244	74,299	74,351	
Middlesex	186,256	186,353	186,458	186,633	186,763	186,888	187,007	187,118	187,223	187,337	187,430	
Monmouth	159,938	160,068	160,177	160,273	160,383	160,484	160,583	160,673	160,763	160,849	160,926	
Morris	115,042	115,107	115,158	115,251	115,336	115,412	115,492	115,566	115,634	115,701	115,761	
Ocean	158,424	158,491	158,557	158,650	158,751	158,849	158,940	159,022	159,108	159,183	159,257	
Passaic	141,215	141,255	141,315	141,408	141,475	141,547	141,610	141,667	141,730	141,784	141,834	
Somerset	65,639	65,663	65,685	65,718	65,760	65,801	65,838	65,874	65,908	65,943	65,973	
Sussex	33,045	33,074	33,087	33,110	33,132	33,152	33,174	33,193	33,211	33,230	33,247	
Union	139,284	139,355	139,401	139,571	139,667	139,764	139,858	139,942	140,029	140,117	140,192	
Warren	23,281	23,297	23,311	23,327	23,345	23,361	23,376	23,391	23,404	23,418	23,431	

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:											
	2/12	2/13	2/14	2/15	2/17				2/19				2/21			
Bergen	215,997	216,141	216,281	216,472	216,763	(43,353)	[10,405]	{5,202}	217,025	(43,405)	[10,417]	{5,209}	217,270	(43,454)	[10,429]	{5,214}
Burlington	99,715	99,797	99,877	99,977	100,211	(20,042)	[4,810]	{2,405}	100,426	(20,085)	[4,820]	{2,410}	100,627	(20,125)	[4,830]	{2,415}
Camden	123,075	123,162	123,220	123,276	123,470	(24,694)	[5,927]	{2,963}	123,640	(24,728)	[5,935]	{2,967}	123,801	(24,760)	[5,942]	{2,971}
Essex	207,221	207,297	207,375	207,506	207,688	(41,538)	[9,969]	{4,985}	207,845	(41,569)	[9,977]	{4,988}	207,995	(41,599)	[9,984]	{4,992}
Gloucester	68,322	68,353	68,399	68,462	68,586	(13,717)	[3,292]	{1,646}	68,696	(13,739)	[3,297]	{1,649}	68,800	(13,760)	[3,302]	{1,651}
Hudson	166,062	166,112	166,172	166,285	166,449	(33,290)	[7,990]	{3,995}	166,588	(33,318)	[7,996]	{3,998}	166,726	(33,345)	[8,003]	{4,001}
Hunterdon	23,838	23,858	23,866	23,884	23,925	(4,785)	[1,148]	{574}	23,963	(4,793)	[1,150]	{575}	23,997	(4,799)	[1,152]	{576}
Mercer	73,744	73,805	73,851	73,931	74,067	(14,813)	[3,555]	{1,778}	74,184	(14,837)	[3,561]	{1,780}	74,299	(14,860)	[3,566]	{1,783}
Middlesex	186,256	186,353	186,458	186,633	186,888	(37,378)	[8,971]	{4,485}	187,118	(37,424)	[8,982]	{4,491}	187,337	(37,467)	[8,992]	{4,496}
Monmouth	159,938	160,068	160,177	160,273	160,484	(32,097)	[7,703]	{3,852}	160,673	(32,135)	[7,712]	{3,856}	160,849	(32,170)	[7,721]	{3,860}
Morris	115,042	115,107	115,158	115,251	115,412	(23,082)	[5,540]	{2,770}	115,566	(23,113)	[5,547]	{2,774}	115,701	(23,140)	[5,554]	{2,777}
Ocean	158,424	158,491	158,557	158,650	158,849	(31,770)	[7,625]	{3,812}	159,022	(31,804)	[7,633]	{3,817}	159,183	(31,837)	[7,641]	{3,820}
Passaic	141,215	141,255	141,315	141,408	141,547	(28,309)	[6,794]	{3,397}	141,667	(28,333)	[6,800]	{3,400}	141,784	(28,357)	[6,806]	{3,403}
Somerset	65,639	65,663	65,685	65,718	65,801	(13,160)	[3,158]	{1,579}	65,874	(13,175)	[3,162]	{1,581}	65,943	(13,189)	[3,165]	{1,583}
Sussex	33,045	33,074	33,087	33,110	33,152	(6,630)	[1,591]	{796}	33,193	(6,639)	[1,593]	{797}	33,230	(6,646)	[1,595]	{798}
Union	139,284	139,355	139,401	139,571	139,764	(27,953)	[6,709]	{3,354}	139,942	(27,988)	[6,717]	{3,359}	140,117	(28,023)	[6,726]	{3,363}
Warren	23,281	23,297	23,311	23,327	23,361	(4,672)	[1,121]	{561}	23,391	(4,678)	[1,123]	{561}	23,418	(4,684)	[1,124]	{562}

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.