

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/1/20**

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 12/1/20 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.

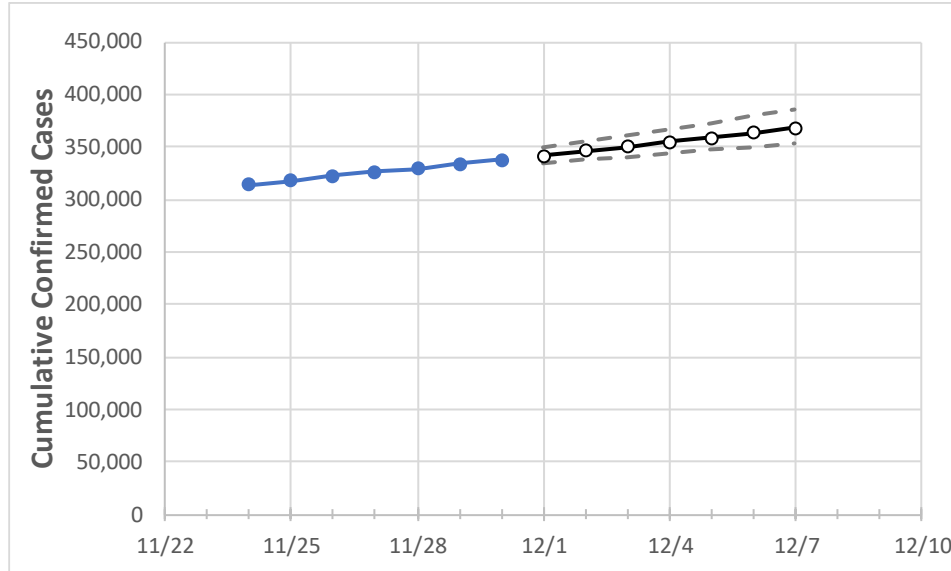
IEM's Modeling Lead

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:						
	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7
New Jersey	326,473	329,553	334,114	337,304	341,532	345,801	350,109	354,459	358,850	363,283	367,757

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:						
	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7
Bergen	33,875	34,083	34,583	34,871	35,287	35,711	36,141	36,579	37,025	37,478	37,939
Burlington	13,217	13,284	13,636	13,803	14,046	14,295	14,550	14,811	15,078	15,351	15,631
Camden	18,378	18,497	18,956	19,249	19,568	19,893	20,223	20,558	20,899	21,245	21,596
Essex	34,478	34,632	35,041	35,358	35,670	35,979	36,286	36,592	36,895	37,196	37,496
Gloucester	8,711	8,765	8,932	9,053	9,182	9,311	9,442	9,572	9,704	9,836	9,969
Hudson	30,746	30,928	31,432	31,691	32,041	32,397	32,759	33,126	33,499	33,877	34,262
Hunterdon	2,380	2,402	2,469	2,510	2,549	2,588	2,629	2,670	2,712	2,755	2,799
Mercer	13,414	13,485	13,724	13,797	13,959	14,120	14,281	14,442	14,602	14,762	14,921
Middlesex	29,602	29,817	30,273	30,562	30,911	31,265	31,626	31,992	32,363	32,741	33,125
Monmouth	19,918	20,036	20,447	20,657	20,942	21,232	21,529	21,831	22,140	22,455	22,776
Morris	13,159	13,312	13,515	13,647	13,830	14,016	14,205	14,396	14,590	14,787	14,987
Ocean	21,303	21,457	21,748	21,993	22,275	22,565	22,865	23,174	23,493	23,821	24,160
Passaic	29,148	29,281	29,849	30,180	30,550	30,925	31,306	31,692	32,085	32,484	32,888
Somerset	8,839	8,908	9,032	9,104	9,200	9,297	9,394	9,491	9,588	9,686	9,783
Sussex	2,475	2,504	2,549	2,593	2,633	2,673	2,715	2,758	2,801	2,845	2,891
Union	27,709	27,803	28,255	28,437	28,707	28,978	29,248	29,520	29,791	30,063	30,335
Warren	2,414	2,435	2,495	2,512	2,544	2,576	2,609	2,642	2,675	2,709	2,742

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:											
	11/27	11/28	11/29	11/30	12/2			12/4			12/6					
Bergen	33,875	34,083	34,583	34,871	35,711	(7,142)	[1,714]	{857}	36,579	(7,316)	[1,756]	{878}	37,478	(7,496)	[1,799]	{899}
Burlington	13,217	13,284	13,636	13,803	14,295	(2,859)	[686]	{343}	14,811	(2,962)	[711]	{355}	15,351	(3,070)	[737]	{368}
Camden	18,378	18,497	18,956	19,249	19,893	(3,979)	[955]	{477}	20,558	(4,112)	[987]	{493}	21,245	(4,249)	[1,020]	{510}
Essex	34,478	34,632	35,041	35,358	35,979	(7,196)	[1,727]	{863}	36,592	(7,318)	[1,756]	{878}	37,196	(7,439)	[1,785]	{893}
Gloucester	8,711	8,765	8,932	9,053	9,311	(1,862)	[447]	{223}	9,572	(1,914)	[459]	{230}	9,836	(1,967)	[472]	{236}
Hudson	30,746	30,928	31,432	31,691	32,397	(6,479)	[1,555]	{778}	33,126	(6,625)	[1,590]	{795}	33,877	(6,775)	[1,626]	{813}
Hunterdon	2,380	2,402	2,469	2,510	2,588	(518)	[124]	{62}	2,670	(534)	[128]	{64}	2,755	(551)	[132]	{66}
Mercer	13,414	13,485	13,724	13,797	14,120	(2,824)	[678]	{339}	14,442	(2,888)	[693]	{347}	14,762	(2,952)	[709]	{354}
Middlesex	29,602	29,817	30,273	30,562	31,265	(6,253)	[1,501]	{750}	31,992	(6,398)	[1,536]	{768}	32,741	(6,548)	[1,572]	{786}
Monmouth	19,918	20,036	20,447	20,657	21,232	(4,246)	[1,019]	{510}	21,831	(4,366)	[1,048]	{524}	22,455	(4,491)	[1,078]	{539}
Morris	13,159	13,312	13,515	13,647	14,016	(2,803)	[673]	{336}	14,396	(2,879)	[691]	{346}	14,787	(2,957)	[710]	{355}
Ocean	21,303	21,457	21,748	21,993	22,565	(4,513)	[1,083]	{542}	23,174	(4,635)	[1,112]	{556}	23,821	(4,764)	[1,143]	{572}
Passaic	29,148	29,281	29,849	30,180	30,925	(6,185)	[1,484]	{742}	31,692	(6,338)	[1,521]	{761}	32,484	(6,497)	[1,559]	{780}
Somerset	8,839	8,908	9,032	9,104	9,297	(1,859)	[446]	{223}	9,491	(1,898)	[456]	{228}	9,686	(1,937)	[465]	{232}
Sussex	2,475	2,504	2,549	2,593	2,673	(535)	[128]	{64}	2,758	(552)	[132]	{66}	2,845	(569)	[137]	{68}
Union	27,709	27,803	28,255	28,437	28,978	(5,796)	[1,391]	{695}	29,520	(5,904)	[1,417]	{708}	30,063	(6,013)	[1,443]	{722}
Warren	2,414	2,435	2,495	2,512	2,576	(515)	[124]	{62}	2,642	(528)	[127]	{63}	2,709	(542)	[130]	{65}

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.