

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

Date: 4/27/21

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 4/27/21 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.**

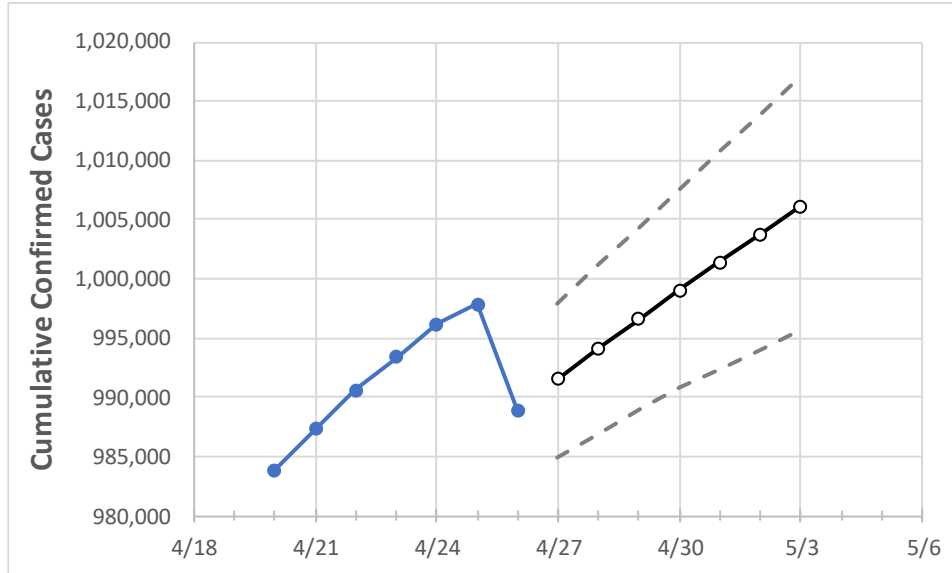
### IEM's Modeling Lead

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:					
	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3

New Jersey 993,414 996,197 997,891 988,886 991,561 994,130 996,603 999,047 1,001,431 1,003,758 1,006,102

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:					
	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3
Bergen	99,780	100,060	100,210	100,215	100,419	100,614	100,800	100,976	101,149	101,318	101,479
Burlington	43,389	43,519	43,622	43,469	43,578	43,685	43,793	43,898	44,001	44,098	44,199
Camden	53,144	53,335	53,460	53,297	53,463	53,632	53,799	53,968	54,134	54,296	54,458
Essex	94,447	94,758	94,947	92,122	92,441	92,760	93,075	93,372	93,678	93,978	94,266
Gloucester	29,334	29,439	29,492	29,331	29,422	29,514	29,602	29,692	29,779	29,865	29,950
Hudson	86,901	87,145	87,333	86,004	86,236	86,469	86,694	86,913	87,137	87,355	87,569
Hunterdon	9,386	9,420	9,437	9,438	9,463	9,487	9,510	9,532	9,554	9,576	9,596
Mercer	33,192	33,264	33,304	33,006	33,084	33,160	33,235	33,308	33,379	33,449	33,518
Middlesex	91,407	91,654	91,810	90,090	90,345	90,590	90,834	91,069	91,292	91,516	91,738
Monmouth	74,123	74,312	74,408	73,835	74,013	74,178	74,341	74,499	74,656	74,802	74,943
Morris	49,152	49,274	49,346	49,070	49,187	49,300	49,411	49,514	49,615	49,718	49,815
Ocean	74,011	74,149	74,234	74,133	74,260	74,382	74,499	74,608	74,717	74,819	74,917
Passaic	70,761	70,993	71,102	70,760	71,009	71,254	71,499	71,750	71,995	72,239	72,477
Somerset	29,224	29,280	29,334	29,161	29,232	29,300	29,367	29,432	29,493	29,551	29,608
Sussex	13,393	13,437	13,462	13,390	13,435	13,479	13,521	13,561	13,600	13,637	13,674
Union	69,767	69,950	70,053	69,545	69,730	69,909	70,085	70,260	70,431	70,597	70,759
Warren	9,498	9,542	9,573	9,560	9,601	9,640	9,680	9,721	9,760	9,799	9,838

