

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

Date: 4/5/21

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 4/5/21 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.**

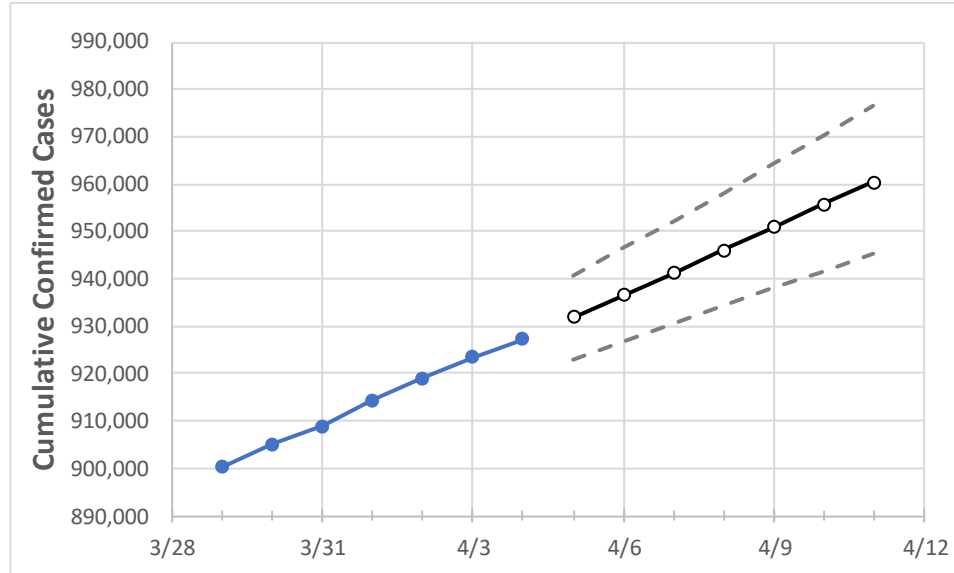
### IEM's Modeling Lead

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:						
	4/1	4/2	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11
New Jersey	914,422	918,951	923,396	927,195	931,877	936,572	941,298	946,105	950,903	955,745	960,462

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:						
	4/1	4/2	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11
Bergen	92,021	92,547	93,058	93,426	93,977	94,523	95,082	95,643	96,207	96,781	97,350
Burlington	40,095	40,316	40,494	40,699	40,913	41,132	41,355	41,584	41,816	42,055	42,300
Camden	49,000	49,223	49,468	49,676	49,899	50,128	50,362	50,606	50,853	51,103	51,361
Essex	85,661	86,128	86,518	86,986	87,487	88,009	88,525	89,058	89,603	90,152	90,708
Gloucester	27,041	27,155	27,274	27,370	27,492	27,617	27,743	27,871	28,001	28,133	28,265
Hudson	80,204	80,614	80,996	81,323	81,725	82,140	82,547	82,965	83,385	83,802	84,233
Hunterdon	8,401	8,492	8,548	8,601	8,672	8,744	8,818	8,893	8,972	9,052	9,134
Mercer	30,999	31,120	31,224	31,314	31,433	31,556	31,679	31,803	31,926	32,050	32,178
Middlesex	83,813	84,176	84,593	84,939	85,371	85,798	86,236	86,667	87,106	87,542	87,995
Monmouth	68,357	68,700	69,024	69,268	69,614	69,952	70,287	70,614	70,940	71,275	71,597
Morris	45,171	45,417	45,670	45,889	46,127	46,361	46,595	46,835	47,071	47,310	47,549
Ocean	68,765	69,118	69,463	69,787	70,141	70,504	70,868	71,237	71,605	71,972	72,335
Passaic	64,836	65,132	65,413	65,636	65,950	66,266	66,588	66,918	67,246	67,580	67,919
Somerset	26,887	27,028	27,160	27,268	27,418	27,570	27,721	27,874	28,029	28,183	28,338
Sussex	11,689	11,801	11,937	12,034	12,168	12,306	12,446	12,593	12,744	12,899	13,058
Union	64,600	64,852	65,130	65,354	65,642	65,928	66,223	66,515	66,815	67,116	67,418
Warren	8,512	8,562	8,607	8,650	8,705	8,761	8,817	8,873	8,930	8,987	9,046

