

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

Date: 4/16/21

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 4/16/21 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.**

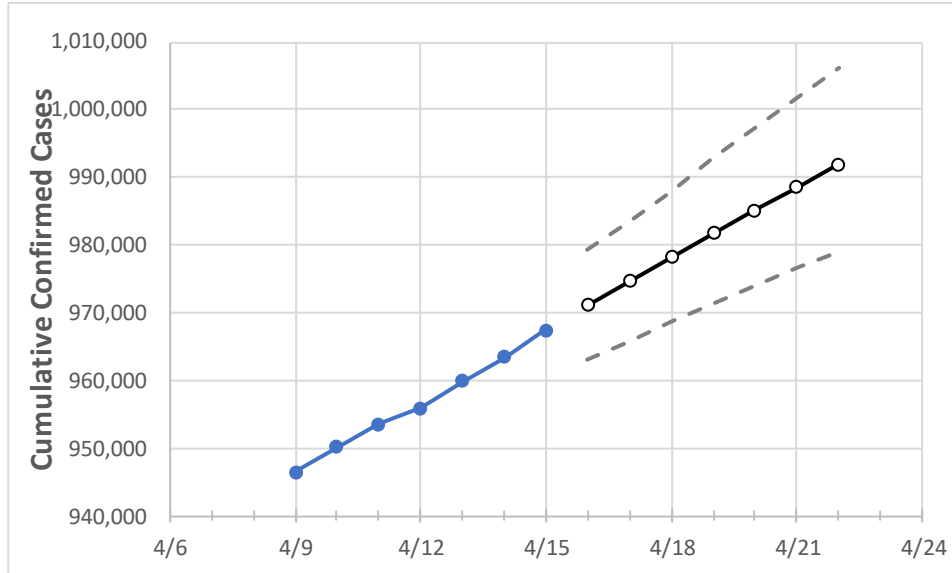
### IEM's Modeling Lead

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:							
	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21	4/22	

New Jersey 955,958 959,921 963,484 967,442 971,057 974,657 978,212 981,697 985,116 988,533 991,947

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:							
	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21	4/22	
Bergen	96,411	96,748	97,118	97,483	97,824	98,156	98,477	98,797	99,115	99,413	99,710	
Burlington	41,879	42,083	42,229	42,374	42,530	42,686	42,839	42,993	43,146	43,298	43,447	
Camden	51,077	51,325	51,494	51,655	51,845	52,038	52,233	52,425	52,620	52,816	53,012	
Essex	90,059	90,520	90,895	91,404	91,818	92,232	92,651	93,059	93,464	93,880	94,292	
Gloucester	28,181	28,348	28,463	28,587	28,705	28,825	28,943	29,061	29,181	29,303	29,422	
Hudson	83,701	84,019	84,305	84,598	84,885	85,177	85,460	85,742	86,012	86,283	86,554	
Hunterdon	8,965	9,025	9,071	9,113	9,161	9,207	9,254	9,301	9,346	9,391	9,437	
Mercer	32,143	32,269	32,342	32,427	32,528	32,625	32,724	32,821	32,920	33,015	33,111	
Middlesex	87,830	88,192	88,540	88,926	89,274	89,622	89,972	90,317	90,659	91,006	91,354	
Monmouth	71,517	71,790	72,065	72,295	72,542	72,787	73,028	73,265	73,494	73,720	73,935	
Morris	47,358	47,599	47,741	47,951	48,130	48,304	48,476	48,650	48,816	48,981	49,140	
Ocean	71,927	72,140	72,368	72,553	72,791	73,027	73,259	73,483	73,710	73,925	74,134	
Passaic	67,536	67,843	68,110	68,533	68,809	69,085	69,364	69,658	69,948	70,236	70,528	
Somerset	28,150	28,256	28,365	28,485	28,590	28,695	28,797	28,897	28,995	29,094	29,191	
Sussex	12,661	12,736	12,818	12,906	12,984	13,061	13,138	13,214	13,288	13,363	13,436	
Union	67,191	67,398	67,647	67,936	68,176	68,415	68,649	68,884	69,117	69,349	69,579	
Warren	8,995	9,060	9,111	9,174	9,224	9,274	9,325	9,377	9,427	9,478	9,530	

