

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

Date: 8/11/20

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 8/11/20 12 p.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.

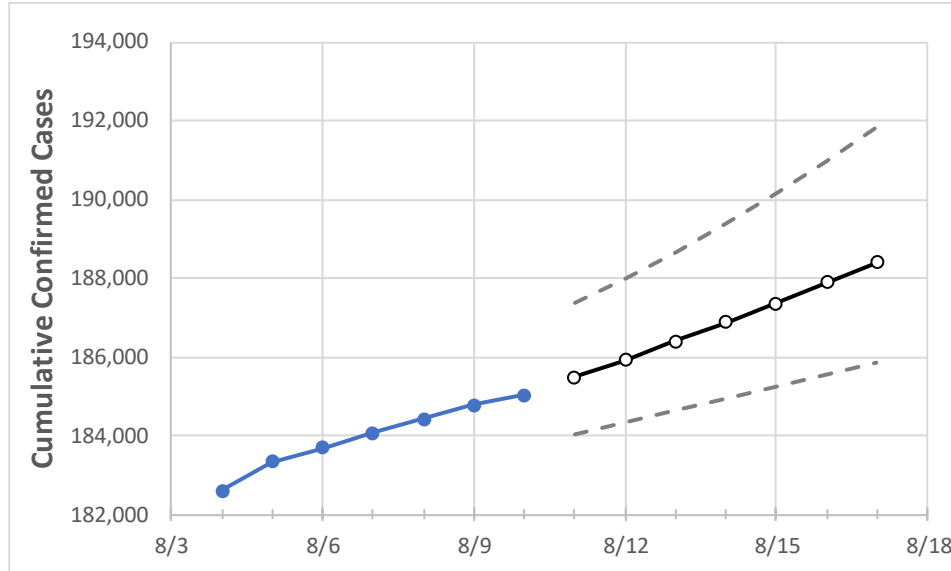
IEM's Modeling Lead

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:							
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	
New Jersey	184,061	184,429	184,773	185,031	185,473	185,928	186,396	186,877	187,371	187,880	188,403	

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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	
Bergen	20,694	20,751	20,794	20,825	20,866	20,908	20,951	20,995	21,040	21,087	21,134	
Burlington	5,952	5,977	6,007	6,025	6,056	6,088	6,122	6,156	6,192	6,229	6,268	
Camden	8,499	8,525	8,562	8,580	8,612	8,644	8,676	8,709	8,742	8,776	8,810	
Essex	19,686	19,715	19,728	19,747	19,775	19,805	19,835	19,865	19,897	19,929	19,963	
Gloucester	3,216	3,236	3,248	3,258	3,278	3,299	3,319	3,341	3,363	3,385	3,408	
Hudson	19,607	19,641	19,671	19,683	19,703	19,723	19,743	19,765	19,786	19,809	19,832	
Hunterdon	1,146	1,148	1,149	1,149	1,151	1,153	1,155	1,157	1,159	1,162	1,164	
Mercer	8,104	8,115	8,119	8,127	8,139	8,151	8,163	8,176	8,188	8,201	8,214	
Middlesex	17,857	17,884	17,919	17,932	17,955	17,979	18,002	18,026	18,050	18,073	18,097	
Monmouth	10,267	10,284	10,302	10,326	10,355	10,385	10,415	10,445	10,476	10,508	10,539	
Morris	7,224	7,235	7,248	7,261	7,273	7,286	7,299	7,312	7,325	7,338	7,352	
Ocean	10,564	10,585	10,596	10,603	10,622	10,641	10,661	10,680	10,699	10,718	10,737	
Passaic	17,599	17,623	17,642	17,665	17,690	17,716	17,743	17,770	17,798	17,827	17,856	
Somerset	5,223	5,231	5,245	5,253	5,260	5,267	5,274	5,281	5,289	5,296	5,303	
Sussex	1,322	1,327	1,330	1,333	1,336	1,340	1,343	1,347	1,350	1,354	1,358	
Union	16,636	16,663	16,695	16,725	16,773	16,791	16,812	16,831	16,852	16,873	16,892	
Warren	1,340	1,343	1,345	1,345	1,347	1,348	1,350	1,352	1,354	1,355	1,357	

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:											
	8/7	8/8	8/9	8/10	8/12				8/14				8/16			
Bergen	20,694	20,751	20,794	20,825	20,908	(4,182)	[1,004]	{502}	20,995	(4,199)	[1,008]	{504}	21,087	(4,217)	[1,012]	{506}
Burlington	5,952	5,977	6,007	6,025	6,088	(1,218)	[292]	{146}	6,156	(1,231)	[295]	{148}	6,229	(1,246)	[299]	{149}
Camden	8,499	8,525	8,562	8,580	8,644	(1,729)	[415]	{207}	8,709	(1,742)	[418]	{209}	8,776	(1,755)	[421]	{211}
Essex	19,686	19,715	19,728	19,747	19,805	(3,961)	[951]	{475}	19,865	(3,973)	[954]	{477}	19,929	(3,986)	[957]	{478}
Gloucester	3,216	3,236	3,248	3,258	3,299	(660)	[158]	{79}	3,341	(668)	[160]	{80}	3,385	(677)	[162]	{81}
Hudson	19,607	19,641	19,671	19,683	19,723	(3,945)	[947]	{473}	19,765	(3,953)	[949]	{474}	19,809	(3,962)	[951]	{475}
Hunterdon	1,146	1,148	1,149	1,149	1,153	(231)	[55]	{28}	1,157	(231)	[56]	{28}	1,162	(232)	[56]	{28}
Mercer	8,104	8,115	8,119	8,127	8,151	(1,630)	[391]	{196}	8,176	(1,635)	[392]	{196}	8,201	(1,640)	[394]	{197}
Middlesex	17,857	17,884	17,919	17,932	17,979	(3,596)	[863]	{431}	18,026	(3,605)	[865]	{433}	18,073	(3,615)	[868]	{434}
Monmouth	10,267	10,284	10,302	10,326	10,385	(2,077)	[498]	{249}	10,445	(2,089)	[501]	{251}	10,508	(2,102)	[504]	{252}
Morris	7,224	7,235	7,248	7,261	7,286	(1,457)	[350]	{175}	7,312	(1,462)	[351]	{175}	7,338	(1,468)	[352]	{176}
Ocean	10,564	10,585	10,596	10,603	10,641	(2,128)	[511]	{255}	10,680	(2,136)	[513]	{256}	10,718	(2,144)	[514]	{257}
Passaic	17,599	17,623	17,642	17,665	17,716	(3,543)	[850]	{425}	17,770	(3,554)	[853]	{426}	17,827	(3,565)	[856]	{428}
Somerset	5,223	5,231	5,245	5,253	5,267	(1,053)	[253]	{126}	5,281	(1,056)	[254]	{127}	5,296	(1,059)	[254]	{127}
Sussex	1,322	1,327	1,330	1,333	1,340	(268)	[64]	{32}	1,347	(269)	[65]	{32}	1,354	(271)	[65]	{32}
Union	16,636	16,663	16,695	16,725	16,791	(3,358)	[806]	{403}	16,831	(3,366)	[808]	{404}	16,873	(3,375)	[810]	{405}
Warren	1,340	1,343	1,345	1,345	1,348	(270)	[65]	{32}	1,352	(270)	[65]	{32}	1,355	(271)	[65]	{33}

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.