

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

Date: 5/3/21

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 5/3/21 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.**

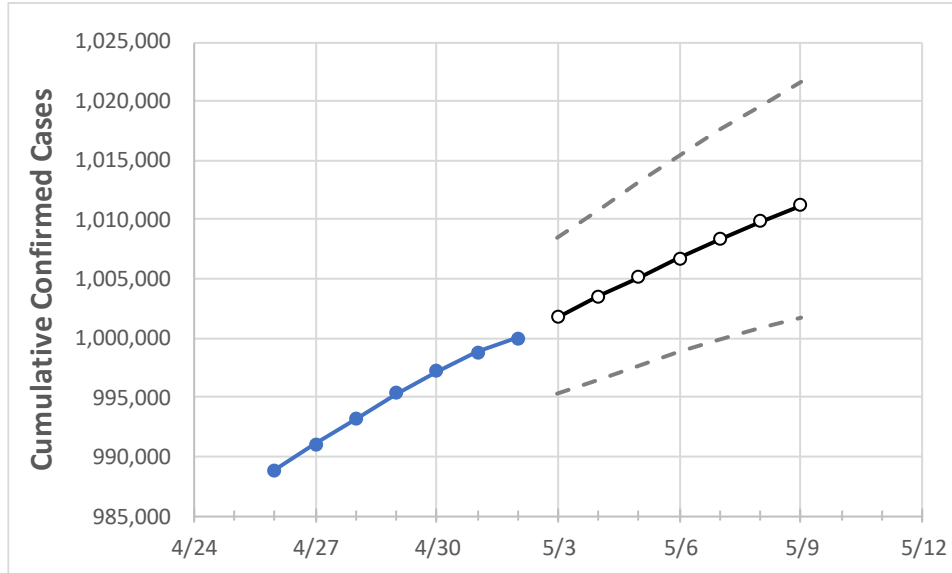
### IEM's Modeling Lead

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:						
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9

New Jersey 995,365 997,223 998,812 1,000,010 1,001,808 1,003,569 1,005,176 1,006,784 1,008,322 1,009,833 1,011,254

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:						
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9
Bergen	100,826	100,988	101,120	101,198	101,334	101,464	101,589	101,704	101,821	101,932	102,035
Burlington	43,694	43,756	43,840	43,902	43,972	44,037	44,101	44,161	44,220	44,275	44,329
Camden	53,723	53,864	54,014	54,072	54,198	54,320	54,440	54,560	54,674	54,788	54,898
Essex	92,822	93,007	93,170	93,273	93,471	93,658	93,840	94,012	94,181	94,342	94,497
Gloucester	29,550	29,614	29,697	29,770	29,835	29,901	29,964	30,027	30,089	30,148	30,206
Hudson	86,559	86,752	86,882	87,000	87,160	87,318	87,474	87,617	87,758	87,898	88,032
Hunterdon	9,490	9,508	9,519	9,523	9,535	9,546	9,557	9,566	9,575	9,584	9,592
Mercer	33,214	33,259	33,309	33,352	33,409	33,465	33,518	33,572	33,623	33,674	33,721
Middlesex	90,705	90,854	91,001	91,143	91,311	91,471	91,625	91,771	91,916	92,053	92,188
Monmouth	74,160	74,287	74,368	74,446	74,546	74,644	74,738	74,825	74,908	74,988	75,067
Morris	49,357	49,415	49,488	49,534	49,603	49,670	49,734	49,795	49,853	49,907	49,962
Ocean	74,469	74,575	74,664	74,742	74,831	74,915	74,996	75,072	75,146	75,215	75,281
Passaic	71,337	71,470	71,574	71,630	71,784	71,940	72,084	72,231	72,369	72,517	72,655
Somerset	29,357	29,405	29,442	29,489	29,538	29,584	29,630	29,673	29,715	29,755	29,794
Sussex	13,507	13,554	13,591	13,620	13,652	13,682	13,711	13,739	13,766	13,793	13,819
Union	70,092	70,239	70,328	70,399	70,535	70,668	70,799	70,930	71,050	71,169	71,283
Warren	9,638	9,661	9,671	9,684	9,707	9,729	9,751	9,772	9,792	9,811	9,829

