

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/8/21**

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 10/8/21 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.

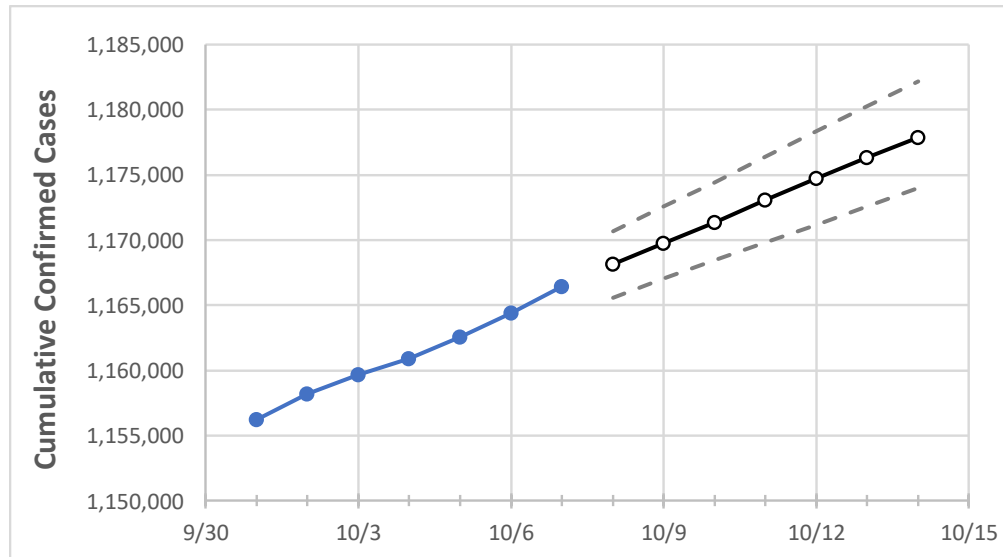
IEM's Modeling Lead

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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
New Jersey	1,160,878	1,162,526	1,164,378	1,166,443	1,168,117	1,169,775	1,171,364	1,173,041	1,174,699	1,176,308	1,177,883

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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Bergen	117,022	117,153	117,321	117,476	117,624	117,772	117,921	118,059	118,207	118,351	118,496
Burlington	52,464	52,532	52,663	52,797	52,900	53,006	53,111	53,215	53,318	53,422	53,529
Camden	65,537	65,630	65,761	65,942	66,079	66,218	66,356	66,491	66,629	66,770	66,908
Essex	104,603	104,687	104,834	104,968	105,062	105,153	105,241	105,331	105,420	105,506	105,593
Gloucester	36,666	36,802	36,903	37,023	37,118	37,211	37,303	37,397	37,489	37,585	37,678
Hudson	95,928	96,001	96,074	96,145	96,209	96,270	96,329	96,388	96,447	96,506	96,560
Hunterdon	11,471	11,494	11,512	11,548	11,570	11,591	11,613	11,635	11,656	11,679	11,701
Mercer	38,314	38,376	38,412	38,479	38,527	38,574	38,620	38,666	38,713	38,758	38,802
Middlesex	103,757	103,864	103,993	104,138	104,244	104,348	104,451	104,552	104,654	104,753	104,849
Monmouth	89,397	89,551	89,683	89,812	89,946	90,079	90,212	90,344	90,474	90,608	90,736
Morris	56,403	56,485	56,556	56,651	56,730	56,809	56,889	56,968	57,048	57,129	57,209
Ocean	90,518	90,758	90,989	91,259	91,470	91,679	91,885	92,098	92,303	92,511	92,719
Passaic	80,011	80,086	80,192	80,278	80,347	80,416	80,486	80,553	80,619	80,685	80,751
Somerset	34,119	34,174	34,213	34,265	34,310	34,355	34,400	34,445	34,488	34,532	34,576
Sussex	16,299	16,348	16,397	16,449	16,493	16,537	16,581	16,626	16,671	16,717	16,762
Union	78,766	78,849	78,925	79,000	79,065	79,131	79,192	79,261	79,317	79,383	79,444
Warren	11,573	11,584	11,613	11,641	11,666	11,690	11,715	11,740	11,764	11,789	11,813

