

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

Date: 8/6/20

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 8/6/20 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.

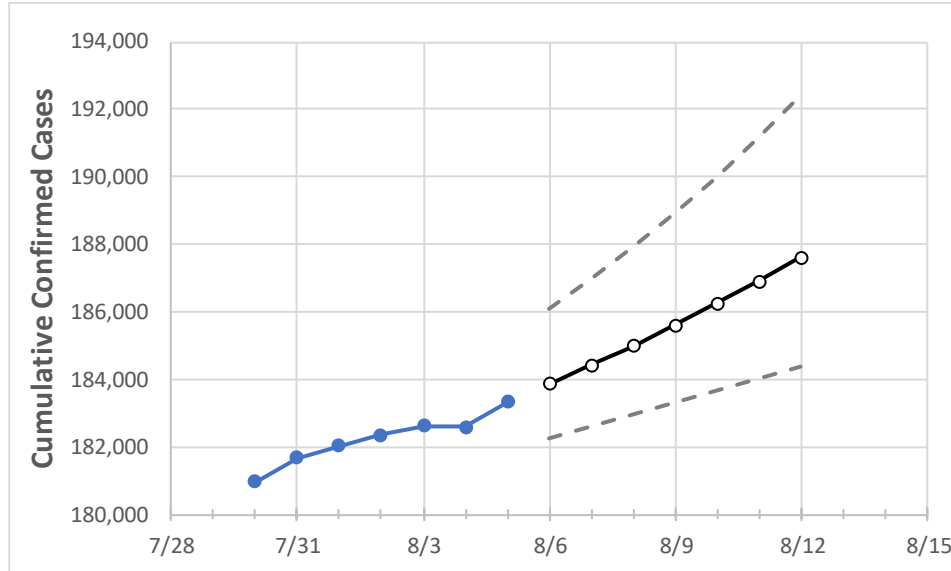
IEM's Modeling Lead

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:							
	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	
New Jersey	182,350	182,614	182,586	183,327	183,856	184,411	184,993	185,602	186,241	186,910	187,611	

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:							
	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	
Bergen	20,521	20,552	20,596	20,639	20,681	20,725	20,770	20,817	20,865	20,916	20,967	
Burlington	5,831	5,846	5,877	5,907	5,941	5,977	6,014	6,053	6,095	6,138	6,184	
Camden	8,357	8,375	8,409	8,442	8,480	8,519	8,560	8,601	8,643	8,686	8,731	
Essex	19,526	19,558	19,585	19,611	19,643	19,675	19,709	19,744	19,781	19,819	19,858	
Gloucester	3,097	3,106	3,135	3,164	3,186	3,209	3,232	3,256	3,282	3,308	3,335	
Hudson	19,511	19,528	19,546	19,564	19,581	19,598	19,615	19,633	19,651	19,669	19,688	
Hunterdon	1,137	1,138	1,141	1,144	1,147	1,150	1,153	1,156	1,159	1,163	1,166	
Mercer	8,042	8,051	8,064	8,076	8,092	8,108	8,125	8,143	8,161	8,180	8,199	
Middlesex	17,713	17,735	17,767	17,798	17,822	17,847	17,871	17,896	17,920	17,945	17,969	
Monmouth	10,117	10,137	10,165	10,192	10,225	10,260	10,295	10,331	10,367	10,405	10,444	
Morris	7,156	7,167	7,181	7,195	7,207	7,219	7,231	7,243	7,256	7,269	7,282	
Ocean	10,459	10,469	10,495	10,520	10,550	10,582	10,614	10,647	10,680	10,715	10,750	
Passaic	17,493	17,507	17,529	17,550	17,576	17,602	17,629	17,658	17,687	17,717	17,748	
Somerset	5,190	5,195	5,199	5,202	5,208	5,213	5,219	5,225	5,230	5,236	5,241	
Sussex	1,307	1,310	1,313	1,316	1,320	1,324	1,328	1,332	1,336	1,341	1,345	
Union	16,575	16,590	16,598	16,605	16,638	16,661	16,686	16,711	16,734	16,756	16,781	
Warren	1,330	1,332	1,334	1,336	1,338	1,339	1,341	1,343	1,345	1,346	1,348	

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:											
	8/2	8/3	8/4	8/5	8/7				8/9				8/11			
Bergen	20,521	20,552	20,596	20,639	20,725	(4,145)	[995]	{497}	20,817	(4,163)	[999]	{500}	20,916	(4,183)	[1,004]	{502}
Burlington	5,831	5,846	5,877	5,907	5,977	(1,195)	[287]	{143}	6,053	(1,211)	[291]	{145}	6,138	(1,228)	[295]	{147}
Camden	8,357	8,375	8,409	8,442	8,519	(1,704)	[409]	{204}	8,601	(1,720)	[413]	{206}	8,686	(1,737)	[417]	{208}
Essex	19,526	19,558	19,585	19,611	19,675	(3,935)	[944]	{472}	19,744	(3,949)	[948]	{474}	19,819	(3,964)	[951]	{476}
Gloucester	3,097	3,106	3,135	3,164	3,209	(642)	[154]	{77}	3,256	(651)	[156]	{78}	3,308	(662)	[159]	{79}
Hudson	19,511	19,528	19,546	19,564	19,598	(3,920)	[941]	{470}	19,633	(3,927)	[942]	{471}	19,669	(3,934)	[944]	{472}
Hunterdon	1,137	1,138	1,141	1,144	1,150	(230)	[55]	{28}	1,156	(231)	[55]	{28}	1,163	(233)	[56]	{28}
Mercer	8,042	8,051	8,064	8,076	8,108	(1,622)	[389]	{195}	8,143	(1,629)	[391]	{195}	8,180	(1,636)	[393]	{196}
Middlesex	17,713	17,735	17,767	17,798	17,847	(3,569)	[857]	{428}	17,896	(3,579)	[859]	{429}	17,945	(3,589)	[861]	{431}
Monmouth	10,117	10,137	10,165	10,192	10,260	(2,052)	[492]	{246}	10,331	(2,066)	[496]	{248}	10,405	(2,081)	[499]	{250}
Morris	7,156	7,167	7,181	7,195	7,219	(1,444)	[346]	{173}	7,243	(1,449)	[348]	{174}	7,269	(1,454)	[349]	{174}
Ocean	10,459	10,469	10,495	10,520	10,582	(2,116)	[508]	{254}	10,647	(2,129)	[511]	{256}	10,715	(2,143)	[514]	{257}
Passaic	17,493	17,507	17,529	17,550	17,602	(3,520)	[845]	{422}	17,658	(3,532)	[848]	{424}	17,717	(3,543)	[850]	{425}
Somerset	5,190	5,195	5,199	5,202	5,213	(1,043)	[250]	{125}	5,225	(1,045)	[251]	{125}	5,236	(1,047)	[251]	{126}
Sussex	1,307	1,310	1,313	1,316	1,324	(265)	[64]	{32}	1,332	(266)	[64]	{32}	1,341	(268)	[64]	{32}
Union	16,575	16,590	16,598	16,605	16,661	(3,332)	[800]	{400}	16,711	(3,342)	[802]	{401}	16,756	(3,351)	[804]	{402}
Warren	1,330	1,332	1,334	1,336	1,339	(268)	[64]	{32}	1,343	(269)	[64]	{32}	1,346	(269)	[65]	{32}

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.