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:											
	4/1	4/2	4/3	4/4	4/6				4/8				4/10			
Bergen	92,021	92,547	93,058	93,426	94,523	(18,905)	[4,537]	{2,269}	95,643	(19,129)	[4,591]	{2,295}	96,781	(19,356)	[4,645]	{2,323}
Burlington	40,095	40,316	40,494	40,699	41,132	(8,226)	[1,974]	{987}	41,584	(8,317)	[1,996]	{998}	42,055	(8,411)	[2,019]	{1,009}
Camden	49,000	49,223	49,468	49,676	50,128	(10,026)	[2,406]	{1,203}	50,606	(10,121)	[2,429]	{1,215}	51,103	(10,221)	[2,453]	{1,226}
Essex	85,661	86,128	86,518	86,986	88,009	(17,602)	[4,224]	{2,112}	89,058	(17,812)	[4,275]	{2,137}	90,152	(18,030)	[4,327]	{2,164}
Gloucester	27,041	27,155	27,274	27,370	27,617	(5,523)	[1,326]	{663}	27,871	(5,574)	[1,338]	{669}	28,133	(5,627)	[1,350]	{675}
Hudson	80,204	80,614	80,996	81,323	82,140	(16,428)	[3,943]	{1,971}	82,965	(16,593)	[3,982]	{1,991}	83,802	(16,760)	[4,022]	{2,011}
Hunterdon	8,401	8,492	8,548	8,601	8,744	(1,749)	[420]	{210}	8,893	(1,779)	[427]	{213}	9,052	(1,810)	[434]	{217}
Mercer	30,999	31,120	31,224	31,314	31,556	(6,311)	[1,515]	{757}	31,803	(6,361)	[1,527]	{763}	32,050	(6,410)	[1,538]	{769}
Middlesex	83,813	84,176	84,593	84,939	85,798	(17,160)	[4,118]	{2,059}	86,667	(17,333)	[4,160]	{2,080}	87,542	(17,508)	[4,202]	{2,101}
Monmouth	68,357	68,700	69,024	69,268	69,952	(13,990)	[3,358]	{1,679}	70,614	(14,123)	[3,389]	{1,695}	71,275	(14,255)	[3,421]	{1,711}
Morris	45,171	45,417	45,670	45,889	46,361	(9,272)	[2,225]	{1,113}	46,835	(9,367)	[2,248]	{1,124}	47,310	(9,462)	[2,271]	{1,135}
Ocean	68,765	69,118	69,463	69,787	70,504	(14,101)	[3,384]	{1,692}	71,237	(14,247)	[3,419]	{1,710}	71,972	(14,394)	[3,455]	{1,727}
Passaic	64,836	65,132	65,413	65,636	66,266	(13,253)	[3,181]	{1,590}	66,918	(13,384)	[3,212]	{1,606}	67,580	(13,516)	[3,244]	{1,622}
Somerset	26,887	27,028	27,160	27,268	27,570	(5,514)	[1,323]	{662}	27,874	(5,575)	[1,338]	{669}	28,183	(5,637)	[1,353]	{676}
Sussex	11,689	11,801	11,937	12,034	12,306	(2,461)	[591]	{295}	12,593	(2,519)	[604]	{302}	12,899	(2,580)	[619]	{310}
Union	64,600	64,852	65,130	65,354	65,928	(13,186)	[3,165]	{1,582}	66,515	(13,303)	[3,193]	{1,596}	67,116	(13,423)	[3,222]	{1,611}
Warren	8,512	8,562	8,607	8,650	8,761	(1,752)	[421]	{210}	8,873	(1,775)	[426]	{213}	8,987	(1,797)	[431]	{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.