

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 7/23/20**

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 7/23/20 11 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.

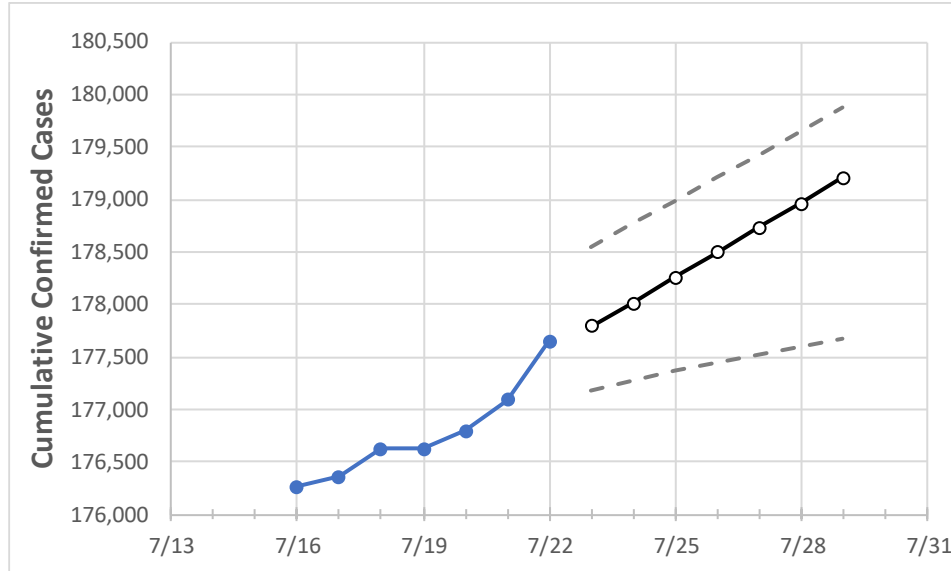
IEM's Modeling Lead

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:						
	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29
New Jersey	176,626	176,797	177,092	177,645	177,788	178,007	178,257	178,493	178,729	178,961	179,206

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:						
	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29
Bergen	19,980	20,034	20,052	20,099	20,113	20,127	20,140	20,153	20,165	20,176	20,188
Burlington	5,442	5,450	5,478	5,490	5,498	5,505	5,512	5,519	5,526	5,532	5,538
Camden	7,829	7,845	7,867	7,888	7,903	7,917	7,930	7,944	7,956	7,969	7,981
Essex	19,116	19,121	19,153	19,173	19,185	19,198	19,210	19,221	19,233	19,244	19,255
Gloucester	2,824	2,829	2,855	2,870	2,878	2,886	2,894	2,902	2,910	2,917	2,925
Hudson	19,248	19,263	19,267	19,281	19,295	19,309	19,323	19,337	19,351	19,365	19,379
Hunterdon	1,100	1,101	1,101	1,102	1,103	1,103	1,104	1,104	1,105	1,105	1,106
Mercer	7,825	7,828	7,839	7,858	7,865	7,871	7,877	7,883	7,889	7,895	7,901
Middlesex	17,158	17,168	17,155	17,379	17,410	17,442	17,475	17,509	17,544	17,579	17,616
Monmouth	9,659	9,672	9,683	9,720	9,737	9,754	9,770	9,786	9,802	9,817	9,832
Morris	6,958	6,967	6,990	7,010	7,021	7,031	7,042	7,054	7,065	7,077	7,089
Ocean	9,947	9,956	9,988	10,054	10,073	10,091	10,110	10,130	10,150	10,170	10,190
Passaic	17,162	17,172	17,181	17,196	17,208	17,219	17,231	17,242	17,254	17,265	17,276
Somerset	5,065	5,068	5,072	5,082	5,088	5,094	5,099	5,105	5,111	5,116	5,122
Sussex	1,246	1,250	1,253	1,256	1,259	1,262	1,265	1,268	1,271	1,274	1,277
Union	16,351	16,351	16,351	16,351	60,544	70,553	80,498	90,374	100,154	110,123	119,611
Warren	1,276	1,280	1,286	1,295	1,298	1,300	1,303	1,306	1,309	1,312	1,315

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:											
	7/19	7/20	7/21	7/22	7/24				7/26				7/28			
Bergen	19,980	20,034	20,052	20,099	20,127	(4,025)	[966]	{483}	20,153	(4,031)	[967]	{484}	20,176	(4,035)	[968]	{484}
Burlington	5,442	5,450	5,478	5,490	5,505	(1,101)	[264]	{132}	5,519	(1,104)	[265]	{132}	5,532	(1,106)	[266]	{133}
Camden	7,829	7,845	7,867	7,888	7,917	(1,583)	[380]	{190}	7,944	(1,589)	[381]	{191}	7,969	(1,594)	[383]	{191}
Essex	19,116	19,121	19,153	19,173	19,198	(3,840)	[921]	{461}	19,221	(3,844)	[923]	{461}	19,244	(3,849)	[924]	{462}
Gloucester	2,824	2,829	2,855	2,870	2,886	(577)	[139]	{69}	2,902	(580)	[139]	{70}	2,917	(583)	[140]	{70}
Hudson	19,248	19,263	19,267	19,281	19,309	(3,862)	[927]	{463}	19,337	(3,867)	[928]	{464}	19,365	(3,873)	[930]	{465}
Hunterdon	1,100	1,101	1,101	1,102	1,103	(221)	[53]	{26}	1,104	(221)	[53]	{26}	1,105	(221)	[53]	{27}
Mercer	7,825	7,828	7,839	7,858	7,871	(1,574)	[378]	{189}	7,883	(1,577)	[378]	{189}	7,895	(1,579)	[379]	{189}
Middlesex	17,158	17,168	17,155	17,379	17,442	(3,488)	[837]	{419}	17,509	(3,502)	[840]	{420}	17,579	(3,516)	[844]	{422}
Monmouth	9,659	9,672	9,683	9,720	9,754	(1,951)	[468]	{234}	9,786	(1,957)	[470]	{235}	9,817	(1,963)	[471]	{236}
Morris	6,958	6,967	6,990	7,010	7,031	(1,406)	[338]	{169}	7,054	(1,411)	[339]	{169}	7,077	(1,415)	[340]	{170}
Ocean	9,947	9,956	9,988	10,054	10,091	(2,018)	[484]	{242}	10,130	(2,026)	[486]	{243}	10,170	(2,034)	[488]	{244}
Passaic	17,162	17,172	17,181	17,196	17,219	(3,444)	[827]	{413}	17,242	(3,448)	[828]	{414}	17,265	(3,453)	[829]	{414}
Somerset	5,065	5,068	5,072	5,082	5,094	(1,019)	[244]	{122}	5,105	(1,021)	[245]	{123}	5,116	(1,023)	[246]	{123}
Sussex	1,246	1,250	1,253	1,256	1,262	(252)	[61]	{30}	1,268	(254)	[61]	{30}	1,274	(255)	[61]	{31}
Union	16,351	16,351	16,351	16,351	70,553	(14,111)	[3,387]	{1,693}	90,374	(18,075)	[4,338]	{2,169}	110,123	(22,025)	[5,286]	{2,643}
Warren	1,276	1,280	1,286	1,295	1,300	(260)	[62]	{31}	1,306	(261)	[63]	{31}	1,312	(262)	[63]	{31}

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.