

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

Date: 1/28/21

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 1/28/21 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.**

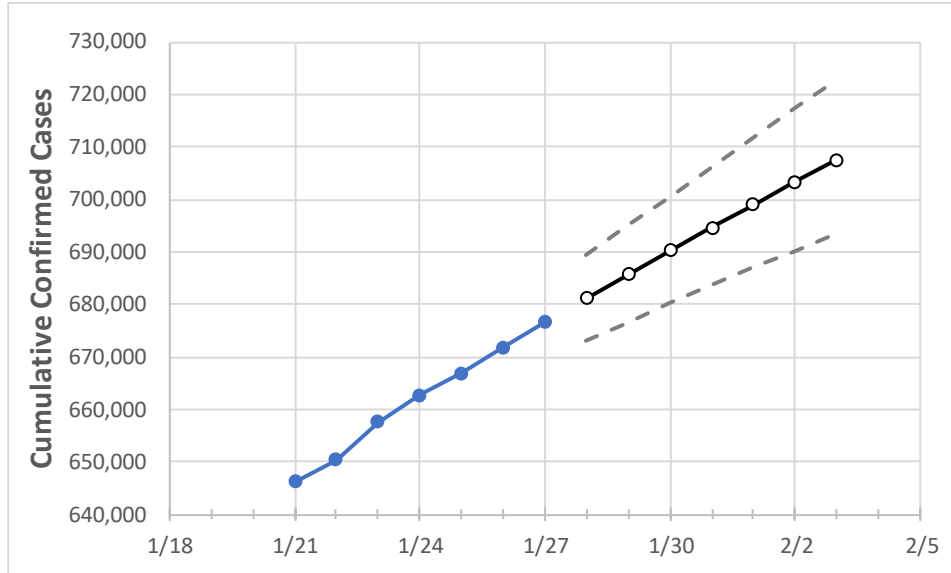
### IEM's Modeling Lead

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:						
	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3
New Jersey	662,808	666,951	671,781	676,537	681,111	685,663	690,187	694,682	699,058	703,354	707,600

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:						
	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3
Bergen	64,044	64,390	64,848	65,338	65,785	66,223	66,638	67,055	67,466	67,869	68,279
Burlington	30,050	30,248	30,433	30,661	30,872	31,081	31,285	31,485	31,684	31,876	32,066
Camden	38,713	38,941	39,166	39,397	39,634	39,859	40,088	40,312	40,535	40,751	40,965
Essex	61,919	62,266	62,593	63,084	63,454	63,820	64,178	64,533	64,887	65,228	65,570
Gloucester	20,749	20,881	21,100	21,259	21,429	21,597	21,762	21,923	22,084	22,248	22,406
Hudson	58,640	59,000	59,353	59,684	60,055	60,419	60,784	61,140	61,482	61,815	62,148
Hunterdon	5,593	5,630	5,668	5,714	5,757	5,797	5,835	5,873	5,910	5,948	5,983
Mercer	23,972	24,101	24,256	24,399	24,549	24,699	24,847	24,993	25,138	25,283	25,424
Middlesex	60,635	61,071	61,538	62,018	62,457	62,879	63,284	63,706	64,114	64,515	64,902
Monmouth	46,254	46,683	47,083	47,508	47,908	48,304	48,695	49,083	49,464	49,832	50,203
Morris	30,102	30,331	30,687	31,000	31,281	31,568	31,854	32,139	32,428	32,720	33,006
Ocean	47,232	47,600	48,022	48,406	48,792	49,177	49,555	49,925	50,293	50,648	50,995
Passaic	49,500	49,683	49,907	50,233	50,482	50,730	50,973	51,217	51,458	51,687	51,930
Somerset	19,025	19,136	19,257	19,377	19,499	19,619	19,734	19,848	19,961	20,072	20,179
Sussex	7,374	7,451	7,518	7,584	7,658	7,731	7,804	7,878	7,948	8,016	8,086
Union	49,404	49,621	49,908	50,154	50,395	50,631	50,861	51,086	51,302	51,516	51,723
Warren	5,741	5,783	5,825	5,882	5,927	5,971	6,014	6,058	6,100	6,141	6,181

