

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/12/21**

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 1/12/21 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.

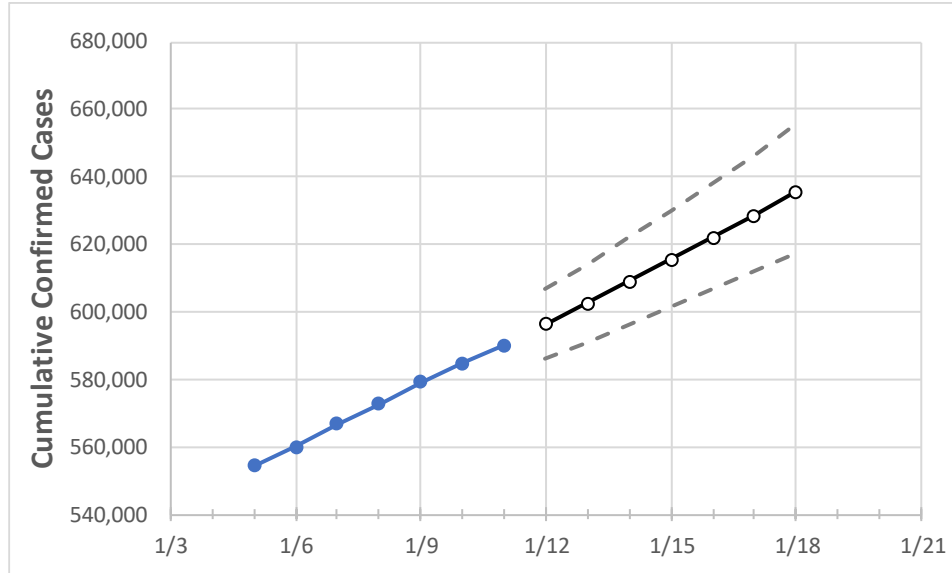
IEM's Modeling Lead

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:							
	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	
New Jersey	572,692	579,250	584,828	590,162	596,271	602,548	608,917	615,401	622,029	628,625	635,474	

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:						
	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18
Bergen	55,861	56,390	56,890	57,259	57,784	58,318	58,874	59,427	59,999	60,566	61,150
Burlington	25,643	25,949	26,167	26,361	26,648	26,936	27,226	27,520	27,818	28,113	28,398
Camden	33,883	34,294	34,601	34,802	35,140	35,478	35,814	36,160	36,517	36,867	37,217
Essex	54,443	54,999	55,454	55,789	56,257	56,730	57,215	57,700	58,192	58,689	59,192
Gloucester	17,618	17,900	18,062	18,191	18,417	18,642	18,879	19,117	19,349	19,596	19,846
Hudson	51,091	51,668	52,036	52,546	53,047	53,554	54,068	54,599	55,122	55,656	56,183
Hunterdon	4,572	4,651	4,714	4,764	4,831	4,900	4,971	5,044	5,117	5,193	5,272
Mercer	21,103	21,320	21,515	21,652	21,836	22,024	22,216	22,411	22,609	22,810	23,017
Middlesex	52,004	52,627	53,218	53,852	54,445	55,029	55,633	56,233	56,857	57,473	58,121
Monmouth	38,641	39,157	39,698	40,185	40,743	41,316	41,899	42,500	43,118	43,738	44,369
Morris	25,530	25,880	26,149	26,488	26,798	27,116	27,438	27,771	28,110	28,459	28,821
Ocean	39,667	40,126	40,548	41,075	41,584	42,090	42,618	43,149	43,698	44,234	44,796
Passaic	45,148	45,386	45,642	45,892	46,137	46,383	46,631	46,874	47,120	47,367	47,612
Somerset	16,409	16,622	16,772	16,926	17,101	17,281	17,465	17,652	17,840	18,034	18,232
Sussex	5,740	5,894	6,027	6,108	6,225	6,346	6,465	6,593	6,724	6,859	6,997
Union	43,843	44,264	44,664	45,006	45,371	45,737	46,119	46,509	46,904	47,310	47,720
Warren	4,780	4,854	4,929	4,999	5,064	5,132	5,200	5,270	5,340	5,413	5,486

