

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

Date: 7/24/20

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 7/24/20 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.**

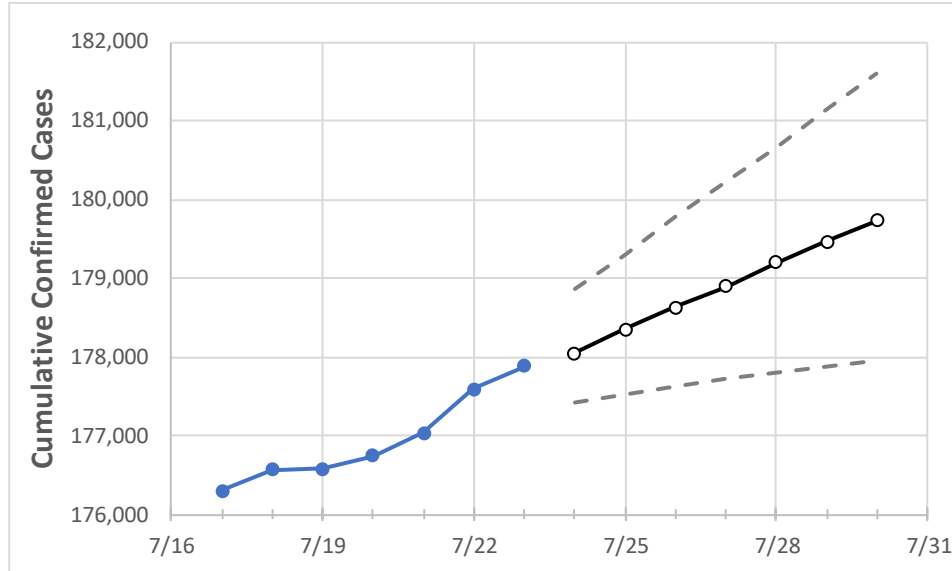
### IEM's Modeling Lead

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:						
	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30
New Jersey	176,743	177,038	177,591	177,887	178,042	178,348	178,626	178,894	179,201	179,467	179,726

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:						
	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30
Bergen	20,034	20,052	20,099	20,133	20,148	20,163	20,177	20,191	20,205	20,218	20,230
Burlington	5,450	5,478	5,490	5,502	5,510	5,517	5,525	5,532	5,538	5,545	5,551
Camden	7,845	7,867	7,888	7,910	7,924	7,938	7,952	7,965	7,978	7,990	8,002
Essex	19,121	19,153	19,173	19,198	19,212	19,225	19,239	19,252	19,265	19,278	19,290
Gloucester	2,829	2,855	2,870	2,894	2,904	2,914	2,924	2,934	2,944	2,953	2,963
Hudson	19,263	19,267	19,281	19,289	19,302	19,315	19,328	19,342	19,355	19,368	19,381
Hunterdon	1,101	1,101	1,102	1,102	1,103	1,103	1,104	1,104	1,105	1,106	1,106
Mercer	7,828	7,839	7,858	7,869	7,876	7,882	7,888	7,895	7,901	7,907	7,913
Middlesex	17,168	17,155	17,379	17,442	17,481	17,522	17,564	17,608	17,654	17,701	17,750
Monmouth	9,672	9,683	9,720	9,748	9,765	9,782	9,798	9,814	9,829	9,844	9,859
Morris	6,967	6,990	7,010	7,016	7,027	7,038	7,049	7,060	7,072	7,084	7,096
Ocean	9,956	9,988	10,054	10,074	10,095	10,116	10,138	10,161	10,183	10,207	10,231
Passaic	17,172	17,181	17,196	17,214	17,226	17,239	17,251	17,263	17,275	17,288	17,300
Somerset	5,068	5,072	5,082	5,094	5,100	5,107	5,113	5,120	5,126	5,132	5,139
Sussex	1,250	1,253	1,256	1,259	1,262	1,265	1,268	1,271	1,275	1,278	1,281
Union	16,297	16,297	16,297	16,297	69,718	79,590	90,318	100,619	110,247	120,689	130,855
Warren	1,280	1,286	1,295	1,296	1,298	1,301	1,303	1,306	1,308	1,311	1,314

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:											
	7/20	7/21	7/22	7/23	7/25				7/27				7/29			
Bergen	20,034	20,052	20,099	20,133	20,163	(4,033)	[968]	{484}	20,191	(4,038)	[969]	{485}	20,218	(4,044)	[970]	{485}
Burlington	5,450	5,478	5,490	5,502	5,517	(1,103)	[265]	{132}	5,532	(1,106)	[266]	{133}	5,545	(1,109)	[266]	{133}
Camden	7,845	7,867	7,888	7,910	7,938	(1,588)	[381]	{191}	7,965	(1,593)	[382]	{191}	7,990	(1,598)	[384]	{192}
Essex	19,121	19,153	19,173	19,198	19,225	(3,845)	[923]	{461}	19,252	(3,850)	[924]	{462}	19,278	(3,856)	[925]	{463}
Gloucester	2,829	2,855	2,870	2,894	2,914	(583)	[140]	{70}	2,934	(587)	[141]	{70}	2,953	(591)	[142]	{71}
Hudson	19,263	19,267	19,281	19,289	19,315	(3,863)	[927]	{464}	19,342	(3,868)	[928]	{464}	19,368	(3,874)	[930]	{465}
Hunterdon	1,101	1,101	1,102	1,102	1,103	(221)	[53]	{26}	1,104	(221)	[53]	{27}	1,106	(221)	[53]	{27}
Mercer	7,828	7,839	7,858	7,869	7,882	(1,576)	[378]	{189}	7,895	(1,579)	[379]	{189}	7,907	(1,581)	[380]	{190}
Middlesex	17,168	17,155	17,379	17,442	17,522	(3,504)	[841]	{421}	17,608	(3,522)	[845]	{423}	17,701	(3,540)	[850]	{425}
Monmouth	9,672	9,683	9,720	9,748	9,782	(1,956)	[470]	{235}	9,814	(1,963)	[471]	{236}	9,844	(1,969)	[473]	{236}
Morris	6,967	6,990	7,010	7,016	7,038	(1,408)	[338]	{169}	7,060	(1,412)	[339]	{169}	7,084	(1,417)	[340]	{170}
Ocean	9,956	9,988	10,054	10,074	10,116	(2,023)	[486]	{243}	10,161	(2,032)	[488]	{244}	10,207	(2,041)	[490]	{245}
Passaic	17,172	17,181	17,196	17,214	17,239	(3,448)	[827]	{414}	17,263	(3,453)	[829]	{414}	17,288	(3,458)	[830]	{415}
Somerset	5,068	5,072	5,082	5,094	5,107	(1,021)	[245]	{123}	5,120	(1,024)	[246]	{123}	5,132	(1,026)	[246]	{123}
Sussex	1,250	1,253	1,256	1,259	1,265	(253)	[61]	{30}	1,271	(254)	[61]	{31}	1,278	(256)	[61]	{31}
Union	16,297	16,297	16,297	16,297	79,590	(15,918)	[3,820]	{1,910}	100,619	(20,124)	[4,830]	{2,415}	120,689	(24,138)	[5,793]	{2,897}
Warren	1,280	1,286	1,295	1,296	1,301	(260)	[62]	{31}	1,306	(261)	[63]	{31}	1,311	(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](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.