

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

Date: 4/8/21

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 4/8/21 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.**

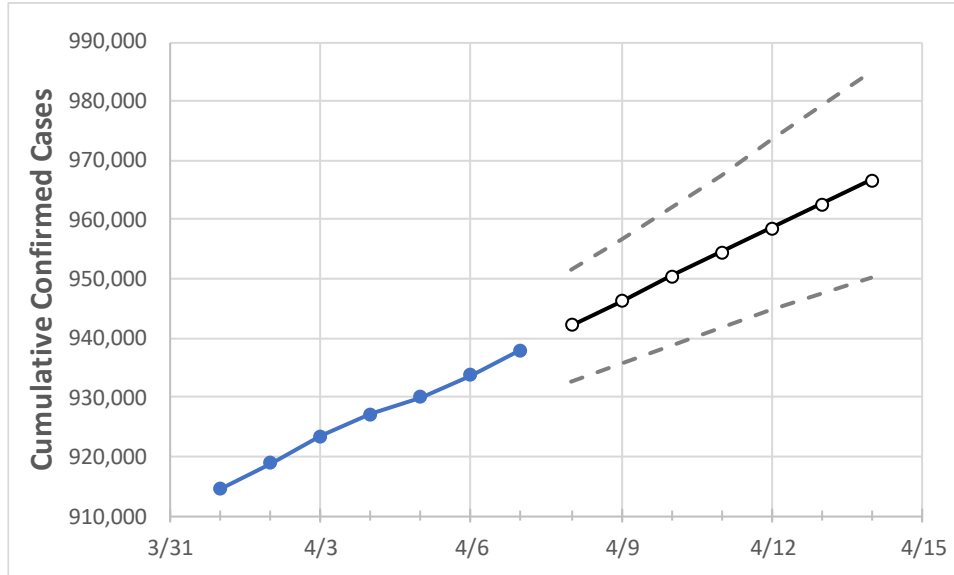
### IEM's Modeling Lead

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:						
	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14

New Jersey 927,195 930,026 933,736 937,979 942,115 946,279 950,381 954,478 958,596 962,629 966,717

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:						
	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14
Bergen	93,426	93,767	94,130	94,657	95,120	95,583	96,041	96,505	96,966	97,420	97,862
Burlington	40,699	40,821	40,959	41,085	41,266	41,446	41,628	41,811	41,997	42,181	42,370
Camden	49,676	49,833	49,963	50,148	50,351	50,557	50,765	50,968	51,173	51,380	51,592
Essex	86,986	87,242	87,641	88,166	88,623	89,097	89,563	90,051	90,535	91,022	91,497
Gloucester	27,370	27,438	27,518	27,642	27,748	27,854	27,963	28,067	28,172	28,277	28,383
Hudson	81,323	81,520	81,819	82,191	82,533	82,877	83,212	83,548	83,889	84,219	84,547
Hunterdon	8,601	8,641	8,688	8,743	8,806	8,870	8,935	9,002	9,068	9,135	9,204
Mercer	31,314	31,394	31,497	31,617	31,725	31,835	31,943	32,051	32,162	32,270	32,380
Middlesex	84,939	85,227	85,647	86,006	86,377	86,743	87,114	87,478	87,844	88,215	88,571
Monmouth	69,268	69,492	69,781	70,111	70,399	70,685	70,964	71,232	71,494	71,754	72,011
Morris	45,889	46,036	46,290	46,472	46,694	46,912	47,129	47,343	47,557	47,759	47,968
Ocean	69,787	70,020	70,250	70,592	70,905	71,211	71,516	71,818	72,120	72,417	72,716
Passaic	65,636	65,784	66,120	66,384	66,681	66,973	67,271	67,564	67,865	68,165	68,470
Somerset	27,268	27,346	27,496	27,626	27,762	27,896	28,032	28,165	28,295	28,425	28,565
Sussex	12,034	12,114	12,178	12,252	12,354	12,455	12,559	12,663	12,765	12,868	12,973
Union	65,354	65,522	65,739	66,033	66,300	66,568	66,838	67,106	67,374	67,643	67,909
Warren	8,650	8,678	8,716	8,755	8,799	8,841	8,884	8,926	8,968	9,010	9,052

