

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

Date: 4/20/21

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 4/20/21 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.**

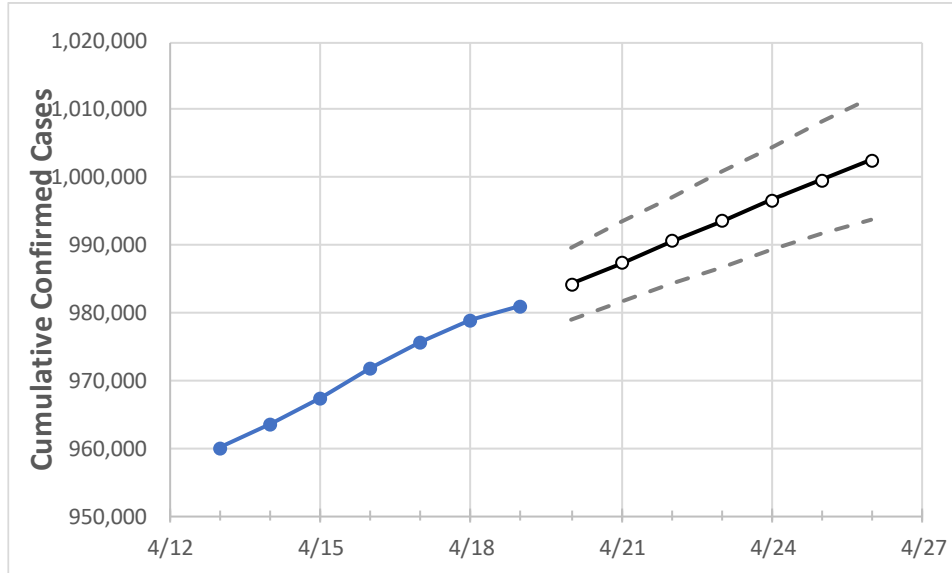
### IEM's Modeling Lead

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:					
	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26
New Jersey	971,782	975,704	978,853	981,036	984,219	987,385	990,518	993,587	996,621	999,598	1,002,551

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:					
	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26
Bergen	97,885	98,258	98,483	98,660	98,939	99,208	99,467	99,718	99,963	100,204	100,441
Burlington	42,539	42,701	42,825	42,935	43,070	43,203	43,336	43,465	43,594	43,719	43,844
Camden	51,929	52,121	52,289	52,431	52,619	52,805	52,989	53,177	53,367	53,557	53,748
Essex	91,903	92,333	92,705	92,965	93,333	93,710	94,087	94,456	94,816	95,182	95,542
Gloucester	28,721	28,837	28,909	28,973	29,084	29,191	29,301	29,409	29,518	29,627	29,733
Hudson	85,025	85,384	85,684	85,856	86,128	86,403	86,682	86,950	87,211	87,475	87,733
Hunterdon	9,163	9,205	9,243	9,268	9,305	9,342	9,377	9,411	9,445	9,478	9,510
Mercer	32,550	32,664	32,737	32,806	32,898	32,987	33,075	33,162	33,250	33,337	33,421
Middlesex	89,348	89,737	90,031	90,241	90,570	90,886	91,201	91,508	91,813	92,123	92,428
Monmouth	72,594	72,910	73,105	73,288	73,519	73,746	73,966	74,183	74,398	74,607	74,813
Morris	48,174	48,371	48,521	48,603	48,756	48,904	49,048	49,190	49,329	49,466	49,600
Ocean	72,798	73,030	73,180	73,305	73,485	73,657	73,823	73,985	74,140	74,285	74,427
Passaic	68,894	69,152	69,502	69,658	69,940	70,223	70,500	70,776	71,054	71,338	71,618
Somerset	28,597	28,703	28,803	28,864	28,953	29,042	29,128	29,213	29,297	29,380	29,461
Sussex	13,003	13,085	13,133	13,179	13,246	13,310	13,372	13,435	13,495	13,556	13,615
Union	68,224	68,498	68,754	68,915	69,149	69,377	69,603	69,829	70,053	70,280	70,501
Warren	9,215	9,272	9,308	9,327	9,373	9,419	9,466	9,511	9,558	9,605	9,652

