

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

Date: 9/20/21

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 9/20/21 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.

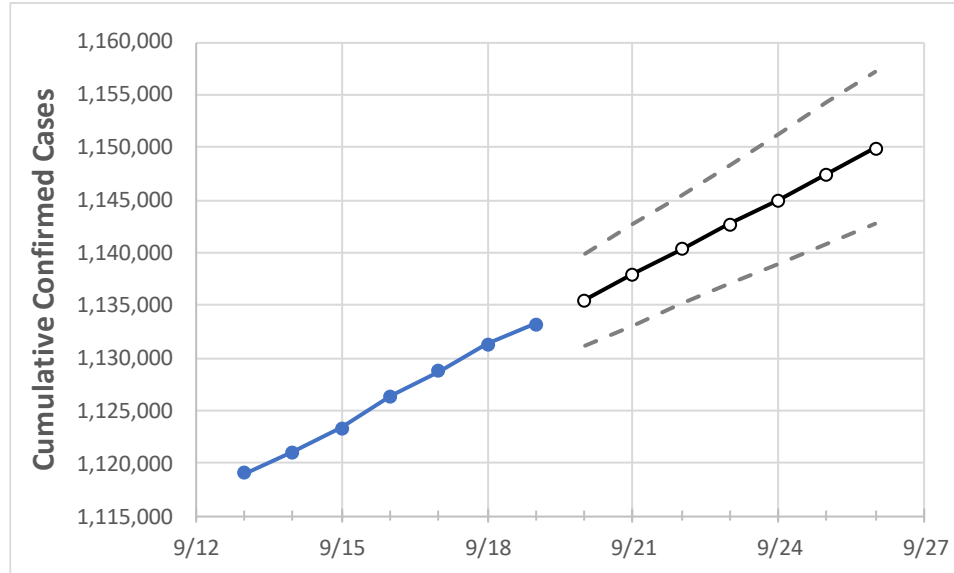
IEM's Modeling Lead

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:					
	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26
New Jersey	1,126,322	1,128,696	1,131,319	1,133,228	1,135,506	1,137,920	1,140,311	1,142,671	1,145,003	1,147,451	1,149,923

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:						
	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26
Bergen	114,050	114,230	114,435	114,602	114,788	114,984	115,172	115,368	115,553	115,760	115,961
Burlington	50,383	50,535	50,693	50,796	50,926	51,054	51,187	51,318	51,450	51,585	51,717
Camden	62,696	62,883	63,147	63,275	63,449	63,632	63,807	63,992	64,177	64,368	64,562
Essex	102,448	102,606	102,809	102,907	103,064	103,225	103,384	103,544	103,701	103,877	104,039
Gloucester	34,907	35,010	35,169	35,271	35,389	35,509	35,631	35,752	35,879	36,008	36,135
Hudson	94,395	94,512	94,661	94,760	94,887	95,016	95,146	95,276	95,406	95,541	95,678
Hunterdon	11,088	11,113	11,141	11,159	11,183	11,206	11,229	11,253	11,277	11,301	11,325
Mercer	37,264	37,349	37,413	37,478	37,546	37,613	37,677	37,748	37,815	37,886	37,953
Middlesex	101,150	101,365	101,584	101,751	101,963	102,173	102,389	102,603	102,827	103,050	103,280
Monmouth	86,548	86,747	86,963	87,145	87,346	87,552	87,753	87,947	88,150	88,361	88,564
Morris	54,959	55,060	55,172	55,260	55,358	55,463	55,562	55,666	55,768	55,875	55,979
Ocean	86,591	86,830	87,056	87,212	87,447	87,689	87,928	88,164	88,416	88,672	88,918
Passaic	78,419	78,550	78,636	78,757	78,862	78,975	79,082	79,197	79,311	79,427	79,538
Somerset	33,196	33,258	33,323	33,364	33,427	33,493	33,556	33,623	33,688	33,758	33,822
Sussex	15,542	15,579	15,620	15,665	15,706	15,748	15,791	15,835	15,879	15,924	15,969
Union	77,179	77,295	77,396	77,514	77,633	77,749	77,862	77,984	78,104	78,230	78,349
Warren	11,133	11,161	11,188	11,198	11,227	11,259	11,288	11,319	11,350	11,381	11,412