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:											
	4/12	4/13	4/14	4/15	4/17			4/19			4/21					
Bergen	96,411	96,748	97,118	97,483	98,156	(19,631)	[4,711]	{2,356}	98,797	(19,759)	[4,742]	{2,371}	99,413	(19,883)	[4,772]	{2,386}
Burlington	41,879	42,083	42,229	42,374	42,686	(8,537)	[2,049]	{1,024}	42,993	(8,599)	[2,064]	{1,032}	43,298	(8,660)	[2,078]	{1,039}
Camden	51,077	51,325	51,494	51,655	52,038	(10,408)	[2,498]	{1,249}	52,425	(10,485)	[2,516]	{1,258}	52,816	(10,563)	[2,535]	{1,268}
Essex	90,059	90,520	90,895	91,404	92,232	(18,446)	[4,427]	{2,214}	93,059	(18,612)	[4,467]	{2,233}	93,880	(18,776)	[4,506]	{2,253}
Gloucester	28,181	28,348	28,463	28,587	28,825	(5,765)	[1,384]	{692}	29,061	(5,812)	[1,395]	{697}	29,303	(5,861)	[1,407]	{703}
Hudson	83,701	84,019	84,305	84,598	85,177	(17,035)	[4,089]	{2,044}	85,742	(17,148)	[4,116]	{2,058}	86,283	(17,257)	[4,142]	{2,071}
Hunterdon	8,965	9,025	9,071	9,113	9,207	(1,841)	[442]	{221}	9,301	(1,860)	[446]	{223}	9,391	(1,878)	[451]	{225}
Mercer	32,143	32,269	32,342	32,427	32,625	(6,525)	[1,566]	{783}	32,821	(6,564)	[1,575]	{788}	33,015	(6,603)	[1,585]	{792}
Middlesex	87,830	88,192	88,540	88,926	89,622	(17,924)	[4,302]	{2,151}	90,317	(18,063)	[4,335]	{2,168}	91,006	(18,201)	[4,368]	{2,184}
Monmouth	71,517	71,790	72,065	72,295	72,787	(14,557)	[3,494]	{1,747}	73,265	(14,653)	[3,517]	{1,758}	73,720	(14,744)	[3,539]	{1,769}
Morris	47,358	47,599	47,741	47,951	48,304	(9,661)	[2,319]	{1,159}	48,650	(9,730)	[2,335]	{1,168}	48,981	(9,796)	[2,351]	{1,176}
Ocean	71,927	72,140	72,368	72,553	73,027	(14,605)	[3,505]	{1,753}	73,483	(14,697)	[3,527]	{1,764}	73,925	(14,785)	[3,548]	{1,774}
Passaic	67,536	67,843	68,110	68,533	69,085	(13,817)	[3,316]	{1,658}	69,658	(13,932)	[3,344]	{1,672}	70,236	(14,047)	[3,371]	{1,686}
Somerset	28,150	28,256	28,365	28,485	28,695	(5,739)	[1,377]	{689}	28,897	(5,779)	[1,387]	{694}	29,094	(5,819)	[1,397]	{698}
Sussex	12,661	12,736	12,818	12,906	13,061	(2,612)	[627]	{313}	13,214	(2,643)	[634]	{317}	13,363	(2,673)	[641]	{321}
Union	67,191	67,398	67,647	67,936	68,415	(13,683)	[3,284]	{1,642}	68,884	(13,777)	[3,306]	{1,653}	69,349	(13,870)	[3,329]	{1,664}
Warren	8,995	9,060	9,111	9,174	9,274	(1,855)	[445]	{223}	9,377	(1,875)	[450]	{225}	9,478	(1,896)	[455]	{227}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.