

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

Date: 3/5/21

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 3/5/21 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.

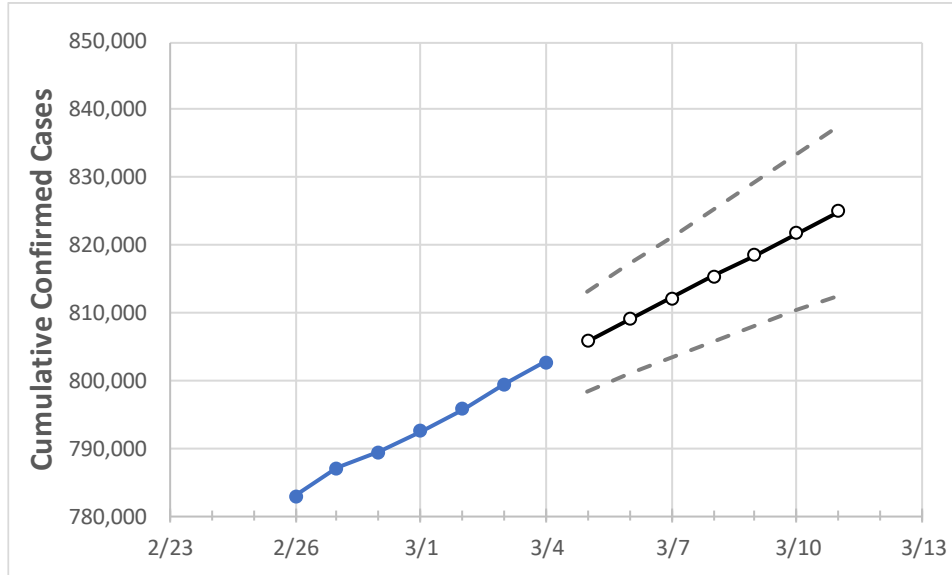
IEM's Modeling Lead

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:						
	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11

New Jersey 792,496 795,785 799,476 802,669 805,862 809,040 812,193 815,327 818,506 821,778 824,927

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:						
	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11
Bergen	78,040	78,445	78,951	79,332	79,746	80,156	80,578	81,006	81,427	81,866	82,291
Burlington	35,483	35,600	35,715	35,842	35,957	36,069	36,181	36,290	36,400	36,508	36,616
Camden	44,301	44,423	44,527	44,633	44,748	44,862	44,976	45,086	45,197	45,307	45,419
Essex	73,995	74,249	74,570	74,861	75,137	75,417	75,690	75,965	76,230	76,504	76,771
Gloucester	24,235	24,311	24,363	24,442	24,508	24,572	24,638	24,702	24,767	24,829	24,891
Hudson	69,600	69,940	70,202	70,465	70,751	71,048	71,335	71,632	71,933	72,231	72,526
Hunterdon	6,951	6,989	7,035	7,079	7,113	7,147	7,182	7,216	7,252	7,287	7,323
Mercer	27,881	27,976	28,076	28,155	28,236	28,316	28,399	28,480	28,561	28,644	28,722
Middlesex	72,848	73,117	73,459	73,743	74,005	74,269	74,532	74,792	75,049	75,303	75,560
Monmouth	57,157	57,460	57,808	58,113	58,403	58,694	58,989	59,279	59,579	59,882	60,176
Morris	37,727	37,892	38,045	38,209	38,356	38,502	38,646	38,787	38,928	39,070	39,211
Ocean	58,875	59,147	59,500	59,803	60,062	60,322	60,578	60,835	61,089	61,339	61,592
Passaic	56,986	57,218	57,533	57,708	57,904	58,096	58,293	58,489	58,688	58,889	59,091
Somerset	22,926	23,041	23,143	23,239	23,338	23,436	23,535	23,629	23,728	23,826	23,924
Sussex	9,173	9,219	9,252	9,303	9,342	9,380	9,419	9,458	9,495	9,532	9,567
Union	56,976	57,196	57,442	57,632	57,837	58,046	58,250	58,459	58,668	58,875	59,079
Warren	7,102	7,141	7,180	7,211	7,249	7,286	7,324	7,363	7,401	7,440	7,479

