

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/10/21**

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 11/10/21 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.

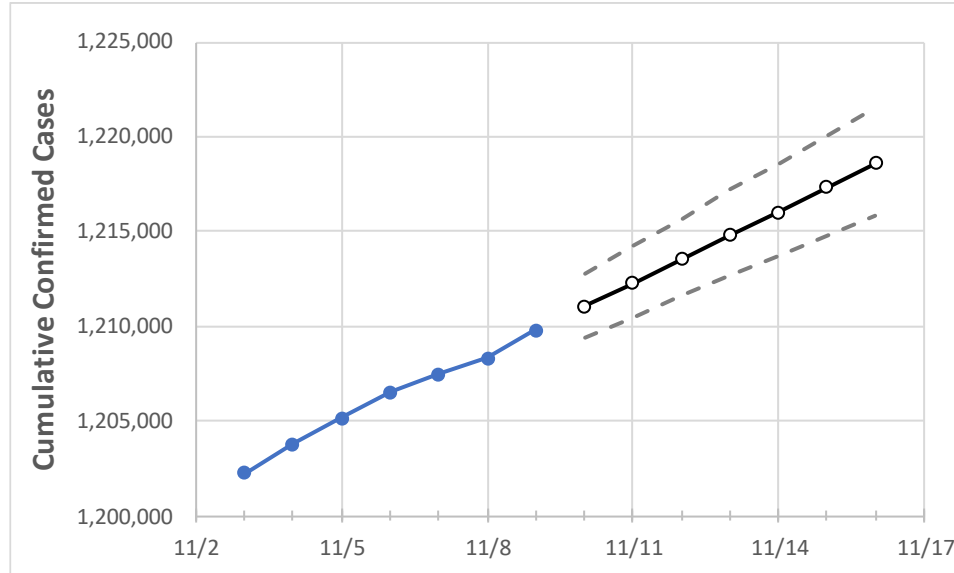
IEM's Modeling Lead

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:							
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	
New Jersey	1,206,543	1,207,469	1,208,321	1,209,785	1,211,069	1,212,294	1,213,542	1,214,807	1,216,042	1,217,318	1,218,582	

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:							
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	
Bergen	120,671	120,734	120,802	120,902	120,997	121,093	121,186	121,282	121,379	121,473	121,567	
Burlington	55,447	55,508	55,552	55,651	55,732	55,813	55,890	55,971	56,051	56,131	56,208	
Camden	68,907	68,957	69,011	69,110	69,197	69,291	69,374	69,467	69,556	69,645	69,737	
Essex	106,851	106,891	106,948	107,054	107,135	107,217	107,302	107,384	107,470	107,560	107,648	
Gloucester	38,961	39,007	39,032	39,098	39,162	39,226	39,287	39,350	39,413	39,476	39,539	
Hudson	97,920	97,974	98,017	98,055	98,108	98,161	98,216	98,268	98,322	98,376	98,429	
Hunterdon	12,165	12,178	12,191	12,211	12,225	12,239	12,253	12,266	12,279	12,293	12,306	
Mercer	39,949	39,978	40,007	40,066	40,112	40,159	40,207	40,255	40,302	40,351	40,397	
Middlesex	107,032	107,117	107,193	107,308	107,397	107,484	107,572	107,663	107,750	107,839	107,928	
Monmouth	93,496	93,617	93,703	93,850	93,981	94,117	94,245	94,380	94,514	94,648	94,784	
Morris	58,599	58,658	58,705	58,801	58,871	58,943	59,015	59,086	59,159	59,234	59,308	
Ocean	96,691	96,799	96,891	97,056	97,200	97,347	97,492	97,630	97,771	97,913	98,053	
Passaic	82,230	82,257	82,304	82,359	82,421	82,483	82,540	82,599	82,658	82,721	82,779	
Somerset	35,138	35,163	35,195	35,230	35,261	35,292	35,324	35,357	35,389	35,422	35,455	
Sussex	17,686	17,705	17,720	17,771	17,809	17,849	17,889	17,928	17,969	18,009	18,047	
Union	80,057	80,099	80,134	80,206	80,264	80,322	80,380	80,440	80,500	80,562	80,625	
Warren	12,333	12,353	12,373	12,401	12,420	12,440	12,459	12,479	12,498	12,518	12,538	