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:											
	4/29	4/30	5/1	5/2	5/4				5/6				5/8			
Bergen	100,826	100,988	101,120	101,198	101,464	(20,293)	[4,870]	{2,435}	101,704	(20,341)	[4,882]	{2,441}	101,932	(20,386)	[4,893]	{2,446}
Burlington	43,694	43,756	43,840	43,902	44,037	(8,807)	[2,114]	{1,057}	44,161	(8,832)	[2,120]	{1,060}	44,275	(8,855)	[2,125]	{1,063}
Camden	53,723	53,864	54,014	54,072	54,320	(10,864)	[2,607]	{1,304}	54,560	(10,912)	[2,619]	{1,309}	54,788	(10,958)	[2,630]	{1,315}
Essex	92,822	93,007	93,170	93,273	93,658	(18,732)	[4,496]	{2,248}	94,012	(18,802)	[4,513]	{2,256}	94,342	(18,868)	[4,528]	{2,264}
Gloucester	29,550	29,614	29,697	29,770	29,901	(5,980)	[1,435]	{718}	30,027	(6,005)	[1,441]	{721}	30,148	(6,030)	[1,447]	{724}
Hudson	86,559	86,752	86,882	87,000	87,318	(17,464)	[4,191]	{2,096}	87,617	(17,523)	[4,206]	{2,103}	87,898	(17,580)	[4,219]	{2,110}
Hunterdon	9,490	9,508	9,519	9,523	9,546	(1,909)	[458]	{229}	9,566	(1,913)	[459]	{230}	9,584	(1,917)	[460]	{230}
Mercer	33,214	33,259	33,309	33,352	33,465	(6,693)	[1,606]	{803}	33,572	(6,714)	[1,611]	{806}	33,674	(6,735)	[1,616]	{808}
Middlesex	90,705	90,854	91,001	91,143	91,471	(18,294)	[4,391]	{2,195}	91,771	(18,354)	[4,405]	{2,202}	92,053	(18,411)	[4,419]	{2,209}
Monmouth	74,160	74,287	74,368	74,446	74,644	(14,929)	[3,583]	{1,791}	74,825	(14,965)	[3,592]	{1,796}	74,988	(14,998)	[3,599]	{1,800}
Morris	49,357	49,415	49,488	49,534	49,670	(9,934)	[2,384]	{1,192}	49,795	(9,959)	[2,390]	{1,195}	49,907	(9,981)	[2,396]	{1,198}
Ocean	74,469	74,575	74,664	74,742	74,915	(14,983)	[3,596]	{1,798}	75,072	(15,014)	[3,603]	{1,802}	75,215	(15,043)	[3,610]	{1,805}
Passaic	71,337	71,470	71,574	71,630	71,940	(14,388)	[3,453]	{1,727}	72,231	(14,446)	[3,467]	{1,734}	72,517	(14,503)	[3,481]	{1,740}
Somerset	29,357	29,405	29,442	29,489	29,584	(5,917)	[1,420]	{710}	29,673	(5,935)	[1,424]	{712}	29,755	(5,951)	[1,428]	{714}
Sussex	13,507	13,554	13,591	13,620	13,682	(2,736)	[657]	{328}	13,739	(2,748)	[659]	{330}	13,793	(2,759)	[662]	{331}
Union	70,092	70,239	70,328	70,399	70,668	(14,134)	[3,392]	{1,696}	70,930	(14,186)	[3,405]	{1,702}	71,169	(14,234)	[3,416]	{1,708}
Warren	9,638	9,661	9,671	9,684	9,729	(1,946)	[467]	{234}	9,772	(1,954)	[469]	{235}	9,811	(1,962)	[471]	{235}

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.