

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/10/20**

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 12/10/20 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.

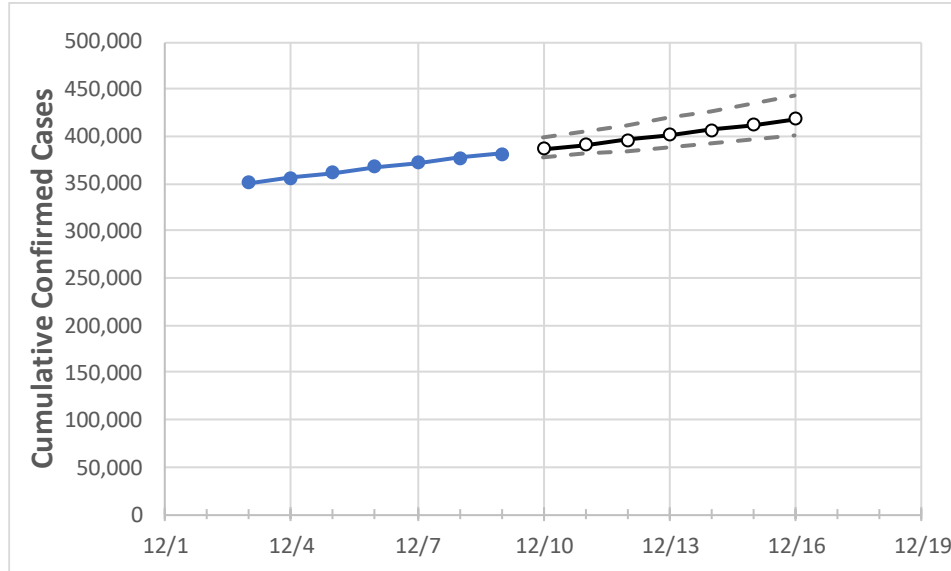
IEM's Modeling Lead

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:						
	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16
New Jersey	368,016	371,579	377,055	381,486	386,469	391,532	396,675	401,900	407,207	412,597	418,072

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:						
	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16
Bergen	37,893	38,227	38,602	38,879	39,315	39,755	40,200	40,649	41,103	41,561	42,023
Burlington	15,305	15,547	15,785	15,997	16,239	16,486	16,736	16,990	17,248	17,511	17,777
Camden	21,578	21,793	22,191	22,443	22,798	23,158	23,523	23,893	24,269	24,650	25,036
Essex	38,252	38,574	39,011	39,350	39,800	40,260	40,730	41,212	41,704	42,208	42,723
Gloucester	10,271	10,355	10,575	10,761	10,930	11,103	11,279	11,458	11,641	11,827	12,017
Hudson	34,393	34,661	35,115	35,508	35,944	36,389	36,844	37,308	37,781	38,264	38,757
Hunterdon	2,742	2,765	2,818	2,848	2,886	2,925	2,965	3,005	3,045	3,086	3,128
Mercer	14,936	15,069	15,281	15,440	15,587	15,732	15,877	16,020	16,162	16,303	16,443
Middlesex	33,475	33,834	34,420	34,867	35,387	35,925	36,481	37,054	37,647	38,259	38,890
Monmouth	22,837	23,076	23,524	23,867	24,239	24,621	25,014	25,418	25,832	26,258	26,695
Morris	14,982	15,159	15,579	15,763	15,998	16,238	16,485	16,736	16,994	17,258	17,527
Ocean	23,969	24,227	24,547	24,790	25,133	25,484	25,845	26,214	26,593	26,982	27,381
Passaic	32,776	33,174	33,393	33,780	34,170	34,564	34,962	35,364	35,769	36,179	36,592
Somerset	9,829	9,909	10,052	10,219	10,345	10,473	10,604	10,737	10,873	11,011	11,151
Sussex	2,950	2,984	3,068	3,123	3,190	3,261	3,335	3,412	3,493	3,578	3,667
Union	30,205	30,390	30,879	31,239	31,518	31,799	32,082	32,366	32,652	32,939	33,228
Warren	2,770	2,807	2,858	2,903	2,946	2,991	3,036	3,083	3,131	3,181	3,231

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:											
	12/6	12/7	12/8	12/9	12/11				12/13				12/15			
Bergen	37,893	38,227	38,602	38,879	39,755	(7,951)	[1,908]	{954}	40,649	(8,130)	[1,951]	{976}	41,561	(8,312)	[1,995]	{997}
Burlington	15,305	15,547	15,785	15,997	16,486	(3,297)	[791]	{396}	16,990	(3,398)	[816]	{408}	17,511	(3,502)	[841]	{420}
Camden	21,578	21,793	22,191	22,443	23,158	(4,632)	[1,112]	{556}	23,893	(4,779)	[1,147]	{573}	24,650	(4,930)	[1,183]	{592}
Essex	38,252	38,574	39,011	39,350	40,260	(8,052)	[1,932]	{966}	41,212	(8,242)	[1,978]	{989}	42,208	(8,442)	[2,026]	{1,013}
Gloucester	10,271	10,355	10,575	10,761	11,103	(2,221)	[533]	{266}	11,458	(2,292)	[550]	{275}	11,827	(2,365)	[568]	{284}
Hudson	34,393	34,661	35,115	35,508	36,389	(7,278)	[1,747]	{873}	37,308	(7,462)	[1,791]	{895}	38,264	(7,653)	[1,837]	{918}
Hunterdon	2,742	2,765	2,818	2,848	2,925	(585)	[140]	{70}	3,005	(601)	[144]	{72}	3,086	(617)	[148]	{74}
Mercer	14,936	15,069	15,281	15,440	15,732	(3,146)	[755]	{378}	16,020	(3,204)	[769]	{384}	16,303	(3,261)	[783]	{391}
Middlesex	33,475	33,834	34,420	34,867	35,925	(7,185)	[1,724]	{862}	37,054	(7,411)	[1,779]	{889}	38,259	(7,652)	[1,836]	{918}
Monmouth	22,837	23,076	23,524	23,867	24,621	(4,924)	[1,182]	{591}	25,418	(5,084)	[1,220]	{610}	26,258	(5,252)	[1,260]	{630}
Morris	14,982	15,159	15,579	15,763	16,238	(3,248)	[779]	{390}	16,736	(3,347)	[803]	{402}	17,258	(3,452)	[828]	{414}
Ocean	23,969	24,227	24,547	24,790	25,484	(5,097)	[1,223]	{612}	26,214	(5,243)	[1,258]	{629}	26,982	(5,396)	[1,295]	{648}
Passaic	32,776	33,174	33,393	33,780	34,564	(6,913)	[1,659]	{830}	35,364	(7,073)	[1,697]	{849}	36,179	(7,236)	[1,737]	{868}
Somerset	9,829	9,909	10,052	10,219	10,473	(2,095)	[503]	{251}	10,737	(2,147)	[515]	{258}	11,011	(2,202)	[529]	{264}
Sussex	2,950	2,984	3,068	3,123	3,261	(652)	[157]	{78}	3,412	(682)	[164]	{82}	3,578	(716)	[172]	{86}
Union	30,205	30,390	30,879	31,239	31,799	(6,360)	[1,526]	{763}	32,366	(6,473)	[1,554]	{777}	32,939	(6,588)	[1,581]	{791}
Warren	2,770	2,807	2,858	2,903	2,991	(598)	[144]	{72}	3,083	(617)	[148]	{74}	3,181	(636)	[153]	{76}

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.