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:											
	4/23	4/24	4/25	4/26	4/28			4/30			5/2					
Bergen	99,780	100,060	100,210	100,215	100,614	(20,123)	[4,829]	{2,415}	100,976	(20,195)	[4,847]	{2,423}	101,318	(20,264)	[4,863]	{2,432}
Burlington	43,389	43,519	43,622	43,469	43,685	(8,737)	[2,097]	{1,048}	43,898	(8,780)	[2,107]	{1,054}	44,098	(8,820)	[2,117]	{1,058}
Camden	53,144	53,335	53,460	53,297	53,632	(10,726)	[2,574]	{1,287}	53,968	(10,794)	[2,590]	{1,295}	54,296	(10,859)	[2,606]	{1,303}
Essex	94,447	94,758	94,947	92,122	92,760	(18,552)	[4,452]	{2,226}	93,372	(18,674)	[4,482]	{2,241}	93,978	(18,796)	[4,511]	{2,255}
Gloucester	29,334	29,439	29,492	29,331	29,514	(5,903)	[1,417]	{708}	29,692	(5,938)	[1,425]	{713}	29,865	(5,973)	[1,434]	{717}
Hudson	86,901	87,145	87,333	86,004	86,469	(17,294)	[4,151]	{2,075}	86,913	(17,383)	[4,172]	{2,086}	87,355	(17,471)	[4,193]	{2,097}
Hunterdon	9,386	9,420	9,437	9,438	9,487	(1,897)	[455]	{228}	9,532	(1,906)	[458]	{229}	9,576	(1,915)	[460]	{230}
Mercer	33,192	33,264	33,304	33,006	33,160	(6,632)	[1,592]	{796}	33,308	(6,662)	[1,599]	{799}	33,449	(6,690)	[1,606]	{803}
Middlesex	91,407	91,654	91,810	90,090	90,590	(18,118)	[4,348]	{2,174}	91,069	(18,214)	[4,371]	{2,186}	91,516	(18,303)	[4,393]	{2,196}
Monmouth	74,123	74,312	74,408	73,835	74,178	(14,836)	[3,561]	{1,780}	74,499	(14,900)	[3,576]	{1,788}	74,802	(14,960)	[3,591]	{1,795}
Morris	49,152	49,274	49,346	49,070	49,300	(9,860)	[2,366]	{1,183}	49,514	(9,903)	[2,377]	{1,188}	49,718	(9,944)	[2,386]	{1,193}
Ocean	74,011	74,149	74,234	74,133	74,382	(14,876)	[3,570]	{1,785}	74,608	(14,922)	[3,581]	{1,791}	74,819	(14,964)	[3,591]	{1,796}
Passaic	70,761	70,993	71,102	70,760	71,254	(14,251)	[3,420]	{1,710}	71,750	(14,350)	[3,444]	{1,722}	72,239	(14,448)	[3,467]	{1,734}
Somerset	29,224	29,280	29,334	29,161	29,300	(5,860)	[1,406]	{703}	29,432	(5,886)	[1,413]	{706}	29,551	(5,910)	[1,418]	{709}
Sussex	13,393	13,437	13,462	13,390	13,479	(2,696)	[647]	{323}	13,561	(2,712)	[651]	{325}	13,637	(2,727)	[655]	{327}
Union	69,767	69,950	70,053	69,545	69,909	(13,982)	[3,356]	{1,678}	70,260	(14,052)	[3,372]	{1,686}	70,597	(14,119)	[3,389]	{1,694}
Warren	9,498	9,542	9,573	9,560	9,640	(1,928)	[463]	{231}	9,721	(1,944)	[467]	{233}	9,799	(1,960)	[470]	{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.