

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

Date: 2/10/21

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 2/10/21 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.

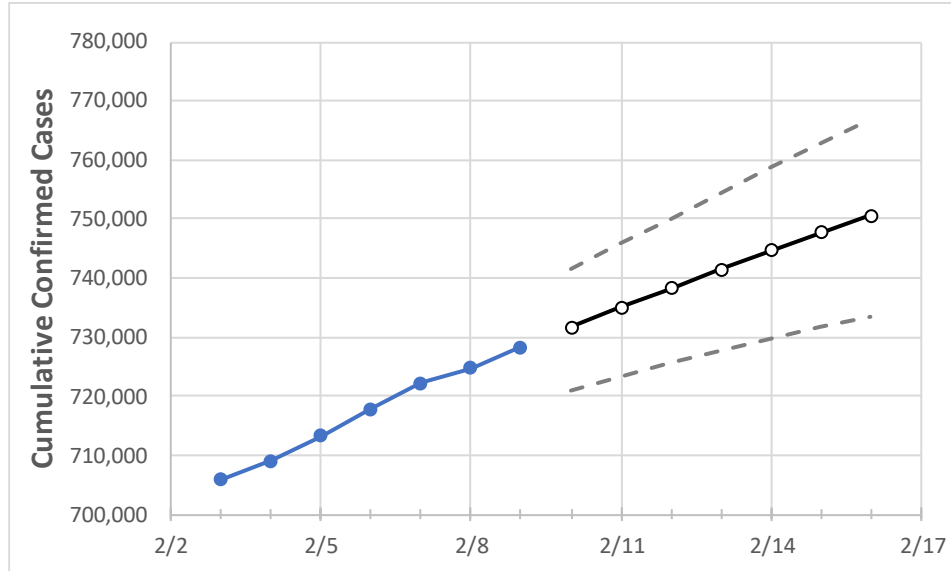
IEM's Modeling Lead

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:						
	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16
New Jersey	717,835	722,167	724,728	728,304	731,697	735,018	738,315	741,433	744,604	747,695	750,625

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:						
	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16
Bergen	69,523	69,951	70,209	70,526	70,875	71,219	71,556	71,890	72,208	72,521	72,829
Burlington	32,610	32,811	32,919	33,056	33,205	33,352	33,493	33,631	33,766	33,900	34,027
Camden	41,264	41,419	41,517	41,638	41,760	41,875	41,983	42,087	42,187	42,281	42,370
Essex	66,849	67,316	67,620	67,893	68,214	68,517	68,813	69,099	69,381	69,659	69,935
Gloucester	22,489	22,579	22,645	22,720	22,796	22,868	22,936	23,001	23,063	23,124	23,179
Hudson	62,928	63,293	63,457	63,736	63,975	64,205	64,433	64,656	64,868	65,073	65,275
Hunterdon	6,130	6,183	6,200	6,252	6,290	6,327	6,362	6,398	6,433	6,468	6,503
Mercer	25,706	25,812	25,922	26,024	26,126	26,225	26,324	26,420	26,510	26,602	26,689
Middlesex	66,087	66,494	66,773	67,157	67,482	67,807	68,134	68,451	68,751	69,049	69,339
Monmouth	50,695	51,104	51,350	51,693	51,950	52,202	52,451	52,698	52,934	53,157	53,386
Morris	33,557	33,849	34,003	34,209	34,430	34,645	34,855	35,059	35,256	35,450	35,647
Ocean	52,187	52,585	52,781	53,278	53,607	53,931	54,254	54,564	54,872	55,187	55,485
Passaic	52,644	52,866	52,987	53,188	53,401	53,610	53,815	54,023	54,225	54,427	54,623
Somerset	20,591	20,728	20,812	20,917	21,022	21,123	21,222	21,322	21,420	21,517	21,614
Sussex	8,132	8,200	8,242	8,279	8,319	8,356	8,393	8,430	8,463	8,497	8,529
Union	52,393	52,602	52,736	52,919	53,086	53,251	53,412	53,567	53,716	53,864	54,010
Warren	6,350	6,394	6,421	6,456	6,495	6,534	6,574	6,612	6,649	6,684	6,721

