

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

Date: 3/23/21

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 3/23/21 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.**

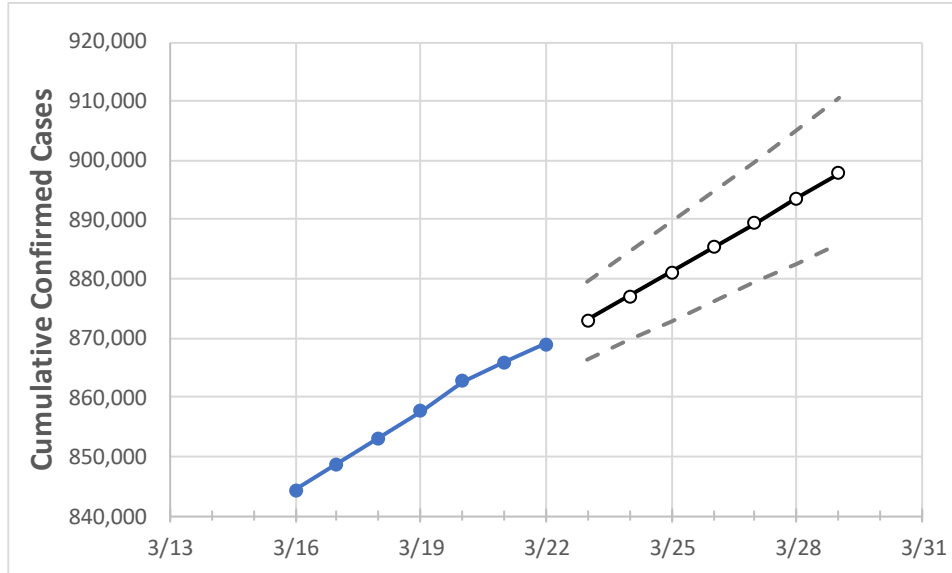
### IEM's Modeling Lead

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:							
	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	

New Jersey 857,739 862,648 865,886 869,037 873,082 877,117 881,173 885,273 889,406 893,665 897,923

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:							
	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	
Bergen	85,586	86,106	86,467	86,830	87,297	87,768	88,235	88,710	89,188	89,672	90,150	
Burlington	37,844	38,004	38,116	38,258	38,405	38,556	38,706	38,859	39,013	39,170	39,328	
Camden	46,639	46,885	47,005	47,161	47,324	47,490	47,660	47,834	48,012	48,190	48,369	
Essex	79,950	80,358	80,704	80,999	81,389	81,775	82,174	82,578	82,979	83,397	83,815	
Gloucester	25,651	25,775	25,844	25,911	26,006	26,102	26,200	26,299	26,398	26,499	26,602	
Hudson	75,218	75,757	76,017	76,296	76,645	76,994	77,341	77,693	78,045	78,408	78,773	
Hunterdon	7,679	7,717	7,752	7,783	7,827	7,871	7,915	7,960	8,005	8,050	8,096	
Mercer	29,515	29,659	29,756	29,814	29,912	30,011	30,109	30,208	30,309	30,407	30,506	
Middlesex	78,719	79,134	79,447	79,710	80,096	80,485	80,884	81,285	81,703	82,113	82,526	
Monmouth	63,415	63,919	64,209	64,489	64,866	65,242	65,625	66,007	66,393	66,777	67,178	
Morris	42,009	42,348	42,586	42,784	43,077	43,370	43,672	43,977	44,287	44,606	44,930	
Ocean	64,374	64,706	64,985	65,308	65,633	65,955	66,279	66,608	66,936	67,260	67,590	
Passaic	61,257	61,482	61,662	61,795	62,039	62,286	62,536	62,782	63,030	63,280	63,530	
Somerset	25,004	25,168	25,268	25,373	25,503	25,633	25,768	25,902	26,037	26,171	26,310	
Sussex	10,343	10,435	10,502	10,565	10,652	10,739	10,829	10,922	11,015	11,112	11,210	
Union	61,090	61,390	61,593	61,790	62,038	62,290	62,542	62,793	63,048	63,305	63,566	
Warren	7,840	7,909	7,951	7,994	8,046	8,098	8,152	8,205	8,260	8,315	8,372	