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:											
	1/8	1/9	1/10	1/11	1/13			1/15			1/17					
Bergen	55,861	56,390	56,890	57,259	58,318	(11,664)	[2,799]	{1,400}	59,427	(11,885)	[2,853]	{1,426}	60,566	(12,113)	[2,907]	{1,454}
Burlington	25,643	25,949	26,167	26,361	26,936	(5,387)	[1,293]	{646}	27,520	(5,504)	[1,321]	{660}	28,113	(5,623)	[1,349]	{675}
Camden	33,883	34,294	34,601	34,802	35,478	(7,096)	[1,703]	{851}	36,160	(7,232)	[1,736]	{868}	36,867	(7,373)	[1,770]	{885}
Essex	54,443	54,999	55,454	55,789	56,730	(11,346)	[2,723]	{1,362}	57,700	(11,540)	[2,770]	{1,385}	58,689	(11,738)	[2,817]	{1,409}
Gloucester	17,618	17,900	18,062	18,191	18,642	(3,728)	[895]	{447}	19,117	(3,823)	[918]	{459}	19,596	(3,919)	[941]	{470}
Hudson	51,091	51,668	52,036	52,546	53,554	(10,711)	[2,571]	{1,285}	54,599	(10,920)	[2,621]	{1,310}	55,656	(11,131)	[2,671]	{1,336}
Hunterdon	4,572	4,651	4,714	4,764	4,900	(980)	[235]	{118}	5,044	(1,009)	[242]	{121}	5,193	(1,039)	[249]	{125}
Mercer	21,103	21,320	21,515	21,652	22,024	(4,405)	[1,057]	{529}	22,411	(4,482)	[1,076]	{538}	22,810	(4,562)	[1,095]	{547}
Middlesex	52,004	52,627	53,218	53,852	55,029	(11,006)	[2,641]	{1,321}	56,233	(11,247)	[2,699]	{1,350}	57,473	(11,495)	[2,759]	{1,379}
Monmouth	38,641	39,157	39,698	40,185	41,316	(8,263)	[1,983]	{992}	42,500	(8,500)	[2,040]	{1,020}	43,738	(8,748)	[2,099]	{1,050}
Morris	25,530	25,880	26,149	26,488	27,116	(5,423)	[1,302]	{651}	27,771	(5,554)	[1,333]	{667}	28,459	(5,692)	[1,366]	{683}
Ocean	39,667	40,126	40,548	41,075	42,090	(8,418)	[2,020]	{1,010}	43,149	(8,630)	[2,071]	{1,036}	44,234	(8,847)	[2,123]	{1,062}
Passaic	45,148	45,386	45,642	45,892	46,383	(9,277)	[2,226]	{1,113}	46,874	(9,375)	[2,250]	{1,125}	47,367	(9,473)	[2,274]	{1,137}
Somerset	16,409	16,622	16,772	16,926	17,281	(3,456)	[830]	{415}	17,652	(3,530)	[847]	{424}	18,034	(3,607)	[866]	{433}
Sussex	5,740	5,894	6,027	6,108	6,346	(1,269)	[305]	{152}	6,593	(1,319)	[316]	{158}	6,859	(1,372)	[329]	{165}
Union	43,843	44,264	44,664	45,006	45,737	(9,147)	[2,195]	{1,098}	46,509	(9,302)	[2,232]	{1,116}	47,310	(9,462)	[2,271]	{1,135}
Warren	4,780	4,854	4,929	4,999	5,132	(1,026)	[246]	{123}	5,270	(1,054)	[253]	{126}	5,413	(1,083)	[260]	{130}

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.