

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

Date: 2/3/21

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 2/3/21 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.

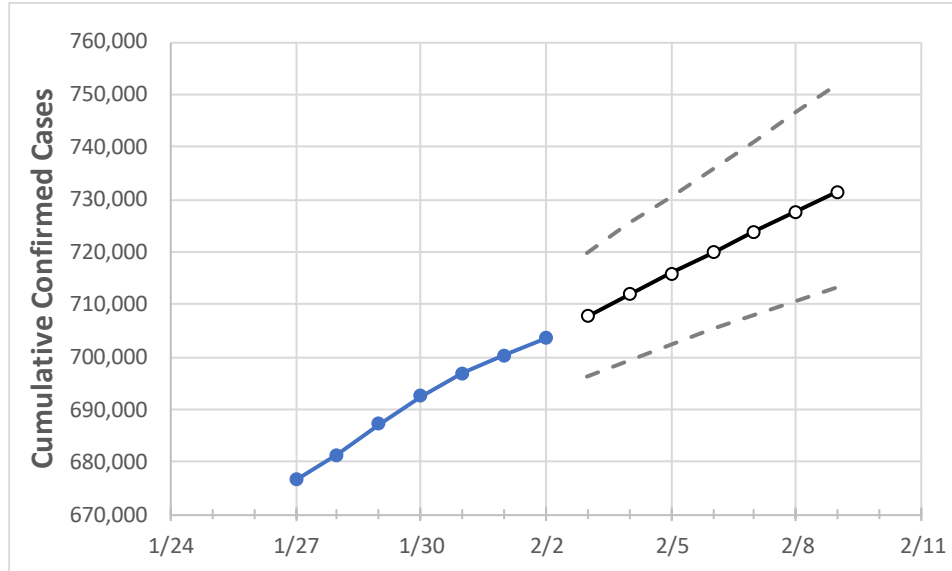
IEM's Modeling Lead

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:						
	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	2/9
New Jersey	692,543	696,829	700,346	703,496	707,761	711,895	715,958	719,926	723,810	727,711	731,554

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:						
	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	2/9
Bergen	66,836	67,253	67,609	67,912	68,330	68,735	69,134	69,529	69,920	70,307	70,698
Burlington	31,359	31,577	31,695	31,886	32,077	32,262	32,446	32,627	32,804	32,979	33,146
Camden	40,201	40,402	40,534	40,675	40,880	41,085	41,282	41,481	41,671	41,857	42,042
Essex	64,755	65,161	65,485	65,785	66,193	66,602	67,008	67,408	67,810	68,201	68,598
Gloucester	21,803	21,907	21,991	22,093	22,234	22,372	22,510	22,646	22,777	22,906	23,035
Hudson	60,990	61,391	61,614	61,784	62,098	62,398	62,690	62,972	63,247	63,512	63,773
Hunterdon	5,854	5,897	5,924	5,953	5,990	6,025	6,060	6,094	6,126	6,158	6,189
Mercer	24,930	25,044	25,166	25,257	25,397	25,531	25,666	25,798	25,926	26,054	26,177
Middlesex	63,619	63,956	64,349	64,776	65,205	65,630	66,060	66,480	66,906	67,321	67,736
Monmouth	48,804	49,109	49,378	49,604	49,945	50,281	50,605	50,921	51,236	51,545	51,840
Morris	32,052	32,317	32,528	32,741	33,026	33,311	33,596	33,879	34,164	34,447	34,730
Ocean	49,860	50,229	50,501	50,793	51,159	51,529	51,889	52,238	52,591	52,927	53,268
Passaic	50,976	51,262	51,620	51,800	52,055	52,304	52,555	52,802	53,049	53,294	53,540
Somerset	19,802	19,946	20,032	20,128	20,241	20,354	20,463	20,573	20,677	20,783	20,884
Sussex	7,801	7,847	7,900	7,951	8,009	8,064	8,119	8,171	8,222	8,271	8,319
Union	50,966	51,257	51,441	51,643	51,868	52,086	52,303	52,511	52,715	52,918	53,116
Warren	6,048	6,078	6,123	6,158	6,200	6,242	6,284	6,325	6,364	6,402	6,440