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:											
	3/19	3/20	3/21	3/22	3/24			3/26			3/28					
Bergen	85,586	86,106	86,467	86,830	87,768	(17,554)	[4,213]	{2,106}	88,710	(17,742)	[4,258]	{2,129}	89,672	(17,934)	[4,304]	{2,152}
Burlington	37,844	38,004	38,116	38,258	38,556	(7,711)	[1,851]	{925}	38,859	(7,772)	[1,865]	{933}	39,170	(7,834)	[1,880]	{940}
Camden	46,639	46,885	47,005	47,161	47,490	(9,498)	[2,280]	{1,140}	47,834	(9,567)	[2,296]	{1,148}	48,190	(9,638)	[2,313]	{1,157}
Essex	79,950	80,358	80,704	80,999	81,775	(16,355)	[3,925]	{1,963}	82,578	(16,516)	[3,964]	{1,982}	83,397	(16,679)	[4,003]	{2,002}
Gloucester	25,651	25,775	25,844	25,911	26,102	(5,220)	[1,253]	{626}	26,299	(5,260)	[1,262]	{631}	26,499	(5,300)	[1,272]	{636}
Hudson	75,218	75,757	76,017	76,296	76,994	(15,399)	[3,696]	{1,848}	77,693	(15,539)	[3,729]	{1,865}	78,408	(15,682)	[3,764]	{1,882}
Hunterdon	7,679	7,717	7,752	7,783	7,871	(1,574)	[378]	{189}	7,960	(1,592)	[382]	{191}	8,050	(1,610)	[386]	{193}
Mercer	29,515	29,659	29,756	29,814	30,011	(6,002)	[1,441]	{720}	30,208	(6,042)	[1,450]	{725}	30,407	(6,081)	[1,460]	{730}
Middlesex	78,719	79,134	79,447	79,710	80,485	(16,097)	[3,863]	{1,932}	81,285	(16,257)	[3,902]	{1,951}	82,113	(16,423)	[3,941]	{1,971}
Monmouth	63,415	63,919	64,209	64,489	65,242	(13,048)	[3,132]	{1,566}	66,007	(13,201)	[3,168]	{1,584}	66,777	(13,355)	[3,205]	{1,603}
Morris	42,009	42,348	42,586	42,784	43,370	(8,674)	[2,082]	{1,041}	43,977	(8,795)	[2,111]	{1,055}	44,606	(8,921)	[2,141]	{1,071}
Ocean	64,374	64,706	64,985	65,308	65,955	(13,191)	[3,166]	{1,583}	66,608	(13,322)	[3,197]	{1,599}	67,260	(13,452)	[3,228]	{1,614}
Passaic	61,257	61,482	61,662	61,795	62,286	(12,457)	[2,990]	{1,495}	62,782	(12,556)	[3,014]	{1,507}	63,280	(12,656)	[3,037]	{1,519}
Somerset	25,004	25,168	25,268	25,373	25,633	(5,127)	[1,230]	{615}	25,902	(5,180)	[1,243]	{622}	26,171	(5,234)	[1,256]	{628}
Sussex	10,343	10,435	10,502	10,565	10,739	(2,148)	[515]	{258}	10,922	(2,184)	[524]	{262}	11,112	(2,222)	[533]	{267}
Union	61,090	61,390	61,593	61,790	62,290	(12,458)	[2,990]	{1,495}	62,793	(12,559)	[3,014]	{1,507}	63,305	(12,661)	[3,039]	{1,519}
Warren	7,840	7,909	7,951	7,994	8,098	(1,620)	[389]	{194}	8,205	(1,641)	[394]	{197}	8,315	(1,663)	[399]	{200}

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.