

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

Date: 4/15/21

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 4/15/21 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.

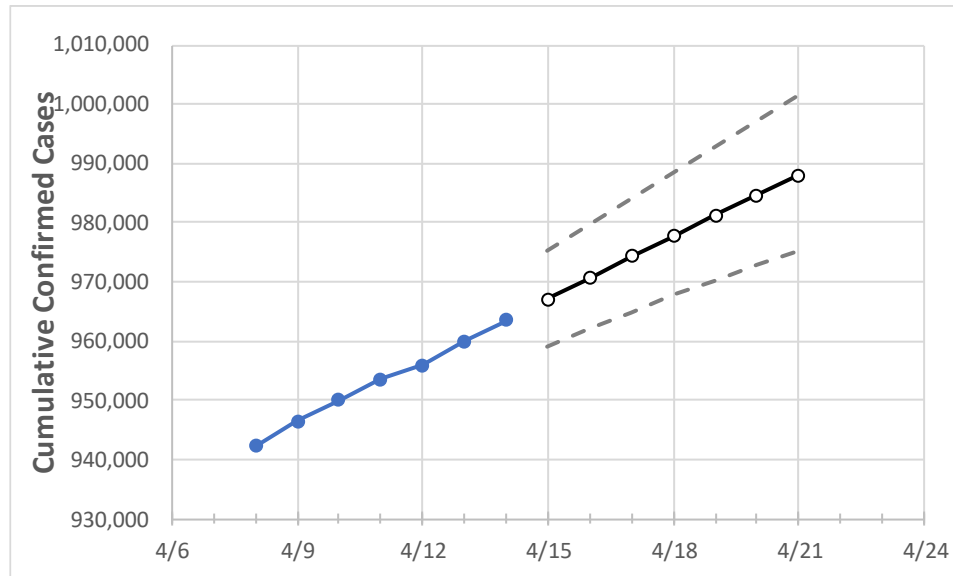
IEM's Modeling Lead

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:						
	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21
New Jersey	953,490	955,958	959,921	963,484	967,096	970,698	974,270	977,755	981,274	984,698	988,094

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:							
	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21	
Bergen	96,164	96,411	96,748	97,118	97,459	97,792	98,118	98,429	98,737	99,044	99,341	
Burlington	41,771	41,879	42,083	42,229	42,395	42,556	42,720	42,886	43,049	43,209	43,372	
Camden	50,927	51,077	51,325	51,494	51,697	51,902	52,102	52,306	52,507	52,716	52,928	
Essex	89,823	90,059	90,520	90,895	91,305	91,707	92,109	92,517	92,919	93,320	93,720	
Gloucester	28,088	28,181	28,348	28,463	28,577	28,694	28,812	28,930	29,050	29,171	29,290	
Hudson	83,500	83,701	84,019	84,305	84,603	84,898	85,191	85,483	85,765	86,046	86,319	
Hunterdon	8,940	8,965	9,025	9,071	9,120	9,170	9,220	9,268	9,315	9,362	9,409	
Mercer	32,041	32,143	32,269	32,342	32,445	32,549	32,653	32,757	32,859	32,963	33,065	
Middlesex	87,582	87,830	88,192	88,540	88,897	89,244	89,587	89,932	90,265	90,601	90,936	
Monmouth	71,353	71,517	71,790	72,065	72,320	72,577	72,827	73,065	73,301	73,531	73,763	
Morris	47,243	47,358	47,599	47,741	47,917	48,092	48,266	48,435	48,605	48,770	48,933	
Ocean	71,768	71,927	72,140	72,368	72,623	72,872	73,123	73,365	73,601	73,834	74,067	
Passaic	67,353	67,536	67,843	68,110	68,362	68,613	68,863	69,116	69,369	69,615	69,873	
Somerset	28,088	28,150	28,256	28,365	28,469	28,571	28,671	28,768	28,864	28,960	29,056	
Sussex	12,600	12,661	12,736	12,818	12,902	12,984	13,064	13,143	13,222	13,302	13,379	
Union	67,048	67,191	67,398	67,647	67,880	68,109	68,334	68,556	68,782	69,001	69,221	
Warren	8,961	8,995	9,060	9,111	9,158	9,205	9,251	9,297	9,344	9,391	9,438	

