

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

Date: 2/1/21

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 2/1/21 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.**

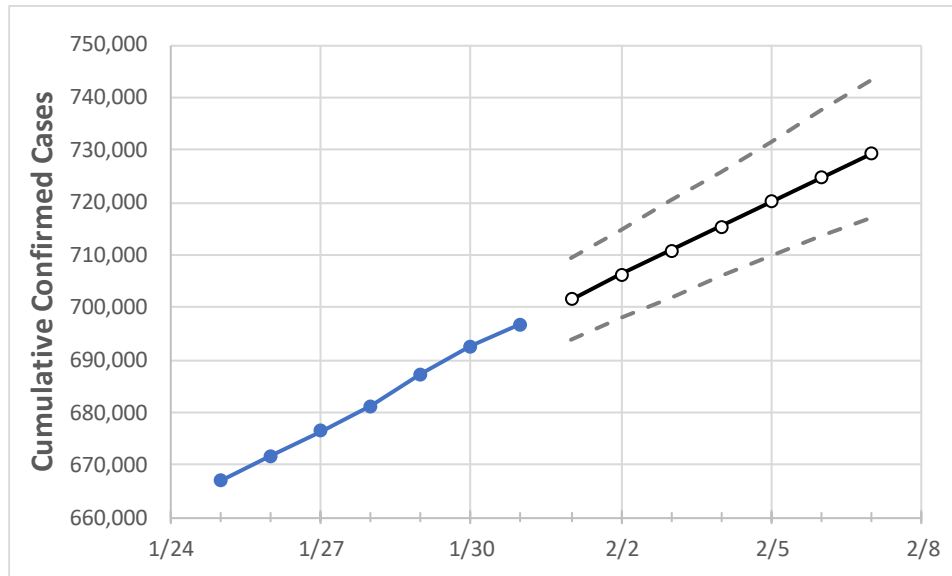
### IEM's Modeling Lead

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:							
	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	
New Jersey	681,283	687,269	692,543	696,829	701,568	706,242	710,815	715,473	720,098	724,715	729,221	

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:							
	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	
Bergen	65,850	66,318	66,836	67,253	67,704	68,146	68,587	69,023	69,458	69,891	70,332	
Burlington	30,835	31,111	31,359	31,577	31,785	31,992	32,198	32,399	32,605	32,800	32,994	
Camden	39,614	39,956	40,201	40,402	40,634	40,862	41,086	41,303	41,521	41,734	41,946	
Essex	63,524	64,264	64,755	65,161	65,606	66,054	66,501	66,945	67,390	67,839	68,298	
Gloucester	21,434	21,650	21,803	21,907	22,067	22,227	22,384	22,540	22,692	22,841	22,988	
Hudson	60,138	60,568	60,990	61,391	61,780	62,160	62,547	62,928	63,307	63,684	64,054	
Hunterdon	5,746	5,795	5,854	5,897	5,939	5,979	6,020	6,060	6,099	6,138	6,175	
Mercer	24,533	24,726	24,930	25,044	25,196	25,349	25,498	25,648	25,795	25,942	26,085	
Middlesex	62,445	63,029	63,619	63,956	64,395	64,839	65,288	65,722	66,154	66,589	67,029	
Monmouth	47,835	48,350	48,804	49,109	49,503	49,887	50,266	50,643	51,018	51,390	51,753	
Morris	31,316	31,732	32,052	32,317	32,616	32,918	33,225	33,533	33,842	34,150	34,461	
Ocean	48,944	49,418	49,860	50,229	50,644	51,058	51,474	51,894	52,306	52,714	53,122	
Passaic	50,455	50,725	50,976	51,262	51,508	51,761	52,007	52,254	52,496	52,740	52,983	
Somerset	19,508	19,678	19,802	19,946	20,072	20,197	20,325	20,450	20,577	20,698	20,822	
Sussex	7,649	7,724	7,801	7,847	7,912	7,975	8,037	8,096	8,155	8,213	8,269	
Union	50,429	50,685	50,966	51,257	51,508	51,760	52,006	52,248	52,493	52,731	52,965	
Warren	5,929	5,985	6,048	6,078	6,123	6,169	6,212	6,255	6,298	6,340	6,382	