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:											
	10/4	10/5	10/6	10/7	10/9				10/11				10/13			
Bergen	117,022	117,153	117,321	117,476	117,772	(23,554)	[5,653]	{2,827}	118,059	(23,612)	[5,667]	{2,833}	118,351	(23,670)	[5,681]	{2,840}
Burlington	52,464	52,532	52,663	52,797	53,006	(10,601)	[2,544]	{1,272}	53,215	(10,643)	[2,554]	{1,277}	53,422	(10,684)	[2,564]	{1,282}
Camden	65,537	65,630	65,761	65,942	66,218	(13,244)	[3,178]	{1,589}	66,491	(13,298)	[3,192]	{1,596}	66,770	(13,354)	[3,205]	{1,602}
Essex	104,603	104,687	104,834	104,968	105,153	(21,031)	[5,047]	{2,524}	105,331	(21,066)	[5,056]	{2,528}	105,506	(21,101)	[5,064]	{2,532}
Gloucester	36,666	36,802	36,903	37,023	37,211	(7,442)	[1,786]	{893}	37,397	(7,479)	[1,795]	{898}	37,585	(7,517)	[1,804]	{902}
Hudson	95,928	96,001	96,074	96,145	96,270	(19,254)	[4,621]	{2,310}	96,388	(19,278)	[4,627]	{2,313}	96,506	(19,301)	[4,632]	{2,316}
Hunterdon	11,471	11,494	11,512	11,548	11,591	(2,318)	[556]	{278}	11,635	(2,327)	[558]	{279}	11,679	(2,336)	[561]	{280}
Mercer	38,314	38,376	38,412	38,479	38,574	(7,715)	[1,852]	{926}	38,666	(7,733)	[1,856]	{928}	38,758	(7,752)	[1,860]	{930}
Middlesex	103,757	103,864	103,993	104,138	104,348	(20,870)	[5,009]	{2,504}	104,552	(20,910)	[5,018]	{2,509}	104,753	(20,951)	[5,028]	{2,514}
Monmouth	89,397	89,551	89,683	89,812	90,079	(18,016)	[4,324]	{2,162}	90,344	(18,069)	[4,336]	{2,168}	90,608	(18,122)	[4,349]	{2,175}
Morris	56,403	56,485	56,556	56,651	56,809	(11,362)	[2,727]	{1,363}	56,968	(11,394)	[2,734]	{1,367}	57,129	(11,426)	[2,742]	{1,371}
Ocean	90,518	90,758	90,989	91,259	91,679	(18,336)	[4,401]	{2,200}	92,098	(18,420)	[4,421]	{2,210}	92,511	(18,502)	[4,441]	{2,220}
Passaic	80,011	80,086	80,192	80,278	80,416	(16,083)	[3,860]	{1,930}	80,553	(16,111)	[3,867]	{1,933}	80,685	(16,137)	[3,873]	{1,936}
Somerset	34,119	34,174	34,213	34,265	34,355	(6,871)	[1,649]	{825}	34,445	(6,889)	[1,653]	{827}	34,532	(6,906)	[1,658]	{829}
Sussex	16,299	16,348	16,397	16,449	16,537	(3,307)	[794]	{397}	16,626	(3,325)	[798]	{399}	16,717	(3,343)	[802]	{401}
Union	78,766	78,849	78,925	79,000	79,131	(15,826)	[3,798]	{1,899}	79,261	(15,852)	[3,805]	{1,902}	79,383	(15,877)	[3,810]	{1,905}
Warren	11,573	11,584	11,613	11,641	11,690	(2,338)	[561]	{281}	11,740	(2,348)	[564]	{282}	11,789	(2,358)	[566]	{283}

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.