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:											
	3/1	3/2	3/3	3/4	3/6			3/8			3/10					
Bergen	78,040	78,445	78,951	79,332	80,156	(16,031)	[3,847]	{1,924}	81,006	(16,201)	[3,888]	{1,944}	81,866	(16,373)	[3,930]	{1,965}
Burlington	35,483	35,600	35,715	35,842	36,069	(7,214)	[1,731]	{866}	36,290	(7,258)	[1,742]	{871}	36,508	(7,302)	[1,752]	{876}
Camden	44,301	44,423	44,527	44,633	44,862	(8,972)	[2,153]	{1,077}	45,086	(9,017)	[2,164]	{1,082}	45,307	(9,061)	[2,175]	{1,087}
Essex	73,995	74,249	74,570	74,861	75,417	(15,083)	[3,620]	{1,810}	75,965	(15,193)	[3,646]	{1,823}	76,504	(15,301)	[3,672]	{1,836}
Gloucester	24,235	24,311	24,363	24,442	24,572	(4,914)	[1,179]	{590}	24,702	(4,940)	[1,186]	{593}	24,829	(4,966)	[1,192]	{596}
Hudson	69,600	69,940	70,202	70,465	71,048	(14,210)	[3,410]	{1,705}	71,632	(14,326)	[3,438]	{1,719}	72,231	(14,446)	[3,467]	{1,734}
Hunterdon	6,951	6,989	7,035	7,079	7,147	(1,429)	[343]	{172}	7,216	(1,443)	[346]	{173}	7,287	(1,457)	[350]	{175}
Mercer	27,881	27,976	28,076	28,155	28,316	(5,663)	[1,359]	{680}	28,480	(5,696)	[1,367]	{684}	28,644	(5,729)	[1,375]	{687}
Middlesex	72,848	73,117	73,459	73,743	74,269	(14,854)	[3,565]	{1,782}	74,792	(14,958)	[3,590]	{1,795}	75,303	(15,061)	[3,615]	{1,807}
Monmouth	57,157	57,460	57,808	58,113	58,694	(11,739)	[2,817]	{1,409}	59,279	(11,856)	[2,845]	{1,423}	59,882	(11,976)	[2,874]	{1,437}
Morris	37,727	37,892	38,045	38,209	38,502	(7,700)	[1,848]	{924}	38,787	(7,757)	[1,862]	{931}	39,070	(7,814)	[1,875]	{938}
Ocean	58,875	59,147	59,500	59,803	60,322	(12,064)	[2,895]	{1,448}	60,835	(12,167)	[2,920]	{1,460}	61,339	(12,268)	[2,944]	{1,472}
Passaic	56,986	57,218	57,533	57,708	58,096	(11,619)	[2,789]	{1,394}	58,489	(11,698)	[2,807]	{1,404}	58,889	(11,778)	[2,827]	{1,413}
Somerset	22,926	23,041	23,143	23,239	23,436	(4,687)	[1,125]	{562}	23,629	(4,726)	[1,134]	{567}	23,826	(4,765)	[1,144]	{572}
Sussex	9,173	9,219	9,252	9,303	9,380	(1,876)	[450]	{225}	9,458	(1,892)	[454]	{227}	9,532	(1,906)	[458]	{229}
Union	56,976	57,196	57,442	57,632	58,046	(11,609)	[2,786]	{1,393}	58,459	(11,692)	[2,806]	{1,403}	58,875	(11,775)	[2,826]	{1,413}
Warren	7,102	7,141	7,180	7,211	7,286	(1,457)	[350]	{175}	7,363	(1,473)	[353]	{177}	7,440	(1,488)	[357]	{179}

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.