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:											
	1/30	1/31	2/1	2/2	2/4				2/6				2/8			
Bergen	66,836	67,253	67,609	67,912	68,735	(13,747)	[3,299]	{1,650}	69,529	(13,906)	[3,337]	{1,669}	70,307	(14,061)	[3,375]	{1,687}
Burlington	31,359	31,577	31,695	31,886	32,262	(6,452)	[1,549]	{774}	32,627	(6,525)	[1,566]	{783}	32,979	(6,596)	[1,583]	{791}
Camden	40,201	40,402	40,534	40,675	41,085	(8,217)	[1,972]	{986}	41,481	(8,296)	[1,991]	{996}	41,857	(8,371)	[2,009]	{1,005}
Essex	64,755	65,161	65,485	65,785	66,602	(13,320)	[3,197]	{1,598}	67,408	(13,482)	[3,236]	{1,618}	68,201	(13,640)	[3,274]	{1,637}
Gloucester	21,803	21,907	21,991	22,093	22,372	(4,474)	[1,074]	{537}	22,646	(4,529)	[1,087]	{544}	22,906	(4,581)	[1,099]	{550}
Hudson	60,990	61,391	61,614	61,784	62,398	(12,480)	[2,995]	{1,498}	62,972	(12,594)	[3,023]	{1,511}	63,512	(12,702)	[3,049]	{1,524}
Hunterdon	5,854	5,897	5,924	5,953	6,025	(1,205)	[289]	{145}	6,094	(1,219)	[292]	{146}	6,158	(1,232)	[296]	{148}
Mercer	24,930	25,044	25,166	25,257	25,531	(5,106)	[1,225]	{613}	25,798	(5,160)	[1,238]	{619}	26,054	(5,211)	[1,251]	{625}
Middlesex	63,619	63,956	64,349	64,776	65,630	(13,126)	[3,150]	{1,575}	66,480	(13,296)	[3,191]	{1,596}	67,321	(13,464)	[3,231]	{1,616}
Monmouth	48,804	49,109	49,378	49,604	50,281	(10,056)	[2,413]	{1,207}	50,921	(10,184)	[2,444]	{1,222}	51,545	(10,309)	[2,474]	{1,237}
Morris	32,052	32,317	32,528	32,741	33,311	(6,662)	[1,599]	{799}	33,879	(6,776)	[1,626]	{813}	34,447	(6,889)	[1,653]	{827}
Ocean	49,860	50,229	50,501	50,793	51,529	(10,306)	[2,473]	{1,237}	52,238	(10,448)	[2,507]	{1,254}	52,927	(10,585)	[2,541]	{1,270}
Passaic	50,976	51,262	51,620	51,800	52,304	(10,461)	[2,511]	{1,255}	52,802	(10,560)	[2,534]	{1,267}	53,294	(10,659)	[2,558]	{1,279}
Somerset	19,802	19,946	20,032	20,128	20,354	(4,071)	[977]	{488}	20,573	(4,115)	[987]	{494}	20,783	(4,157)	[998]	{499}
Sussex	7,801	7,847	7,900	7,951	8,064	(1,613)	[387]	{194}	8,171	(1,634)	[392]	{196}	8,271	(1,654)	[397]	{199}
Union	50,966	51,257	51,441	51,643	52,086	(10,417)	[2,500]	{1,250}	52,511	(10,502)	[2,521]	{1,260}	52,918	(10,584)	[2,540]	{1,270}
Warren	6,048	6,078	6,123	6,158	6,242	(1,248)	[300]	{150}	6,325	(1,265)	[304]	{152}	6,402	(1,280)	[307]	{154}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.