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:											
	4/4	4/5	4/6	4/7	4/9			4/11			4/13					
Bergen	93,426	93,767	94,130	94,657	95,583	(19,117)	[4,588]	{2,294}	96,505	(19,301)	[4,632]	{2,316}	97,420	(19,484)	[4,676]	{2,338}
Burlington	40,699	40,821	40,959	41,085	41,446	(8,289)	[1,989]	{995}	41,811	(8,362)	[2,007]	{1,003}	42,181	(8,436)	[2,025]	{1,012}
Camden	49,676	49,833	49,963	50,148	50,557	(10,111)	[2,427]	{1,213}	50,968	(10,194)	[2,446]	{1,223}	51,380	(10,276)	[2,466]	{1,233}
Essex	86,986	87,242	87,641	88,166	89,097	(17,819)	[4,277]	{2,138}	90,051	(18,010)	[4,322]	{2,161}	91,022	(18,204)	[4,369]	{2,185}
Gloucester	27,370	27,438	27,518	27,642	27,854	(5,571)	[1,337]	{669}	28,067	(5,613)	[1,347]	{674}	28,277	(5,655)	[1,357]	{679}
Hudson	81,323	81,520	81,819	82,191	82,877	(16,575)	[3,978]	{1,989}	83,548	(16,710)	[4,010]	{2,005}	84,219	(16,844)	[4,042]	{2,021}
Hunterdon	8,601	8,641	8,688	8,743	8,870	(1,774)	[426]	{213}	9,002	(1,800)	[432]	{216}	9,135	(1,827)	[438]	{219}
Mercer	31,314	31,394	31,497	31,617	31,835	(6,367)	[1,528]	{764}	32,051	(6,410)	[1,538]	{769}	32,270	(6,454)	[1,549]	{774}
Middlesex	84,939	85,227	85,647	86,006	86,743	(17,349)	[4,164]	{2,082}	87,478	(17,496)	[4,199]	{2,099}	88,215	(17,643)	[4,234]	{2,117}
Monmouth	69,268	69,492	69,781	70,111	70,685	(14,137)	[3,393]	{1,696}	71,232	(14,246)	[3,419]	{1,710}	71,754	(14,351)	[3,444]	{1,722}
Morris	45,889	46,036	46,290	46,472	46,912	(9,382)	[2,252]	{1,126}	47,343	(9,469)	[2,272]	{1,136}	47,759	(9,552)	[2,292]	{1,146}
Ocean	69,787	70,020	70,250	70,592	71,211	(14,242)	[3,418]	{1,709}	71,818	(14,364)	[3,447]	{1,724}	72,417	(14,483)	[3,476]	{1,738}
Passaic	65,636	65,784	66,120	66,384	66,973	(13,395)	[3,215]	{1,607}	67,564	(13,513)	[3,243]	{1,622}	68,165	(13,633)	[3,272]	{1,636}
Somerset	27,268	27,346	27,496	27,626	27,896	(5,579)	[1,339]	{670}	28,165	(5,633)	[1,352]	{676}	28,425	(5,685)	[1,364]	{682}
Sussex	12,034	12,114	12,178	12,252	12,455	(2,491)	[598]	{299}	12,663	(2,533)	[608]	{304}	12,868	(2,574)	[618]	{309}
Union	65,354	65,522	65,739	66,033	66,568	(13,314)	[3,195]	{1,598}	67,106	(13,421)	[3,221]	{1,611}	67,643	(13,529)	[3,247]	{1,623}
Warren	8,650	8,678	8,716	8,755	8,841	(1,768)	[424]	{212}	8,926	(1,785)	[428]	{214}	9,010	(1,802)	[432]	{216}

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.