

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/17/20**

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 11/17/20 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.

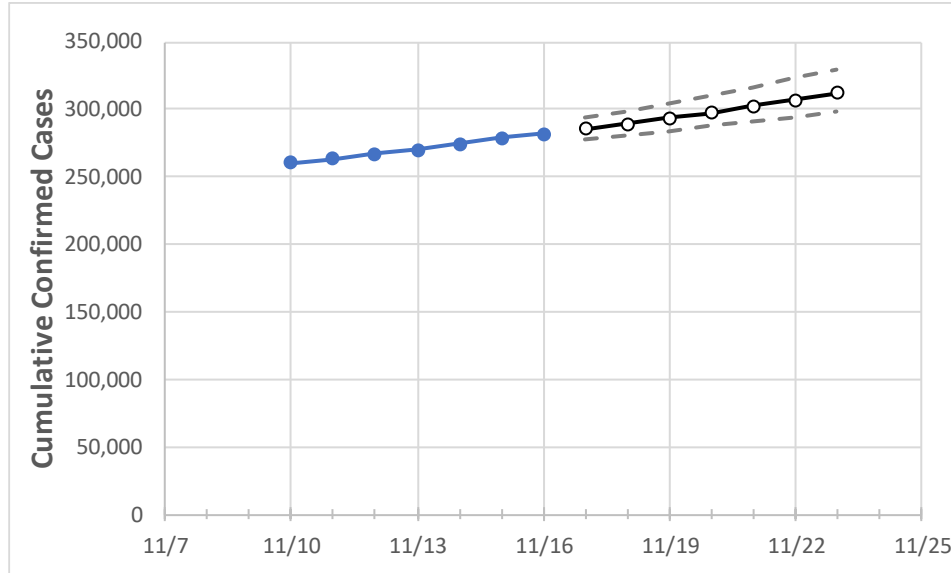
IEM's Modeling Lead

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:						
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23
New Jersey	270,383	274,736	279,274	281,493	285,281	289,245	293,394	297,736	302,281	307,036	312,012

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:							
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	
Bergen	28,436	28,821	29,223	29,409	29,750	30,108	30,484	30,879	31,295	31,731	32,189	
Burlington	10,065	10,222	10,527	10,632	10,808	10,993	11,189	11,396	11,615	11,845	12,088	
Camden	14,166	14,464	14,863	15,032	15,351	15,692	16,057	16,446	16,861	17,304	17,776	
Essex	29,216	29,872	30,216	30,423	30,821	31,234	31,661	32,104	32,561	33,035	33,526	
Gloucester	6,758	6,915	7,068	7,184	7,350	7,527	7,716	7,919	8,137	8,369	8,618	
Hudson	26,173	26,482	26,894	27,050	27,337	27,636	27,945	28,266	28,599	28,944	29,302	
Hunterdon	1,897	1,932	1,981	2,002	2,038	2,077	2,118	2,162	2,208	2,258	2,311	
Mercer	10,629	10,832	11,060	11,200	11,398	11,612	11,845	12,097	12,371	12,669	12,991	
Middlesex	25,064	25,395	25,744	25,951	26,233	26,527	26,832	27,149	27,479	27,822	28,178	
Monmouth	16,167	16,403	16,689	16,835	17,065	17,306	17,561	17,829	18,111	18,407	18,720	
Morris	10,794	11,018	11,195	11,284	11,451	11,626	11,807	11,997	12,194	12,400	12,614	
Ocean	18,235	18,414	18,635	18,747	18,894	19,048	19,207	19,374	19,546	19,726	19,913	
Passaic	24,085	24,489	24,876	25,011	25,395	25,803	26,237	26,698	27,189	27,711	28,265	
Somerset	7,374	7,504	7,648	7,716	7,830	7,951	8,080	8,218	8,364	8,521	8,687	
Sussex	1,995	2,034	2,080	2,096	2,126	2,158	2,192	2,228	2,265	2,305	2,348	
Union	23,463	23,804	24,156	24,350	24,669	25,001	25,346	25,705	26,078	26,466	26,870	
Warren	1,941	1,976	2,024	2,055	2,104	2,158	2,216	2,280	2,348	2,422	2,503	

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:											
	11/13	11/14	11/15	11/16	11/18				11/20				11/22			
Bergen	28,436	28,821	29,223	29,409	30,108	(6,022)	[1,445]	{723}	30,879	(6,176)	[1,482]	{741}	31,731	(6,346)	[1,523]	{762}
Burlington	10,065	10,222	10,527	10,632	10,993	(2,199)	[528]	{264}	11,396	(2,279)	[547]	{274}	11,845	(2,369)	[569]	{284}
Camden	14,166	14,464	14,863	15,032	15,692	(3,138)	[753]	{377}	16,446	(3,289)	[789]	{395}	17,304	(3,461)	[831]	{415}
Essex	29,216	29,872	30,216	30,423	31,234	(6,247)	[1,499]	{750}	32,104	(6,421)	[1,541]	{770}	33,035	(6,607)	[1,586]	{793}
Gloucester	6,758	6,915	7,068	7,184	7,527	(1,505)	[361]	{181}	7,919	(1,584)	[380]	{190}	8,369	(1,674)	[402]	{201}
Hudson	26,173	26,482	26,894	27,050	27,636	(5,527)	[1,327]	{663}	28,266	(5,653)	[1,357]	{678}	28,944	(5,789)	[1,389]	{695}
Hunterdon	1,897	1,932	1,981	2,002	2,077	(415)	[100]	{50}	2,162	(432)	[104]	{52}	2,258	(452)	[108]	{54}
Mercer	10,629	10,832	11,060	11,200	11,612	(2,322)	[557]	{279}	12,097	(2,419)	[581]	{290}	12,669	(2,534)	[608]	{304}
Middlesex	25,064	25,395	25,744	25,951	26,527	(5,305)	[1,273]	{637}	27,149	(5,430)	[1,303]	{652}	27,822	(5,564)	[1,335]	{668}
Monmouth	16,167	16,403	16,689	16,835	17,306	(3,461)	[831]	{415}	17,829	(3,566)	[856]	{428}	18,407	(3,681)	[884]	{442}
Morris	10,794	11,018	11,195	11,284	11,626	(2,325)	[558]	{279}	11,997	(2,399)	[576]	{288}	12,400	(2,480)	[595]	{298}
Ocean	18,235	18,414	18,635	18,747	19,048	(3,810)	[914]	{457}	19,374	(3,875)	[930]	{465}	19,726	(3,945)	[947]	{473}
Passaic	24,085	24,489	24,876	25,011	25,803	(5,161)	[1,239]	{619}	26,698	(5,340)	[1,282]	{641}	27,711	(5,542)	[1,330]	{665}
Somerset	7,374	7,504	7,648	7,716	7,951	(1,590)	[382]	{191}	8,218	(1,644)	[394]	{197}	8,521	(1,704)	[409]	{204}
Sussex	1,995	2,034	2,080	2,096	2,158	(432)	[104]	{52}	2,228	(446)	[107]	{53}	2,305	(461)	[111]	{55}
Union	23,463	23,804	24,156	24,350	25,001	(5,000)	[1,200]	{600}	25,705	(5,141)	[1,234]	{617}	26,466	(5,293)	[1,270]	{635}
Warren	1,941	1,976	2,024	2,055	2,158	(432)	[104]	{52}	2,280	(456)	[109]	{55}	2,422	(484)	[116]	{58}

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.