

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/18/20**

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 8/18/20 1 p.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.

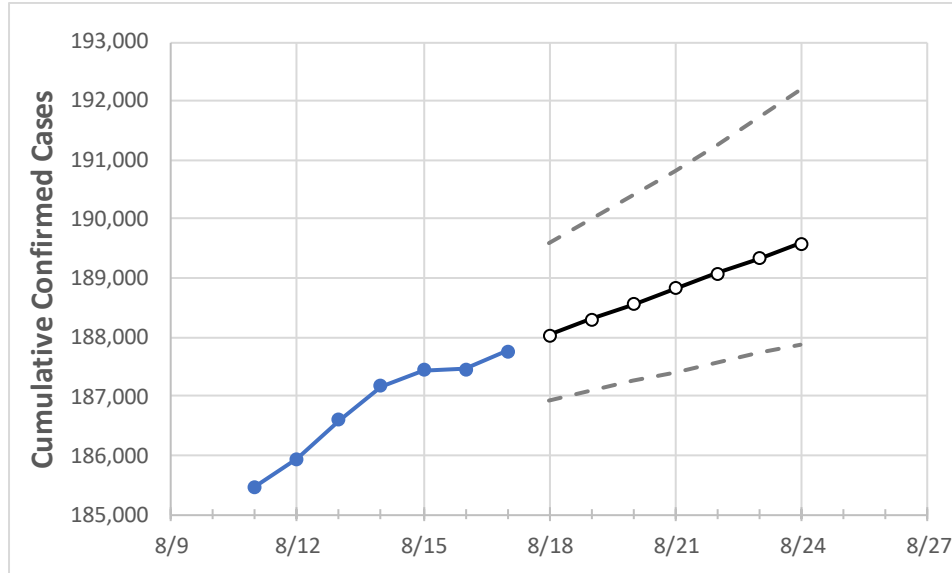
IEM's Modeling Lead

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:							
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	
New Jersey	187,164	187,442	187,455	187,767	188,034	188,299	188,561	188,821	189,079	189,334	189,587	

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 20%, and are often within 10%, of actual confirmed cases.

New Jersey Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	
Bergen	21,058	21,120	21,195	21,277	21,336	21,398	21,462	21,529	21,598	21,670	21,745	
Burlington	6,108	6,128	6,145	6,159	6,179	6,199	6,219	6,238	6,258	6,278	6,298	
Camden	8,733	8,774	8,793	8,820	8,849	8,878	8,908	8,938	8,967	8,997	9,027	
Essex	19,870	19,911	19,927	19,938	19,962	19,985	20,009	20,033	20,058	20,083	20,107	
Gloucester	3,368	3,400	3,413	3,445	3,470	3,495	3,521	3,548	3,575	3,603	3,632	
Hudson	19,830	19,866	19,892	19,911	19,941	19,972	20,004	20,037	20,072	20,108	20,146	
Hunterdon	1,154	1,158	1,161	1,163	1,164	1,165	1,166	1,168	1,169	1,170	1,171	
Mercer	8,169	8,182	8,190	8,199	8,207	8,214	8,221	8,228	8,235	8,242	8,249	
Middlesex	18,045	18,070	18,099	18,119	18,143	18,166	18,190	18,214	18,237	18,261	18,285	
Monmouth	10,434	10,459	10,474	10,496	10,518	10,541	10,563	10,585	10,607	10,629	10,651	
Morris	7,315	7,332	7,341	7,350	7,362	7,375	7,388	7,400	7,414	7,427	7,440	
Ocean	10,708	10,740	10,752	10,763	10,778	10,792	10,806	10,820	10,834	10,848	10,861	
Passaic	17,858	17,915	17,950	17,963	17,998	18,033	18,070	18,108	18,148	18,189	18,231	
Somerset	5,291	5,300	5,307	5,317	5,325	5,334	5,342	5,351	5,359	5,368	5,377	
Sussex	1,344	1,349	1,351	1,353	1,355	1,358	1,360	1,362	1,365	1,367	1,369	
Union	16,827	16,847	16,869	16,879	16,909	16,934	16,960	16,986	17,012	17,036	17,063	
Warren	1,355	1,362	1,365	1,368	1,370	1,373	1,375	1,377	1,380	1,382	1,385	

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:											
	8/14	8/15	8/16	8/17	8/19				8/21				8/23			
Bergen	21,058	21,120	21,195	21,277	21,398	(4,280)	[1,027]	{514}	21,529	(4,306)	[1,033]	{517}	21,670	(4,334)	[1,040]	{520}
Burlington	6,108	6,128	6,145	6,159	6,199	(1,240)	[298]	{149}	6,238	(1,248)	[299]	{150}	6,278	(1,256)	[301]	{151}
Camden	8,733	8,774	8,793	8,820	8,878	(1,776)	[426]	{213}	8,938	(1,788)	[429]	{215}	8,997	(1,799)	[432]	{216}
Essex	19,870	19,911	19,927	19,938	19,985	(3,997)	[959]	{480}	20,033	(4,007)	[962]	{481}	20,083	(4,017)	[964]	{482}
Gloucester	3,368	3,400	3,413	3,445	3,495	(699)	[168]	{84}	3,548	(710)	[170]	{85}	3,603	(721)	[173]	{86}
Hudson	19,830	19,866	19,892	19,911	19,972	(3,994)	[959]	{479}	20,037	(4,007)	[962]	{481}	20,108	(4,022)	[965]	{483}
Hunterdon	1,154	1,158	1,161	1,163	1,165	(233)	[56]	{28}	1,168	(234)	[56]	{28}	1,170	(234)	[56]	{28}
Mercer	8,169	8,182	8,190	8,199	8,214	(1,643)	[394]	{197}	8,228	(1,646)	[395]	{197}	8,242	(1,648)	[396]	{198}
Middlesex	18,045	18,070	18,099	18,119	18,166	(3,633)	[872]	{436}	18,214	(3,643)	[874]	{437}	18,261	(3,652)	[877]	{438}
Monmouth	10,434	10,459	10,474	10,496	10,541	(2,108)	[506]	{253}	10,585	(2,117)	[508]	{254}	10,629	(2,126)	[510]	{255}
Morris	7,315	7,332	7,341	7,350	7,375	(1,475)	[354]	{177}	7,400	(1,480)	[355]	{178}	7,427	(1,485)	[356]	{178}
Ocean	10,708	10,740	10,752	10,763	10,792	(2,158)	[518]	{259}	10,820	(2,164)	[519]	{260}	10,848	(2,170)	[521]	{260}
Passaic	17,858	17,915	17,950	17,963	18,033	(3,607)	[866]	{433}	18,108	(3,622)	[869]	{435}	18,189	(3,638)	[873]	{437}
Somerset	5,291	5,300	5,307	5,317	5,334	(1,067)	[256]	{128}	5,351	(1,070)	[257]	{128}	5,368	(1,074)	[258]	{129}
Sussex	1,344	1,349	1,351	1,353	1,358	(272)	[65]	{33}	1,362	(272)	[65]	{33}	1,367	(273)	[66]	{33}
Union	16,827	16,847	16,869	16,879	16,934	(3,387)	[813]	{406}	16,986	(3,397)	[815]	{408}	17,036	(3,407)	[818]	{409}
Warren	1,355	1,362	1,365	1,368	1,373	(275)	[66]	{33}	1,377	(275)	[66]	{33}	1,382	(276)	[66]	{33}

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.