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:											
	4/16	4/17	4/18	4/19	4/21				4/23				4/25			
Bergen	97,885	98,258	98,483	98,660	99,208	(19,842)	[4,762]	{2,381}	99,718	(19,944)	[4,786]	{2,393}	100,204	(20,041)	[4,810]	{2,405}
Burlington	42,539	42,701	42,825	42,935	43,203	(8,641)	[2,074]	{1,037}	43,465	(8,693)	[2,086]	{1,043}	43,719	(8,744)	[2,099]	{1,049}
Camden	51,929	52,121	52,289	52,431	52,805	(10,561)	[2,535]	{1,267}	53,177	(10,635)	[2,552]	{1,276}	53,557	(10,711)	[2,571]	{1,285}
Essex	91,903	92,333	92,705	92,965	93,710	(18,742)	[4,498]	{2,249}	94,456	(18,891)	[4,534]	{2,267}	95,182	(19,036)	[4,569]	{2,284}
Gloucester	28,721	28,837	28,909	28,973	29,191	(5,838)	[1,401]	{701}	29,409	(5,882)	[1,412]	{706}	29,627	(5,925)	[1,422]	{711}
Hudson	85,025	85,384	85,684	85,856	86,403	(17,281)	[4,147]	{2,074}	86,950	(17,390)	[4,174]	{2,087}	87,475	(17,495)	[4,199]	{2,099}
Hunterdon	9,163	9,205	9,243	9,268	9,342	(1,868)	[448]	{224}	9,411	(1,882)	[452]	{226}	9,478	(1,896)	[455]	{227}
Mercer	32,550	32,664	32,737	32,806	32,987	(6,597)	[1,583]	{792}	33,162	(6,632)	[1,592]	{796}	33,337	(6,667)	[1,600]	{800}
Middlesex	89,348	89,737	90,031	90,241	90,886	(18,177)	[4,363]	{2,181}	91,508	(18,302)	[4,392]	{2,196}	92,123	(18,425)	[4,422]	{2,211}
Monmouth	72,594	72,910	73,105	73,288	73,746	(14,749)	[3,540]	{1,770}	74,183	(14,837)	[3,561]	{1,780}	74,607	(14,921)	[3,581]	{1,791}
Morris	48,174	48,371	48,521	48,603	48,904	(9,781)	[2,347]	{1,174}	49,190	(9,838)	[2,361]	{1,181}	49,466	(9,893)	[2,374]	{1,187}
Ocean	72,798	73,030	73,180	73,305	73,657	(14,731)	[3,536]	{1,768}	73,985	(14,797)	[3,551]	{1,776}	74,285	(14,857)	[3,566]	{1,783}
Passaic	68,894	69,152	69,502	69,658	70,223	(14,045)	[3,371]	{1,685}	70,776	(14,155)	[3,397]	{1,699}	71,338	(14,268)	[3,424]	{1,712}
Somerset	28,597	28,703	28,803	28,864	29,042	(5,808)	[1,394]	{697}	29,213	(5,843)	[1,402]	{701}	29,380	(5,876)	[1,410]	{705}
Sussex	13,003	13,085	13,133	13,179	13,310	(2,662)	[639]	{319}	13,435	(2,687)	[645]	{322}	13,556	(2,711)	[651]	{325}
Union	68,224	68,498	68,754	68,915	69,377	(13,875)	[3,330]	{1,665}	69,829	(13,966)	[3,352]	{1,676}	70,280	(14,056)	[3,373]	{1,687}
Warren	9,215	9,272	9,308	9,327	9,419	(1,884)	[452]	{226}	9,511	(1,902)	[457]	{228}	9,605	(1,921)	[461]	{231}

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.