

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/14/20**

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 12/14/20 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.

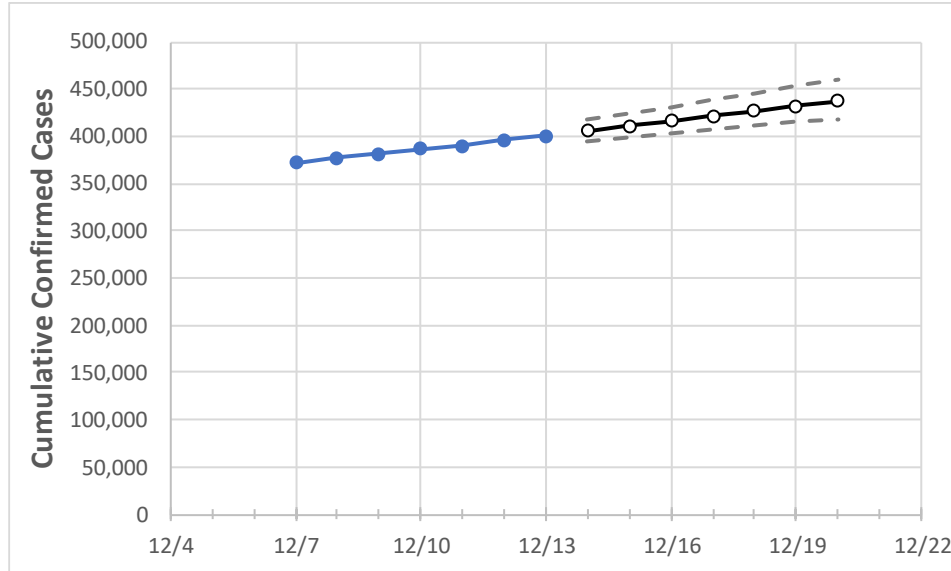
IEM's Modeling Lead

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:						
	12/10	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20
New Jersey	386,606	390,256	396,496	400,650	405,695	410,800	415,965	421,191	426,478	431,827	437,237

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:						
	12/10	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20
Bergen	39,303	39,588	40,115	40,483	40,902	41,323	41,746	42,170	42,597	43,026	43,458
Burlington	16,264	16,422	16,736	16,874	17,099	17,325	17,553	17,782	18,012	18,243	18,475
Camden	22,740	22,973	23,486	23,633	23,945	24,258	24,571	24,886	25,202	25,518	25,835
Essex	39,782	40,145	40,650	41,089	41,553	42,025	42,504	42,992	43,488	43,992	44,504
Gloucester	10,959	11,134	11,375	11,472	11,663	11,857	12,054	12,255	12,460	12,668	12,880
Hudson	36,049	36,348	36,850	37,187	37,640	38,101	38,570	39,047	39,532	40,026	40,528
Hunterdon	2,893	2,935	3,015	3,040	3,081	3,122	3,164	3,206	3,249	3,293	3,337
Mercer	15,621	15,755	15,985	16,134	16,298	16,462	16,627	16,791	16,956	17,121	17,286
Middlesex	35,313	35,674	36,246	36,739	37,271	37,816	38,374	38,945	39,530	40,129	40,741
Monmouth	24,281	24,558	25,001	25,288	25,676	26,072	26,476	26,889	27,310	27,740	28,179
Morris	15,970	16,164	16,486	16,692	16,943	17,200	17,462	17,729	18,002	18,281	18,566
Ocean	25,148	25,418	25,927	26,145	26,499	26,861	27,230	27,606	27,990	28,382	28,781
Passaic	34,219	34,480	34,930	35,368	35,770	36,175	36,583	36,995	37,410	37,829	38,251
Somerset	10,336	10,411	10,571	10,671	10,792	10,914	11,037	11,162	11,288	11,415	11,544
Sussex	3,156	3,219	3,294	3,349	3,415	3,483	3,554	3,627	3,702	3,779	3,859
Union	31,557	31,755	32,101	32,383	32,672	32,963	33,256	33,551	33,848	34,146	34,446
Warren	2,951	2,988	3,041	3,079	3,123	3,169	3,215	3,263	3,311	3,361	3,412

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:											
	12/10	12/11	12/12	12/13	12/15				12/17				12/19			
Bergen	39,303	39,588	40,115	40,483	41,323	(8,265)	[1,983]	{992}	42,170	(8,434)	[2,024]	{1,012}	43,026	(8,605)	[2,065]	{1,033}
Burlington	16,264	16,422	16,736	16,874	17,325	(3,465)	[832]	{416}	17,782	(3,556)	[854]	{427}	18,243	(3,649)	[876]	{438}
Camden	22,740	22,973	23,486	23,633	24,258	(4,852)	[1,164]	{582}	24,886	(4,977)	[1,195]	{597}	25,518	(5,104)	[1,225]	{612}
Essex	39,782	40,145	40,650	41,089	42,025	(8,405)	[2,017]	{1,009}	42,992	(8,598)	[2,064]	{1,032}	43,992	(8,798)	[2,112]	{1,056}
Gloucester	10,959	11,134	11,375	11,472	11,857	(2,371)	[569]	{285}	12,255	(2,451)	[588]	{294}	12,668	(2,534)	[608]	{304}
Hudson	36,049	36,348	36,850	37,187	38,101	(7,620)	[1,829]	{914}	39,047	(7,809)	[1,874]	{937}	40,026	(8,005)	[1,921]	{961}
Hunterdon	2,893	2,935	3,015	3,040	3,122	(624)	[150]	{75}	3,206	(641)	[154]	{77}	3,293	(659)	[158]	{79}
Mercer	15,621	15,755	15,985	16,134	16,462	(3,292)	[790]	{395}	16,791	(3,358)	[806]	{403}	17,121	(3,424)	[822]	{411}
Middlesex	35,313	35,674	36,246	36,739	37,816	(7,563)	[1,815]	{908}	38,945	(7,789)	[1,869]	{935}	40,129	(8,026)	[1,926]	{963}
Monmouth	24,281	24,558	25,001	25,288	26,072	(5,214)	[1,251]	{626}	26,889	(5,378)	[1,291]	{645}	27,740	(5,548)	[1,332]	{666}
Morris	15,970	16,164	16,486	16,692	17,200	(3,440)	[826]	{413}	17,729	(3,546)	[851]	{426}	18,281	(3,656)	[878]	{439}
Ocean	25,148	25,418	25,927	26,145	26,861	(5,372)	[1,289]	{645}	27,606	(5,521)	[1,325]	{663}	28,382	(5,676)	[1,362]	{681}
Passaic	34,219	34,480	34,930	35,368	36,175	(7,235)	[1,736]	{868}	36,995	(7,399)	[1,776]	{888}	37,829	(7,566)	[1,816]	{908}
Somerset	10,336	10,411	10,571	10,671	10,914	(2,183)	[524]	{262}	11,162	(2,232)	[536]	{268}	11,415	(2,283)	[548]	{274}
Sussex	3,156	3,219	3,294	3,349	3,483	(697)	[167]	{84}	3,627	(725)	[174]	{87}	3,779	(756)	[181]	{91}
Union	31,557	31,755	32,101	32,383	32,963	(6,593)	[1,582]	{791}	33,551	(6,710)	[1,610]	{805}	34,146	(6,829)	[1,639]	{820}
Warren	2,951	2,988	3,041	3,079	3,169	(634)	[152]	{76}	3,263	(653)	[157]	{78}	3,361	(672)	[161]	{81}

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.