

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/11/20**

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 9/11/20 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.

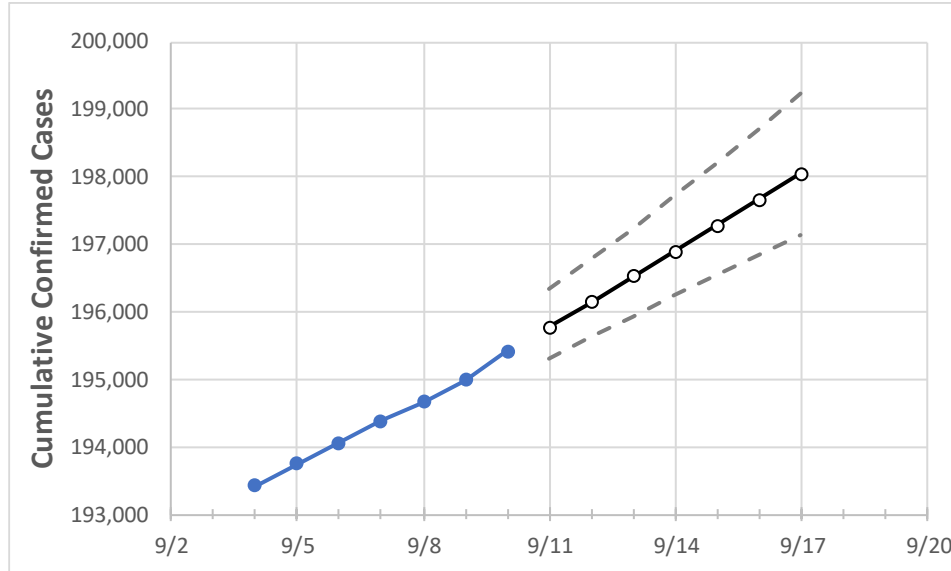
IEM's Modeling Lead

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:						
	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17
New Jersey	194,390	194,667	194,994	195,414	195,779	196,147	196,520	196,897	197,278	197,663	198,052

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:						
	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17
Bergen	21,816	21,844	21,872	21,894	21,915	21,936	21,956	21,975	21,994	22,012	22,030
Burlington	6,581	6,606	6,623	6,641	6,665	6,689	6,713	6,738	6,764	6,790	6,817
Camden	9,336	9,355	9,384	9,413	9,438	9,464	9,489	9,515	9,541	9,567	9,593
Essex	20,528	20,545	20,574	20,591	20,613	20,634	20,655	20,676	20,697	20,717	20,737
Gloucester	3,830	3,853	3,895	3,945	3,974	4,005	4,037	4,070	4,104	4,140	4,178
Hudson	20,286	20,293	20,305	20,329	20,344	20,359	20,374	20,388	20,403	20,418	20,433
Hunterdon	1,234	1,235	1,242	1,245	1,248	1,250	1,253	1,255	1,258	1,260	1,263
Mercer	8,422	8,432	8,439	8,455	8,466	8,477	8,488	8,499	8,510	8,522	8,534
Middlesex	18,603	18,625	18,649	18,703	18,727	18,751	18,775	18,800	18,825	18,850	18,875
Monmouth	10,951	10,966	11,002	11,043	11,077	11,111	11,148	11,185	11,224	11,265	11,307
Morris	7,581	7,592	7,596	7,603	7,613	7,623	7,633	7,644	7,654	7,664	7,675
Ocean	11,495	11,522	11,543	11,598	11,642	11,688	11,736	11,785	11,835	11,888	11,942
Passaic	18,520	18,533	18,560	18,579	18,599	18,619	18,638	18,657	18,676	18,695	18,713
Somerset	5,478	5,481	5,489	5,508	5,516	5,524	5,531	5,540	5,548	5,556	5,564
Sussex	1,416	1,421	1,419	1,416	1,420	1,425	1,430	1,435	1,440	1,445	1,451
Union	17,218	17,238	17,248	17,267	17,282	17,296	17,311	17,325	17,340	17,354	17,369
Warren	1,408	1,411	1,410	1,412	1,414	1,416	1,417	1,419	1,421	1,423	1,425

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:											
	9/7	9/8	9/9	9/10	9/12				9/14				9/16			
Bergen	21,816	21,844	21,872	21,894	21,936	(4,387)	[1,053]	{526}	21,975	(4,395)	[1,055]	{527}	22,012	(4,402)	[1,057]	{528}
Burlington	6,581	6,606	6,623	6,641	6,689	(1,338)	[321]	{161}	6,738	(1,348)	[323]	{162}	6,790	(1,358)	[326]	{163}
Camden	9,336	9,355	9,384	9,413	9,464	(1,893)	[454]	{227}	9,515	(1,903)	[457]	{228}	9,567	(1,913)	[459]	{230}
Essex	20,528	20,545	20,574	20,591	20,634	(4,127)	[990]	{495}	20,676	(4,135)	[992]	{496}	20,717	(4,143)	[994]	{497}
Gloucester	3,830	3,853	3,895	3,945	4,005	(801)	[192]	{96}	4,070	(814)	[195]	{98}	4,140	(828)	[199]	{99}
Hudson	20,286	20,293	20,305	20,329	20,359	(4,072)	[977]	{489}	20,388	(4,078)	[979]	{489}	20,418	(4,084)	[980]	{490}
Hunterdon	1,234	1,235	1,242	1,245	1,250	(250)	[60]	{30}	1,255	(251)	[60]	{30}	1,260	(252)	[60]	{30}
Mercer	8,422	8,432	8,439	8,455	8,477	(1,695)	[407]	{203}	8,499	(1,700)	[408]	{204}	8,522	(1,704)	[409]	{205}
Middlesex	18,603	18,625	18,649	18,703	18,751	(3,750)	[900]	{450}	18,800	(3,760)	[902]	{451}	18,850	(3,770)	[905]	{452}
Monmouth	10,951	10,966	11,002	11,043	11,111	(2,222)	[533]	{267}	11,185	(2,237)	[537]	{268}	11,265	(2,253)	[541]	{270}
Morris	7,581	7,592	7,596	7,603	7,623	(1,525)	[366]	{183}	7,644	(1,529)	[367]	{183}	7,664	(1,533)	[368]	{184}
Ocean	11,495	11,522	11,543	11,598	11,688	(2,338)	[561]	{281}	11,785	(2,357)	[566]	{283}	11,888	(2,378)	[571]	{285}
Passaic	18,520	18,533	18,560	18,579	18,619	(3,724)	[894]	{447}	18,657	(3,731)	[896]	{448}	18,695	(3,739)	[897]	{449}
Somerset	5,478	5,481	5,489	5,508	5,524	(1,105)	[265]	{133}	5,540	(1,108)	[266]	{133}	5,556	(1,111)	[267]	{133}
Sussex	1,416	1,421	1,419	1,416	1,425	(285)	[68]	{34}	1,435	(287)	[69]	{34}	1,445	(289)	[69]	{35}
Union	17,218	17,238	17,248	17,267	17,296	(3,459)	[830]	{415}	17,325	(3,465)	[832]	{416}	17,354	(3,471)	[833]	{417}
Warren	1,408	1,411	1,410	1,412	1,416	(283)	[68]	{34}	1,419	(284)	[68]	{34}	1,423	(285)	[68]	{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.