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:											
	1/28	1/29	1/30	1/31	2/2			2/4			2/6					
Bergen	65,850	66,318	66,836	67,253	68,146	(13,629)	[3,271]	{1,636}	69,023	(13,805)	[3,313]	{1,657}	69,891	(13,978)	[3,355]	{1,677}
Burlington	30,835	31,111	31,359	31,577	31,992	(6,398)	[1,536]	{768}	32,399	(6,480)	[1,555]	{778}	32,800	(6,560)	[1,574]	{787}
Camden	39,614	39,956	40,201	40,402	40,862	(8,172)	[1,961]	{981}	41,303	(8,261)	[1,983]	{991}	41,734	(8,347)	[2,003]	{1,002}
Essex	63,524	64,264	64,755	65,161	66,054	(13,211)	[3,171]	{1,585}	66,945	(13,389)	[3,213]	{1,607}	67,839	(13,568)	[3,256]	{1,628}
Gloucester	21,434	21,650	21,803	21,907	22,227	(4,445)	[1,067]	{533}	22,540	(4,508)	[1,082]	{541}	22,841	(4,568)	[1,096]	{548}
Hudson	60,138	60,568	60,990	61,391	62,160	(12,432)	[2,984]	{1,492}	62,928	(12,586)	[3,021]	{1,510}	63,684	(12,737)	[3,057]	{1,528}
Hunterdon	5,746	5,795	5,854	5,897	5,979	(1,196)	[287]	{144}	6,060	(1,212)	[291]	{145}	6,138	(1,228)	[295]	{147}
Mercer	24,533	24,726	24,930	25,044	25,349	(5,070)	[1,217]	{608}	25,648	(5,130)	[1,231]	{616}	25,942	(5,188)	[1,245]	{623}
Middlesex	62,445	63,029	63,619	63,956	64,839	(12,968)	[3,112]	{1,556}	65,722	(13,144)	[3,155]	{1,577}	66,589	(13,318)	[3,196]	{1,598}
Monmouth	47,835	48,350	48,804	49,109	49,887	(9,977)	[2,395]	{1,197}	50,643	(10,129)	[2,431]	{1,215}	51,390	(10,278)	[2,467]	{1,233}
Morris	31,316	31,732	32,052	32,317	32,918	(6,584)	[1,580]	{790}	33,533	(6,707)	[1,610]	{805}	34,150	(6,830)	[1,639]	{820}
Ocean	48,944	49,418	49,860	50,229	51,058	(10,212)	[2,451]	{1,225}	51,894	(10,379)	[2,491]	{1,245}	52,714	(10,543)	[2,530]	{1,265}
Passaic	50,455	50,725	50,976	51,262	51,761	(10,352)	[2,485]	{1,242}	52,254	(10,451)	[2,508]	{1,254}	52,740	(10,548)	[2,532]	{1,266}
Somerset	19,508	19,678	19,802	19,946	20,197	(4,039)	[969]	{485}	20,450	(4,090)	[982]	{491}	20,698	(4,140)	[994]	{497}
Sussex	7,649	7,724	7,801	7,847	7,975	(1,595)	[383]	{191}	8,096	(1,619)	[389]	{194}	8,213	(1,643)	[394]	{197}
Union	50,429	50,685	50,966	51,257	51,760	(10,352)	[2,484]	{1,242}	52,248	(10,450)	[2,508]	{1,254}	52,731	(10,546)	[2,531]	{1,266}
Warren	5,929	5,985	6,048	6,078	6,169	(1,234)	[296]	{148}	6,255	(1,251)	[300]	{150}	6,340	(1,268)	[304]	{152}

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.