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:											
	1/24	1/25	1/26	1/27	1/29			1/31			2/2					
Bergen	64,044	64,390	64,848	65,338	66,223	(13,245)	[3,179]	{1,589}	67,055	(13,411)	[3,219]	{1,609}	67,869	(13,574)	[3,258]	{1,629}
Burlington	30,050	30,248	30,433	30,661	31,081	(6,216)	[1,492]	{746}	31,485	(6,297)	[1,511]	{756}	31,876	(6,375)	[1,530]	{765}
Camden	38,713	38,941	39,166	39,397	39,859	(7,972)	[1,913]	{957}	40,312	(8,062)	[1,935]	{967}	40,751	(8,150)	[1,956]	{978}
Essex	61,919	62,266	62,593	63,084	63,820	(12,764)	[3,063]	{1,532}	64,533	(12,907)	[3,098]	{1,549}	65,228	(13,046)	[3,131]	{1,565}
Gloucester	20,749	20,881	21,100	21,259	21,597	(4,319)	[1,037]	{518}	21,923	(4,385)	[1,052]	{526}	22,248	(4,450)	[1,068]	{534}
Hudson	58,640	59,000	59,353	59,684	60,419	(12,084)	[2,900]	{1,450}	61,140	(12,228)	[2,935]	{1,467}	61,815	(12,363)	[2,967]	{1,484}
Hunterdon	5,593	5,630	5,668	5,714	5,797	(1,159)	[278]	{139}	5,873	(1,175)	[282]	{141}	5,948	(1,190)	[285]	{143}
Mercer	23,972	24,101	24,256	24,399	24,699	(4,940)	[1,186]	{593}	24,993	(4,999)	[1,200]	{600}	25,283	(5,057)	[1,214]	{607}
Middlesex	60,635	61,071	61,538	62,018	62,879	(12,576)	[3,018]	{1,509}	63,706	(12,741)	[3,058]	{1,529}	64,515	(12,903)	[3,097]	{1,548}
Monmouth	46,254	46,683	47,083	47,508	48,304	(9,661)	[2,319]	{1,159}	49,083	(9,817)	[2,356]	{1,178}	49,832	(9,966)	[2,392]	{1,196}
Morris	30,102	30,331	30,687	31,000	31,568	(6,314)	[1,515]	{758}	32,139	(6,428)	[1,543]	{771}	32,720	(6,544)	[1,571]	{785}
Ocean	47,232	47,600	48,022	48,406	49,177	(9,835)	[2,361]	{1,180}	49,925	(9,985)	[2,396]	{1,198}	50,648	(10,130)	[2,431]	{1,216}
Passaic	49,500	49,683	49,907	50,233	50,730	(10,146)	[2,435]	{1,218}	51,217	(10,243)	[2,458]	{1,229}	51,687	(10,337)	[2,481]	{1,240}
Somerset	19,025	19,136	19,257	19,377	19,619	(3,924)	[942]	{471}	19,848	(3,970)	[953]	{476}	20,072	(4,014)	[963]	{482}
Sussex	7,374	7,451	7,518	7,584	7,731	(1,546)	[371]	{186}	7,878	(1,576)	[378]	{189}	8,016	(1,603)	[385]	{192}
Union	49,404	49,621	49,908	50,154	50,631	(10,126)	[2,430]	{1,215}	51,086	(10,217)	[2,452]	{1,226}	51,516	(10,303)	[2,473]	{1,236}
Warren	5,741	5,783	5,825	5,882	5,971	(1,194)	[287]	{143}	6,058	(1,212)	[291]	{145}	6,141	(1,228)	[295]	{147}

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.