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:											
	9/16	9/17	9/18	9/19	9/21				9/23				9/25			
Bergen	114,050	114,230	114,435	114,602	114,984	(22,997)	[5,519]	{2,760}	115,368	(23,074)	[5,538]	{2,769}	115,760	(23,152)	[5,556]	{2,778}
Burlington	50,383	50,535	50,693	50,796	51,054	(10,211)	[2,451]	{1,225}	51,318	(10,264)	[2,463]	{1,232}	51,585	(10,317)	[2,476]	{1,238}
Camden	62,696	62,883	63,147	63,275	63,632	(12,726)	[3,054]	{1,527}	63,992	(12,798)	[3,072]	{1,536}	64,368	(12,874)	[3,090]	{1,545}
Essex	102,448	102,606	102,809	102,907	103,225	(20,645)	[4,955]	{2,477}	103,544	(20,709)	[4,970]	{2,485}	103,877	(20,775)	[4,986]	{2,493}
Gloucester	34,907	35,010	35,169	35,271	35,509	(7,102)	[1,704]	{852}	35,752	(7,150)	[1,716]	{858}	36,008	(7,202)	[1,728]	{864}
Hudson	94,395	94,512	94,661	94,760	95,016	(19,003)	[4,561]	{2,280}	95,276	(19,055)	[4,573]	{2,287}	95,541	(19,108)	[4,586]	{2,293}
Hunterdon	11,088	11,113	11,141	11,159	11,206	(2,241)	[538]	{269}	11,253	(2,251)	[540]	{270}	11,301	(2,260)	[542]	{271}
Mercer	37,264	37,349	37,413	37,478	37,613	(7,523)	[1,805]	{903}	37,748	(7,550)	[1,812]	{906}	37,886	(7,577)	[1,819]	{909}
Middlesex	101,150	101,365	101,584	101,751	102,173	(20,435)	[4,904]	{2,452}	102,603	(20,521)	[4,925]	{2,462}	103,050	(20,610)	[4,946]	{2,473}
Monmouth	86,548	86,747	86,963	87,145	87,552	(17,510)	[4,202]	{2,101}	87,947	(17,589)	[4,221]	{2,111}	88,361	(17,672)	[4,241]	{2,121}
Morris	54,959	55,060	55,172	55,260	55,463	(11,093)	[2,662]	{1,331}	55,666	(11,133)	[2,672]	{1,336}	55,875	(11,175)	[2,682]	{1,341}
Ocean	86,591	86,830	87,056	87,212	87,689	(17,538)	[4,209]	{2,105}	88,164	(17,633)	[4,232]	{2,116}	88,672	(17,734)	[4,256]	{2,128}
Passaic	78,419	78,550	78,636	78,757	78,975	(15,795)	[3,791]	{1,895}	79,197	(15,839)	[3,801]	{1,901}	79,427	(15,885)	[3,812]	{1,906}
Somerset	33,196	33,258	33,323	33,364	33,493	(6,699)	[1,608]	{804}	33,623	(6,725)	[1,614]	{807}	33,758	(6,752)	[1,620]	{810}
Sussex	15,542	15,579	15,620	15,665	15,748	(3,150)	[756]	{378}	15,835	(3,167)	[760]	{380}	15,924	(3,185)	[764]	{382}
Union	77,179	77,295	77,396	77,514	77,749	(15,550)	[3,732]	{1,866}	77,984	(15,597)	[3,743]	{1,872}	78,230	(15,646)	[3,755]	{1,878}
Warren	11,133	11,161	11,188	11,198	11,259	(2,252)	[540]	{270}	11,319	(2,264)	[543]	{272}	11,381	(2,276)	[546]	{273}

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.