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:											
	4/11	4/12	4/13	4/14	4/16				4/18				4/20			
Bergen	96,164	96,411	96,748	97,118	97,792	(19,558)	[4,694]	{2,347}	98,429	(19,686)	[4,725]	{2,362}	99,044	(19,809)	[4,754]	{2,377}
Burlington	41,771	41,879	42,083	42,229	42,556	(8,511)	[2,043]	{1,021}	42,886	(8,577)	[2,059]	{1,029}	43,209	(8,642)	[2,074]	{1,037}
Camden	50,927	51,077	51,325	51,494	51,902	(10,380)	[2,491]	{1,246}	52,306	(10,461)	[2,511]	{1,255}	52,716	(10,543)	[2,530]	{1,265}
Essex	89,823	90,059	90,520	90,895	91,707	(18,341)	[4,402]	{2,201}	92,517	(18,503)	[4,441]	{2,220}	93,320	(18,664)	[4,479]	{2,240}
Gloucester	28,088	28,181	28,348	28,463	28,694	(5,739)	[1,377]	{689}	28,930	(5,786)	[1,389]	{694}	29,171	(5,834)	[1,400]	{700}
Hudson	83,500	83,701	84,019	84,305	84,898	(16,980)	[4,075]	{2,038}	85,483	(17,097)	[4,103]	{2,052}	86,046	(17,209)	[4,130]	{2,065}
Hunterdon	8,940	8,965	9,025	9,071	9,170	(1,834)	[440]	{220}	9,268	(1,854)	[445]	{222}	9,362	(1,872)	[449]	{225}
Mercer	32,041	32,143	32,269	32,342	32,549	(6,510)	[1,562]	{781}	32,757	(6,551)	[1,572]	{786}	32,963	(6,593)	[1,582]	{791}
Middlesex	87,582	87,830	88,192	88,540	89,244	(17,849)	[4,284]	{2,142}	89,932	(17,986)	[4,317]	{2,158}	90,601	(18,120)	[4,349]	{2,174}
Monmouth	71,353	71,517	71,790	72,065	72,577	(14,515)	[3,484]	{1,742}	73,065	(14,613)	[3,507]	{1,754}	73,531	(14,706)	[3,529]	{1,765}
Morris	47,243	47,358	47,599	47,741	48,092	(9,618)	[2,308]	{1,154}	48,435	(9,687)	[2,325]	{1,162}	48,770	(9,754)	[2,341]	{1,170}
Ocean	71,768	71,927	72,140	72,368	72,872	(14,574)	[3,498]	{1,749}	73,365	(14,673)	[3,522]	{1,761}	73,834	(14,767)	[3,544]	{1,772}
Passaic	67,353	67,536	67,843	68,110	68,613	(13,723)	[3,293]	{1,647}	69,116	(13,823)	[3,318]	{1,659}	69,615	(13,923)	[3,342]	{1,671}
Somerset	28,088	28,150	28,256	28,365	28,571	(5,714)	[1,371]	{686}	28,768	(5,754)	[1,381]	{690}	28,960	(5,792)	[1,390]	{695}
Sussex	12,600	12,661	12,736	12,818	12,984	(2,597)	[623]	{312}	13,143	(2,629)	[631]	{315}	13,302	(2,660)	[638]	{319}
Union	67,048	67,191	67,398	67,647	68,109	(13,622)	[3,269]	{1,635}	68,556	(13,711)	[3,291]	{1,645}	69,001	(13,800)	[3,312]	{1,656}
Warren	8,961	8,995	9,060	9,111	9,205	(1,841)	[442]	{221}	9,297	(1,859)	[446]	{223}	9,391	(1,878)	[451]	{225}

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.