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:											
	2/6	2/7	2/8	2/9	2/11				2/13				2/15			
Bergen	69,523	69,951	70,209	70,526	71,219	(14,244)	[3,419]	{1,709}	71,890	(14,378)	[3,451]	{1,725}	72,521	(14,504)	[3,481]	{1,740}
Burlington	32,610	32,811	32,919	33,056	33,352	(6,670)	[1,601]	{800}	33,631	(6,726)	[1,614]	{807}	33,900	(6,780)	[1,627]	{814}
Camden	41,264	41,419	41,517	41,638	41,875	(8,375)	[2,010]	{1,005}	42,087	(8,417)	[2,020]	{1,010}	42,281	(8,456)	[2,029]	{1,015}
Essex	66,849	67,316	67,620	67,893	68,517	(13,703)	[3,289]	{1,644}	69,099	(13,820)	[3,317]	{1,658}	69,659	(13,932)	[3,344]	{1,672}
Gloucester	22,489	22,579	22,645	22,720	22,868	(4,574)	[1,098]	{549}	23,001	(4,600)	[1,104]	{552}	23,124	(4,625)	[1,110]	{555}
Hudson	62,928	63,293	63,457	63,736	64,205	(12,841)	[3,082]	{1,541}	64,656	(12,931)	[3,103]	{1,552}	65,073	(13,015)	[3,124]	{1,562}
Hunterdon	6,130	6,183	6,200	6,252	6,327	(1,265)	[304]	{152}	6,398	(1,280)	[307]	{154}	6,468	(1,294)	[310]	{155}
Mercer	25,706	25,812	25,922	26,024	26,225	(5,245)	[1,259]	{629}	26,420	(5,284)	[1,268]	{634}	26,602	(5,320)	[1,277]	{638}
Middlesex	66,087	66,494	66,773	67,157	67,807	(13,561)	[3,255]	{1,627}	68,451	(13,690)	[3,286]	{1,643}	69,049	(13,810)	[3,314]	{1,657}
Monmouth	50,695	51,104	51,350	51,693	52,202	(10,440)	[2,506]	{1,253}	52,698	(10,540)	[2,530]	{1,265}	53,157	(10,631)	[2,552]	{1,276}
Morris	33,557	33,849	34,003	34,209	34,645	(6,929)	[1,663]	{831}	35,059	(7,012)	[1,683]	{841}	35,450	(7,090)	[1,702]	{851}
Ocean	52,187	52,585	52,781	53,278	53,931	(10,786)	[2,589]	{1,294}	54,564	(10,913)	[2,619]	{1,310}	55,187	(11,037)	[2,649]	{1,324}
Passaic	52,644	52,866	52,987	53,188	53,610	(10,722)	[2,573]	{1,287}	54,023	(10,805)	[2,593]	{1,297}	54,427	(10,885)	[2,612]	{1,306}
Somerset	20,591	20,728	20,812	20,917	21,123	(4,225)	[1,014]	{507}	21,322	(4,264)	[1,023]	{512}	21,517	(4,303)	[1,033]	{516}
Sussex	8,132	8,200	8,242	8,279	8,356	(1,671)	[401]	{201}	8,430	(1,686)	[405]	{202}	8,497	(1,699)	[408]	{204}
Union	52,393	52,602	52,736	52,919	53,251	(10,650)	[2,556]	{1,278}	53,567	(10,713)	[2,571]	{1,286}	53,864	(10,773)	[2,585]	{1,293}
Warren	6,350	6,394	6,421	6,456	6,534	(1,307)	[314]	{157}	6,612	(1,322)	[317]	{159}	6,684	(1,337)	[321]	{160}

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.