

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/18/20**

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 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 9/18/20 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.

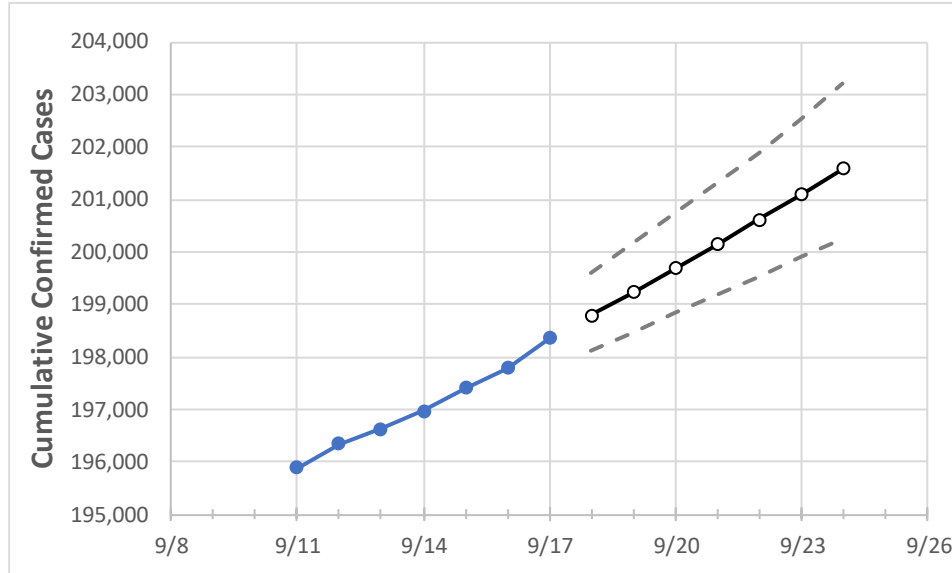
IEM's Modeling Lead

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:						
	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24
New Jersey	196,968	197,404	197,792	198,361	198,795	199,236	199,687	200,146	200,613	201,090	201,576

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:						
	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24
Bergen	21,995	21,999	22,030	22,087	22,105	22,122	22,139	22,157	22,174	22,191	22,207
Burlington	6,747	6,782	6,801	6,830	6,857	6,885	6,913	6,942	6,972	7,002	7,033
Camden	9,506	9,534	9,563	9,607	9,634	9,661	9,689	9,717	9,745	9,774	9,802
Essex	20,669	20,702	20,723	20,749	20,770	20,791	20,812	20,833	20,853	20,874	20,894
Gloucester	4,082	4,147	4,178	4,222	4,265	4,309	4,356	4,405	4,456	4,509	4,564
Hudson	20,385	20,403	20,422	20,437	20,452	20,467	20,482	20,497	20,512	20,527	20,542
Hunterdon	1,264	1,269	1,273	1,275	1,279	1,282	1,286	1,290	1,294	1,298	1,302
Mercer	8,498	8,510	8,526	8,534	8,545	8,557	8,569	8,580	8,592	8,604	8,616
Middlesex	18,870	18,909	18,931	18,971	19,007	19,045	19,083	19,122	19,163	19,204	19,246
Monmouth	11,217	11,268	11,287	11,358	11,403	11,450	11,499	11,550	11,604	11,659	11,717
Morris	7,647	7,671	7,674	7,697	7,708	7,719	7,730	7,741	7,752	7,764	7,775
Ocean	11,774	11,821	11,897	12,005	12,062	12,122	12,184	12,248	12,314	12,383	12,454
Passaic	18,673	18,690	18,719	18,749	18,769	18,790	18,810	18,830	18,850	18,870	18,890
Somerset	5,575	5,596	5,611	5,629	5,644	5,660	5,677	5,695	5,713	5,733	5,753
Sussex	1,428	1,430	1,429	1,429	1,432	1,435	1,438	1,441	1,445	1,448	1,451
Union	17,324	17,337	17,355	17,367	17,380	17,394	17,407	17,420	17,433	17,446	17,459
Warren	1,424	1,425	1,422	1,424	1,426	1,428	1,430	1,432	1,434	1,436	1,438

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:											
	9/14	9/15	9/16	9/17	9/19				9/21				9/23			
Bergen	21,995	21,999	22,030	22,087	22,122	(4,424)	[1,062]	{531}	22,157	(4,431)	[1,064]	{532}	22,191	(4,438)	[1,065]	{533}
Burlington	6,747	6,782	6,801	6,830	6,885	(1,377)	[330]	{165}	6,942	(1,388)	[333]	{167}	7,002	(1,400)	[336]	{168}
Camden	9,506	9,534	9,563	9,607	9,661	(1,932)	[464]	{232}	9,717	(1,943)	[466]	{233}	9,774	(1,955)	[469]	{235}
Essex	20,669	20,702	20,723	20,749	20,791	(4,158)	[998]	{499}	20,833	(4,167)	[1,000]	{500}	20,874	(4,175)	[1,002]	{501}
Gloucester	4,082	4,147	4,178	4,222	4,309	(862)	[207]	{103}	4,405	(881)	[211]	{106}	4,509	(902)	[216]	{108}
Hudson	20,385	20,403	20,422	20,437	20,467	(4,093)	[982]	{491}	20,497	(4,099)	[984]	{492}	20,527	(4,105)	[985]	{493}
Hunterdon	1,264	1,269	1,273	1,275	1,282	(256)	[62]	{31}	1,290	(258)	[62]	{31}	1,298	(260)	[62]	{31}
Mercer	8,498	8,510	8,526	8,534	8,557	(1,711)	[411]	{205}	8,580	(1,716)	[412]	{206}	8,604	(1,721)	[413]	{206}
Middlesex	18,870	18,909	18,931	18,971	19,045	(3,809)	[914]	{457}	19,122	(3,824)	[918]	{459}	19,204	(3,841)	[922]	{461}
Monmouth	11,217	11,268	11,287	11,358	11,450	(2,290)	[550]	{275}	11,550	(2,310)	[554]	{277}	11,659	(2,332)	[560]	{280}
Morris	7,647	7,671	7,674	7,697	7,719	(1,544)	[371]	{185}	7,741	(1,548)	[372]	{186}	7,764	(1,553)	[373]	{186}
Ocean	11,774	11,821	11,897	12,005	12,122	(2,424)	[582]	{291}	12,248	(2,450)	[588]	{294}	12,383	(2,477)	[594]	{297}
Passaic	18,673	18,690	18,719	18,749	18,790	(3,758)	[902]	{451}	18,830	(3,766)	[904]	{452}	18,870	(3,774)	[906]	{453}
Somerset	5,575	5,596	5,611	5,629	5,660	(1,132)	[272]	{136}	5,695	(1,139)	[273]	{137}	5,733	(1,147)	[275]	{138}
Sussex	1,428	1,430	1,429	1,429	1,435	(287)	[69]	{34}	1,441	(288)	[69]	{35}	1,448	(290)	[70]	{35}
Union	17,324	17,337	17,355	17,367	17,394	(3,479)	[835]	{417}	17,420	(3,484)	[836]	{418}	17,446	(3,489)	[837]	{419}
Warren	1,424	1,425	1,422	1,424	1,428	(286)	[69]	{34}	1,432	(286)	[69]	{34}	1,436	(287)	[69]	{34}

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.