

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

Date: 2/16/21

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 2/16/21 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.**

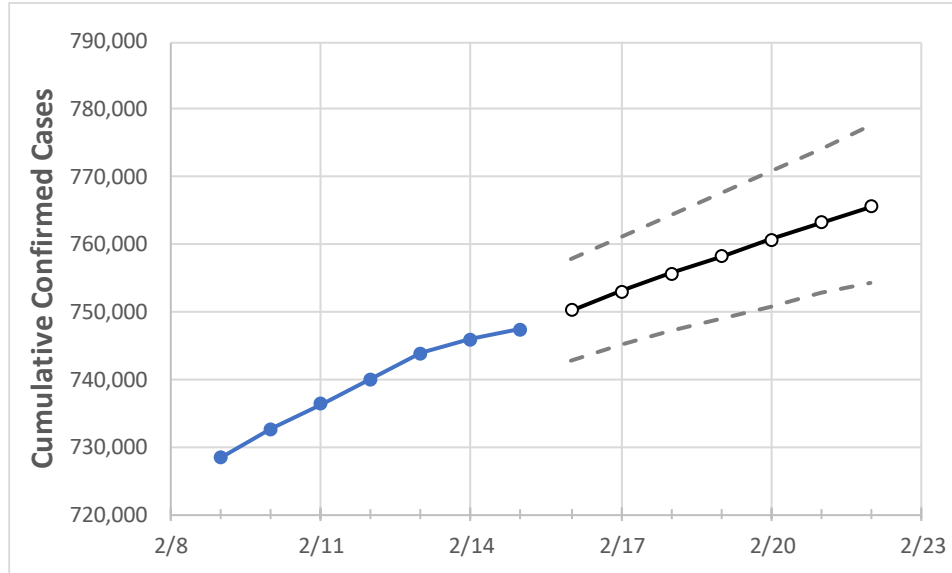
### IEM's Modeling Lead

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:					
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
New Jersey	740,062	743,819	745,987	747,432	750,279	752,999	755,640	758,267	760,761	763,218	765,654	

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:					
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22
Bergen	71,752	72,165	72,420	72,567	72,875	73,178	73,474	73,760	74,046	74,326	74,597
Burlington	33,456	33,619	33,723	33,762	33,873	33,981	34,081	34,182	34,276	34,366	34,454
Camden	42,153	42,314	42,416	42,469	42,572	42,674	42,773	42,866	42,957	43,044	43,127
Essex	69,103	69,458	69,664	69,830	70,107	70,379	70,645	70,906	71,166	71,426	71,669
Gloucester	23,009	23,091	23,133	23,184	23,246	23,305	23,360	23,414	23,465	23,516	23,564
Hudson	64,747	65,058	65,275	65,389	65,622	65,852	66,074	66,294	66,507	66,721	66,929
Hunterdon	6,393	6,438	6,456	6,468	6,500	6,531	6,563	6,594	6,624	6,653	6,683
Mercer	26,377	26,479	26,529	26,576	26,659	26,738	26,814	26,890	26,965	27,036	27,106
Middlesex	68,221	68,574	68,756	68,901	69,168	69,426	69,679	69,930	70,172	70,405	70,632
Monmouth	52,646	52,951	53,108	53,221	53,446	53,665	53,884	54,100	54,310	54,502	54,696
Morris	34,879	35,123	35,268	35,351	35,525	35,697	35,866	36,029	36,194	36,352	36,502
Ocean	54,318	54,677	54,812	54,937	55,209	55,475	55,727	55,976	56,217	56,458	56,686
Passaic	54,037	54,286	54,472	54,552	54,742	54,930	55,115	55,303	55,489	55,672	55,858
Somerset	21,268	21,389	21,437	21,495	21,585	21,670	21,756	21,843	21,924	22,004	22,085
Sussex	8,451	8,505	8,543	8,561	8,598	8,635	8,671	8,705	8,739	8,771	8,804
Union	53,612	53,869	54,029	54,109	54,272	54,428	54,582	54,734	54,882	55,028	55,170
Warren	6,563	6,598	6,612	6,626	6,654	6,680	6,706	6,731	6,755	6,778	6,800

