

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

Date: 3/25/21

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 3/25/21 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.**

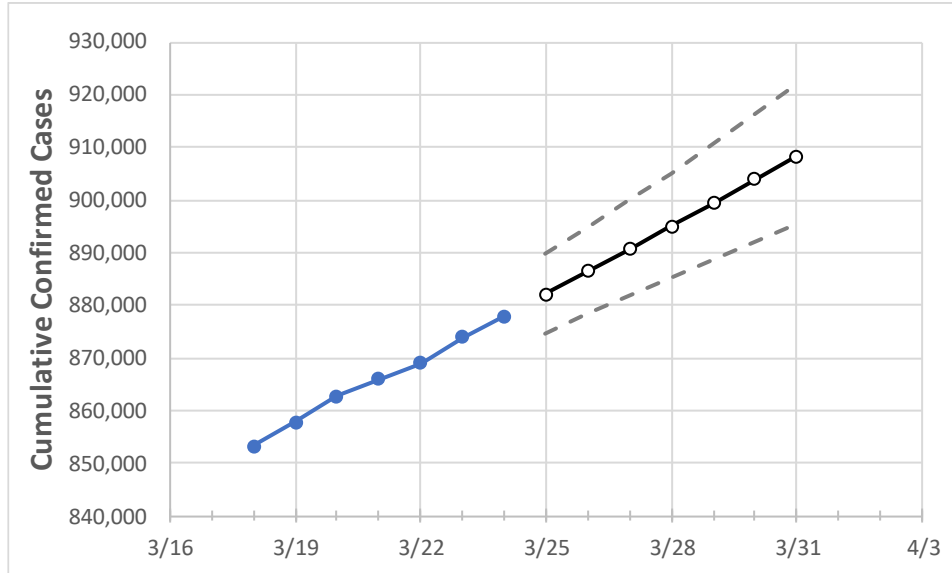
### IEM's Modeling Lead

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
New Jersey	865,886	869,037	873,840	877,936	882,139	886,369	890,695	895,000	899,386	903,856	908,274

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Bergen	86,467	86,830	87,348	87,799	88,272	88,748	89,230	89,713	90,204	90,696	91,187
Burlington	38,116	38,258	38,441	38,595	38,750	38,907	39,064	39,227	39,389	39,551	39,717
Camden	47,005	47,161	47,320	47,502	47,671	47,840	48,014	48,190	48,369	48,554	48,740
Essex	80,704	80,999	81,432	81,875	82,287	82,708	83,138	83,574	84,010	84,458	84,916
Gloucester	25,844	25,911	26,038	26,133	26,234	26,335	26,440	26,546	26,654	26,765	26,878
Hudson	76,017	76,296	76,769	77,073	77,429	77,791	78,145	78,512	78,872	79,252	79,622
Hunterdon	7,752	7,783	7,840	7,895	7,943	7,992	8,041	8,091	8,143	8,195	8,247
Mercer	29,756	29,814	29,946	30,042	30,145	30,250	30,358	30,465	30,574	30,681	30,792
Middlesex	79,447	79,710	80,214	80,537	80,936	81,346	81,747	82,152	82,568	82,995	83,426
Monmouth	64,209	64,489	64,966	65,307	65,692	66,080	66,475	66,875	67,265	67,657	68,063
Morris	42,586	42,784	43,032	43,251	43,536	43,819	44,108	44,400	44,691	44,988	45,289
Ocean	64,985	65,308	65,619	66,013	66,352	66,693	67,040	67,393	67,746	68,103	68,462
Passaic	61,662	61,795	62,064	62,328	62,581	62,836	63,092	63,349	63,615	63,870	64,134
Somerset	25,268	25,373	25,560	25,699	25,838	25,981	26,125	26,271	26,420	26,570	26,725
Sussex	10,502	10,565	10,644	10,767	10,863	10,960	11,062	11,166	11,274	11,383	11,493
Union	61,593	61,790	62,044	62,285	62,533	62,785	63,039	63,294	63,547	63,807	64,066
Warren	7,951	7,994	8,061	8,103	8,159	8,215	8,273	8,331	8,390	8,451	8,513