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:											
	11/6	11/7	11/8	11/9	11/11				11/13				11/15			
Bergen	120,671	120,734	120,802	120,902	121,093	(24,219)	[5,812]	{2,906}	121,282	(24,256)	[5,822]	{2,911}	121,473	(24,295)	[5,831]	{2,915}
Burlington	55,447	55,508	55,552	55,651	55,813	(11,163)	[2,679]	{1,340}	55,971	(11,194)	[2,687]	{1,343}	56,131	(11,226)	[2,694]	{1,347}
Camden	68,907	68,957	69,011	69,110	69,291	(13,858)	[3,326]	{1,663}	69,467	(13,893)	[3,334]	{1,667}	69,645	(13,929)	[3,343]	{1,671}
Essex	106,851	106,891	106,948	107,054	107,217	(21,443)	[5,146]	{2,573}	107,384	(21,477)	[5,154]	{2,577}	107,560	(21,512)	[5,163]	{2,581}
Gloucester	38,961	39,007	39,032	39,098	39,226	(7,845)	[1,883]	{941}	39,350	(7,870)	[1,889]	{944}	39,476	(7,895)	[1,895]	{947}
Hudson	97,920	97,974	98,017	98,055	98,161	(19,632)	[4,712]	{2,356}	98,268	(19,654)	[4,717]	{2,358}	98,376	(19,675)	[4,722]	{2,361}
Hunterdon	12,165	12,178	12,191	12,211	12,239	(2,448)	[587]	{294}	12,266	(2,453)	[589]	{294}	12,293	(2,459)	[590]	{295}
Mercer	39,949	39,978	40,007	40,066	40,159	(8,032)	[1,928]	{964}	40,255	(8,051)	[1,932]	{966}	40,351	(8,070)	[1,937]	{968}
Middlesex	107,032	107,117	107,193	107,308	107,484	(21,497)	[5,159]	{2,580}	107,663	(21,533)	[5,168]	{2,584}	107,839	(21,568)	[5,176]	{2,588}
Monmouth	93,496	93,617	93,703	93,850	94,117	(18,823)	[4,518]	{2,259}	94,380	(18,876)	[4,530]	{2,265}	94,648	(18,930)	[4,543]	{2,272}
Morris	58,599	58,658	58,705	58,801	58,943	(11,789)	[2,829]	{1,415}	59,086	(11,817)	[2,836]	{1,418}	59,234	(11,847)	[2,843]	{1,422}
Ocean	96,691	96,799	96,891	97,056	97,347	(19,469)	[4,673]	{2,336}	97,630	(19,526)	[4,686]	{2,343}	97,913	(19,583)	[4,700]	{2,350}
Passaic	82,230	82,257	82,304	82,359	82,483	(16,497)	[3,959]	{1,980}	82,599	(16,520)	[3,965]	{1,982}	82,721	(16,544)	[3,971]	{1,985}
Somerset	35,138	35,163	35,195	35,230	35,292	(7,058)	[1,694]	{847}	35,357	(7,071)	[1,697]	{849}	35,422	(7,084)	[1,700]	{850}
Sussex	17,686	17,705	17,720	17,771	17,849	(3,570)	[857]	{428}	17,928	(3,586)	[861]	{430}	18,009	(3,602)	[864]	{432}
Union	80,057	80,099	80,134	80,206	80,322	(16,064)	[3,855]	{1,928}	80,440	(16,088)	[3,861]	{1,931}	80,562	(16,112)	[3,867]	{1,933}
Warren	12,333	12,353	12,373	12,401	12,440	(2,488)	[597]	{299}	12,479	(2,496)	[599]	{300}	12,518	(2,504)	[601]	{300}

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.