

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/12/20**

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 8/12/20 1 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.

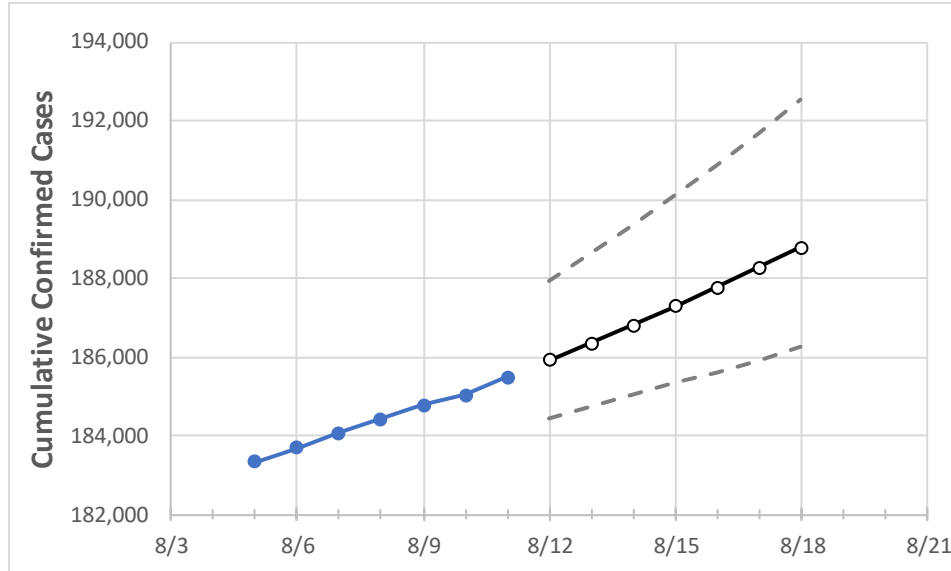
IEM's Modeling Lead

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:							
	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	
New Jersey	184,429	184,773	185,031	185,475	185,909	186,356	186,814	187,285	187,768	188,265	188,775	

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:						
	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	
Bergen	20,751	20,794	20,825	20,864	20,905	20,948	20,992	21,037	21,083	21,130	21,179	
Burlington	5,977	6,007	6,025	6,042	6,071	6,100	6,131	6,162	6,195	6,228	6,263	
Camden	8,525	8,562	8,580	8,614	8,645	8,677	8,708	8,741	8,773	8,806	8,839	
Essex	19,715	19,728	19,747	19,776	19,804	19,833	19,863	19,893	19,924	19,956	19,988	
Gloucester	3,236	3,248	3,258	3,283	3,304	3,325	3,347	3,370	3,393	3,417	3,441	
Hudson	19,641	19,671	19,683	19,717	19,739	19,761	19,784	19,807	19,832	19,857	19,883	
Hunterdon	1,148	1,149	1,149	1,149	1,151	1,153	1,156	1,158	1,160	1,163	1,165	
Mercer	8,115	8,119	8,127	8,139	8,151	8,163	8,175	8,187	8,200	8,213	8,226	
Middlesex	17,884	17,919	17,932	17,959	17,983	18,007	18,032	18,056	18,081	18,105	18,130	
Monmouth	10,284	10,302	10,326	10,348	10,376	10,404	10,432	10,461	10,490	10,519	10,549	
Morris	7,235	7,248	7,261	7,273	7,285	7,298	7,311	7,324	7,337	7,350	7,364	
Ocean	10,585	10,596	10,603	10,640	10,660	10,681	10,701	10,722	10,742	10,763	10,783	
Passaic	17,623	17,642	17,665	17,705	17,732	17,760	17,789	17,819	17,850	17,881	17,914	
Somerset	5,231	5,245	5,253	5,265	5,273	5,280	5,288	5,296	5,304	5,312	5,320	
Sussex	1,327	1,330	1,333	1,336	1,339	1,343	1,347	1,350	1,354	1,358	1,362	
Union	16,663	16,695	16,725	16,749	16,780	16,812	16,846	16,877	16,907	16,937	16,970	
Warren	1,343	1,345	1,346	1,347	1,348	1,350	1,351	1,352	1,353	1,355	1,356	

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:											
	8/8	8/9	8/10	8/11	8/13				8/15				8/17			
Bergen	20,751	20,794	20,825	20,864	20,948	(4,190)	[1,006]	{503}	21,037	(4,207)	[1,010]	{505}	21,130	(4,226)	[1,014]	{507}
Burlington	5,977	6,007	6,025	6,042	6,100	(1,220)	[293]	{146}	6,162	(1,232)	[296]	{148}	6,228	(1,246)	[299]	{149}
Camden	8,525	8,562	8,580	8,614	8,677	(1,735)	[416]	{208}	8,741	(1,748)	[420]	{210}	8,806	(1,761)	[423]	{211}
Essex	19,715	19,728	19,747	19,776	19,833	(3,967)	[952]	{476}	19,893	(3,979)	[955]	{477}	19,956	(3,991)	[958]	{479}
Gloucester	3,236	3,248	3,258	3,283	3,325	(665)	[160]	{80}	3,370	(674)	[162]	{81}	3,417	(683)	[164]	{82}
Hudson	19,641	19,671	19,683	19,717	19,761	(3,952)	[949]	{474}	19,807	(3,961)	[951]	{475}	19,857	(3,971)	[953]	{477}
Hunterdon	1,148	1,149	1,149	1,149	1,153	(231)	[55]	{28}	1,158	(232)	[56]	{28}	1,163	(233)	[56]	{28}
Mercer	8,115	8,119	8,127	8,139	8,163	(1,633)	[392]	{196}	8,187	(1,637)	[393]	{196}	8,213	(1,643)	[394]	{197}
Middlesex	17,884	17,919	17,932	17,959	18,007	(3,601)	[864]	{432}	18,056	(3,611)	[867]	{433}	18,105	(3,621)	[869]	{435}
Monmouth	10,284	10,302	10,326	10,348	10,404	(2,081)	[499]	{250}	10,461	(2,092)	[502]	{251}	10,519	(2,104)	[505]	{252}
Morris	7,235	7,248	7,261	7,273	7,298	(1,460)	[350]	{175}	7,324	(1,465)	[352]	{176}	7,350	(1,470)	[353]	{176}
Ocean	10,585	10,596	10,603	10,640	10,681	(2,136)	[513]	{256}	10,722	(2,144)	[515]	{257}	10,763	(2,153)	[517]	{258}
Passaic	17,623	17,642	17,665	17,705	17,760	(3,552)	[853]	{426}	17,819	(3,564)	[855]	{428}	17,881	(3,576)	[858]	{429}
Somerset	5,231	5,245	5,253	5,265	5,280	(1,056)	[253]	{127}	5,296	(1,059)	[254]	{127}	5,312	(1,062)	[255]	{127}
Sussex	1,327	1,330	1,333	1,336	1,343	(269)	[64]	{32}	1,350	(270)	[65]	{32}	1,358	(272)	[65]	{33}
Union	16,663	16,695	16,725	16,749	16,812	(3,362)	[807]	{403}	16,877	(3,375)	[810]	{405}	16,937	(3,387)	[813]	{406}
Warren	1,343	1,345	1,346	1,347	1,350	(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.