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:											
	2/12	2/13	2/14	2/15	2/17			2/19			2/21					
Bergen	71,752	72,165	72,420	72,567	73,178	(14,636)	[3,513]	{1,756}	73,760	(14,752)	[3,540]	{1,770}	74,326	(14,865)	[3,568]	{1,784}
Burlington	33,456	33,619	33,723	33,762	33,981	(6,796)	[1,631]	{816}	34,182	(6,836)	[1,641]	{820}	34,366	(6,873)	[1,650]	{825}
Camden	42,153	42,314	42,416	42,469	42,674	(8,535)	[2,048]	{1,024}	42,866	(8,573)	[2,058]	{1,029}	43,044	(8,609)	[2,066]	{1,033}
Essex	69,103	69,458	69,664	69,830	70,379	(14,076)	[3,378]	{1,689}	70,906	(14,181)	[3,403]	{1,702}	71,426	(14,285)	[3,428]	{1,714}
Gloucester	23,009	23,091	23,133	23,184	23,305	(4,661)	[1,119]	{559}	23,414	(4,683)	[1,124]	{562}	23,516	(4,703)	[1,129]	{564}
Hudson	64,747	65,058	65,275	65,389	65,852	(13,170)	[3,161]	{1,580}	66,294	(13,259)	[3,182]	{1,591}	66,721	(13,344)	[3,203]	{1,601}
Hunterdon	6,393	6,438	6,456	6,468	6,531	(1,306)	[314]	{157}	6,594	(1,319)	[317]	{158}	6,653	(1,331)	[319]	{160}
Mercer	26,377	26,479	26,529	26,576	26,738	(5,348)	[1,283]	{642}	26,890	(5,378)	[1,291]	{645}	27,036	(5,407)	[1,298]	{649}
Middlesex	68,221	68,574	68,756	68,901	69,426	(13,885)	[3,332]	{1,666}	69,930	(13,986)	[3,357]	{1,678}	70,405	(14,081)	[3,379]	{1,690}
Monmouth	52,646	52,951	53,108	53,221	53,665	(10,733)	[2,576]	{1,288}	54,100	(10,820)	[2,597]	{1,298}	54,502	(10,900)	[2,616]	{1,308}
Morris	34,879	35,123	35,268	35,351	35,697	(7,139)	[1,713]	{857}	36,029	(7,206)	[1,729]	{865}	36,352	(7,270)	[1,745]	{872}
Ocean	54,318	54,677	54,812	54,937	55,475	(11,095)	[2,663]	{1,331}	55,976	(11,195)	[2,687]	{1,343}	56,458	(11,292)	[2,710]	{1,355}
Passaic	54,037	54,286	54,472	54,552	54,930	(10,986)	[2,637]	{1,318}	55,303	(11,061)	[2,655]	{1,327}	55,672	(11,134)	[2,672]	{1,336}
Somerset	21,268	21,389	21,437	21,495	21,670	(4,334)	[1,040]	{520}	21,843	(4,369)	[1,048]	{524}	22,004	(4,401)	[1,056]	{528}
Sussex	8,451	8,505	8,543	8,561	8,635	(1,727)	[414]	{207}	8,705	(1,741)	[418]	{209}	8,771	(1,754)	[421]	{210}
Union	53,612	53,869	54,029	54,109	54,428	(10,886)	[2,613]	{1,306}	54,734	(10,947)	[2,627]	{1,314}	55,028	(11,006)	[2,641]	{1,321}
Warren	6,563	6,598	6,612	6,626	6,680	(1,336)	[321]	{160}	6,731	(1,346)	[323]	{162}	6,778	(1,356)	[325]	{163}

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.