

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/29/20**

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 10/29/20 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.

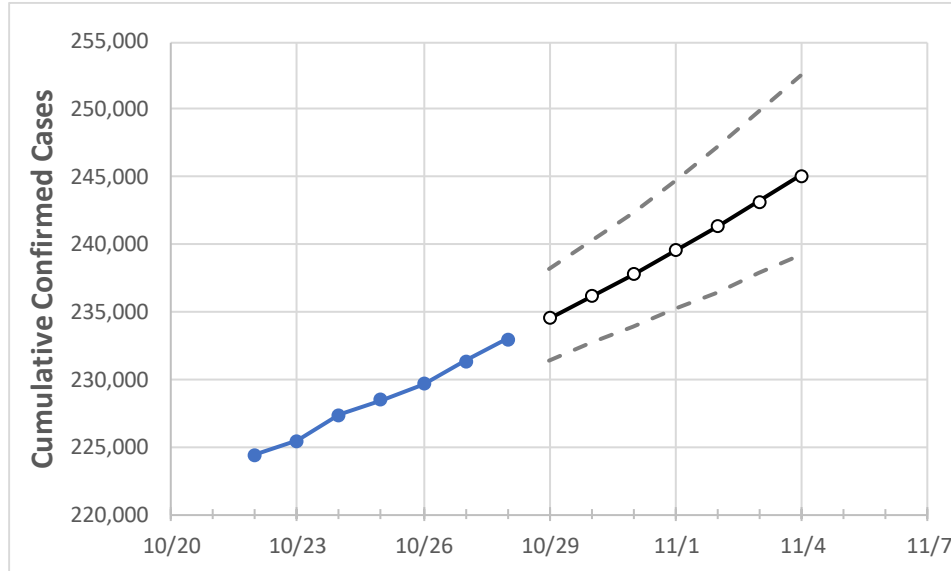
IEM's Modeling Lead

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:						
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4
New Jersey	228,468	229,684	231,331	232,997	234,533	236,130	237,790	239,515	241,307	243,170	245,105

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 20%, and are often within 10%, of actual confirmed cases.

New Jersey Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4	
Bergen	24,527	24,648	24,795	24,890	25,030	25,176	25,327	25,485	25,649	25,820	25,998	
Burlington	8,201	8,280	8,334	8,416	8,484	8,555	8,629	8,706	8,786	8,870	8,957	
Camden	11,280	11,336	11,407	11,519	11,597	11,679	11,763	11,850	11,941	12,035	12,133	
Essex	23,771	23,931	24,177	24,455	24,738	25,043	25,372	25,726	26,108	26,520	26,963	
Gloucester	5,403	5,435	5,467	5,519	5,556	5,593	5,631	5,670	5,710	5,751	5,793	
Hudson	22,573	22,646	22,837	22,956	23,123	23,300	23,489	23,690	23,904	24,132	24,375	
Hunterdon	1,533	1,548	1,569	1,582	1,592	1,602	1,613	1,625	1,637	1,650	1,663	
Mercer	9,146	9,174	9,220	9,250	9,286	9,324	9,364	9,406	9,450	9,496	9,545	
Middlesex	21,668	21,783	21,939	22,111	22,255	22,405	22,561	22,723	22,892	23,068	23,251	
Monmouth	13,747	13,807	13,892	13,996	14,066	14,136	14,207	14,278	14,349	14,421	14,494	
Morris	8,859	8,919	9,002	9,091	9,184	9,283	9,390	9,504	9,625	9,756	9,895	
Ocean	16,477	16,534	16,605	16,642	16,695	16,746	16,794	16,842	16,887	16,931	16,973	
Passaic	20,444	20,554	20,662	20,775	20,873	20,976	21,085	21,198	21,317	21,442	21,573	
Somerset	6,329	6,371	6,411	6,451	6,490	6,531	6,575	6,622	6,672	6,725	6,782	
Sussex	1,677	1,681	1,692	1,707	1,717	1,727	1,738	1,749	1,761	1,774	1,787	
Union	19,559	19,682	19,918	20,106	20,292	20,492	20,706	20,934	21,179	21,441	21,721	
Warren	1,554	1,562	1,570	1,584	1,592	1,600	1,608	1,617	1,627	1,637	1,648	

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:											
	10/25	10/26	10/27	10/28	10/30				11/1				11/3			
Bergen	24,527	24,648	24,795	24,890	25,176	(5,035)	[1,208]	{604}	25,485	(5,097)	[1,223]	{612}	25,820	(5,164)	[1,239]	{620}
Burlington	8,201	8,280	8,334	8,416	8,555	(1,711)	[411]	{205}	8,706	(1,741)	[418]	{209}	8,870	(1,774)	[426]	{213}
Camden	11,280	11,336	11,407	11,519	11,679	(2,336)	[561]	{280}	11,850	(2,370)	[569]	{284}	12,035	(2,407)	[578]	{289}
Essex	23,771	23,931	24,177	24,455	25,043	(5,009)	[1,202]	{601}	25,726	(5,145)	[1,235]	{617}	26,520	(5,304)	[1,273]	{636}
Gloucester	5,403	5,435	5,467	5,519	5,593	(1,119)	[268]	{134}	5,670	(1,134)	[272]	{136}	5,751	(1,150)	[276]	{138}
Hudson	22,573	22,646	22,837	22,956	23,300	(4,660)	[1,118]	{559}	23,690	(4,738)	[1,137]	{569}	24,132	(4,826)	[1,158]	{579}
Hunterdon	1,533	1,548	1,569	1,582	1,602	(320)	[77]	{38}	1,625	(325)	[78]	{39}	1,650	(330)	[79]	{40}
Mercer	9,146	9,174	9,220	9,250	9,324	(1,865)	[448]	{224}	9,406	(1,881)	[451]	{226}	9,496	(1,899)	[456]	{228}
Middlesex	21,668	21,783	21,939	22,111	22,405	(4,481)	[1,075]	{538}	22,723	(4,545)	[1,091]	{545}	23,068	(4,614)	[1,107]	{554}
Monmouth	13,747	13,807	13,892	13,996	14,136	(2,827)	[679]	{339}	14,278	(2,856)	[685]	{343}	14,421	(2,884)	[692]	{346}
Morris	8,859	8,919	9,002	9,091	9,283	(1,857)	[446]	{223}	9,504	(1,901)	[456]	{228}	9,756	(1,951)	[468]	{234}
Ocean	16,477	16,534	16,605	16,642	16,746	(3,349)	[804]	{402}	16,842	(3,368)	[808]	{404}	16,931	(3,386)	[813]	{406}
Passaic	20,444	20,554	20,662	20,775	20,976	(4,195)	[1,007]	{503}	21,198	(4,240)	[1,018]	{509}	21,442	(4,288)	[1,029]	{515}
Somerset	6,329	6,371	6,411	6,451	6,531	(1,306)	[313]	{157}	6,622	(1,324)	[318]	{159}	6,725	(1,345)	[323]	{161}
Sussex	1,677	1,681	1,692	1,707	1,727	(345)	[83]	{41}	1,749	(350)	[84]	{42}	1,774	(355)	[85]	{43}
Union	19,559	19,682	19,918	20,106	20,492	(4,098)	[984]	{492}	20,934	(4,187)	[1,005]	{502}	21,441	(4,288)	[1,029]	{515}
Warren	1,554	1,562	1,570	1,584	1,600	(320)	[77]	{38}	1,617	(323)	[78]	{39}	1,637	(327)	[79]	{39}

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.