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:											
	3/21	3/22	3/23	3/24	3/26			3/28			3/30					
Bergen	86,467	86,830	87,348	87,799	88,748	(17,750)	[4,260]	{2,130}	89,713	(17,943)	[4,306]	{2,153}	90,696	(18,139)	[4,353]	{2,177}
Burlington	38,116	38,258	38,441	38,595	38,907	(7,781)	[1,868]	{934}	39,227	(7,845)	[1,883]	{941}	39,551	(7,910)	[1,898]	{949}
Camden	47,005	47,161	47,320	47,502	47,840	(9,568)	[2,296]	{1,148}	48,190	(9,638)	[2,313]	{1,157}	48,554	(9,711)	[2,331]	{1,165}
Essex	80,704	80,999	81,432	81,875	82,708	(16,542)	[3,970]	{1,985}	83,574	(16,715)	[4,012]	{2,006}	84,458	(16,892)	[4,054]	{2,027}
Gloucester	25,844	25,911	26,038	26,133	26,335	(5,267)	[1,264]	{632}	26,546	(5,309)	[1,274]	{637}	26,765	(5,353)	[1,285]	{642}
Hudson	76,017	76,296	76,769	77,073	77,791	(15,558)	[3,734]	{1,867}	78,512	(15,702)	[3,769]	{1,884}	79,252	(15,850)	[3,804]	{1,902}
Hunterdon	7,752	7,783	7,840	7,895	7,992	(1,598)	[384]	{192}	8,091	(1,618)	[388]	{194}	8,195	(1,639)	[393]	{197}
Mercer	29,756	29,814	29,946	30,042	30,250	(6,050)	[1,452]	{726}	30,465	(6,093)	[1,462]	{731}	30,681	(6,136)	[1,473]	{736}
Middlesex	79,447	79,710	80,214	80,537	81,346	(16,269)	[3,905]	{1,952}	82,152	(16,430)	[3,943]	{1,972}	82,995	(16,599)	[3,984]	{1,992}
Monmouth	64,209	64,489	64,966	65,307	66,080	(13,216)	[3,172]	{1,586}	66,875	(13,375)	[3,210]	{1,605}	67,657	(13,531)	[3,248]	{1,624}
Morris	42,586	42,784	43,032	43,251	43,819	(8,764)	[2,103]	{1,052}	44,400	(8,880)	[2,131]	{1,066}	44,988	(8,998)	[2,159]	{1,080}
Ocean	64,985	65,308	65,619	66,013	66,693	(13,339)	[3,201]	{1,601}	67,393	(13,479)	[3,235]	{1,617}	68,103	(13,621)	[3,269]	{1,634}
Passaic	61,662	61,795	62,064	62,328	62,836	(12,567)	[3,016]	{1,508}	63,349	(12,670)	[3,041]	{1,520}	63,870	(12,774)	[3,066]	{1,533}
Somerset	25,268	25,373	25,560	25,699	25,981	(5,196)	[1,247]	{624}	26,271	(5,254)	[1,261]	{631}	26,570	(5,314)	[1,275]	{638}
Sussex	10,502	10,565	10,644	10,767	10,960	(2,192)	[526]	{263}	11,166	(2,233)	[536]	{268}	11,383	(2,277)	[546]	{273}
Union	61,593	61,790	62,044	62,285	62,785	(12,557)	[3,014]	{1,507}	63,294	(12,659)	[3,038]	{1,519}	63,807	(12,761)	[3,063]	{1,531}
Warren	7,951	7,994	8,061	8,103	8,215	(1,643)	[394]	{197}	8,331	(1,666)	[400]	{200}	8,451	(1,690)	[406]	{203}

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.