

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

Date: 10/9/20

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 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 10/9/20 9 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.

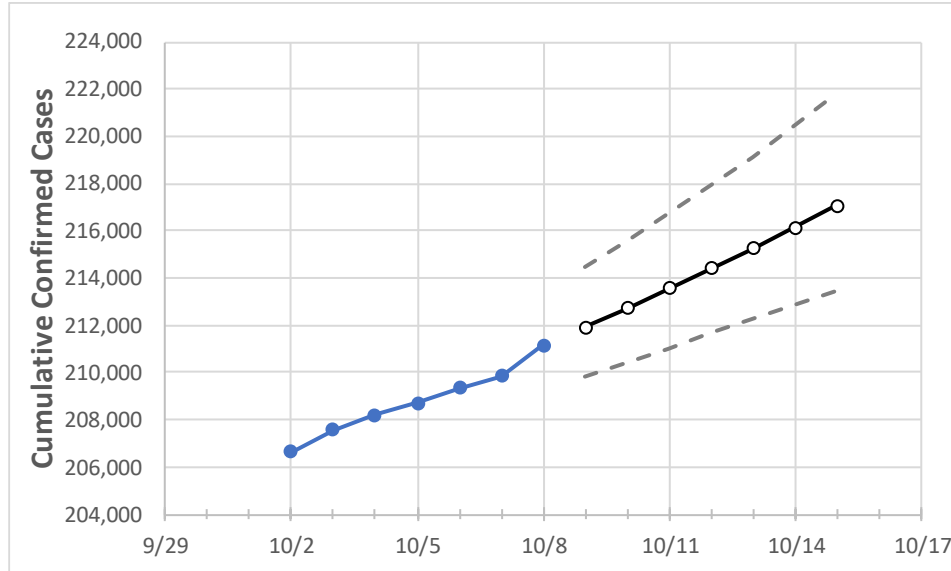
IEM's Modeling Lead

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:						
	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14	10/15
New Jersey	208,713	209,342	209,850	211,148	211,926	212,725	213,545	214,389	215,255	216,145	217,060

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:						
	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14	10/15
Bergen	22,774	22,827	22,876	22,959	23,021	23,087	23,155	23,227	23,302	23,380	23,462
Burlington	7,327	7,343	7,367	7,442	7,470	7,497	7,525	7,553	7,582	7,611	7,640
Camden	10,149	10,170	10,199	10,286	10,321	10,357	10,394	10,432	10,470	10,509	10,548
Essex	21,365	21,407	21,453	21,539	21,591	21,645	21,701	21,760	21,821	21,884	21,951
Gloucester	4,796	4,812	4,830	4,877	4,899	4,921	4,943	4,965	4,986	5,007	5,028
Hudson	20,914	20,954	20,989	21,042	21,082	21,124	21,168	21,213	21,260	21,310	21,361
Hunterdon	1,398	1,400	1,410	1,431	1,440	1,449	1,459	1,469	1,480	1,492	1,504
Mercer	8,732	8,742	8,752	8,773	8,785	8,798	8,811	8,824	8,837	8,850	8,864
Middlesex	19,943	19,990	20,033	20,134	20,205	20,279	20,355	20,433	20,513	20,595	20,681
Monmouth	12,280	12,386	12,467	12,588	12,669	12,754	12,843	12,935	13,032	13,133	13,239
Morris	7,999	8,011	8,025	8,061	8,081	8,102	8,124	8,146	8,168	8,192	8,215
Ocean	14,363	14,489	14,538	14,814	14,998	15,192	15,394	15,607	15,829	16,063	16,307
Passaic	19,269	19,315	19,343	19,418	19,458	19,499	19,542	19,586	19,631	19,677	19,725
Somerset	5,911	5,934	5,935	5,967	5,978	5,989	5,999	6,010	6,021	6,032	6,043
Sussex	1,539	1,547	1,553	1,559	1,563	1,567	1,572	1,576	1,581	1,586	1,590
Union	17,903	17,944	17,978	18,061	18,110	18,161	18,214	18,270	18,329	18,390	18,455
Warren	1,461	1,463	1,465	1,471	1,474	1,477	1,480	1,483	1,487	1,490	1,493

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:											
	10/5	10/6	10/7	10/8	10/10				10/12				10/14			
Bergen	22,774	22,827	22,876	22,959	23,087	(4,617)	[1,108]	{554}	23,227	(4,645)	[1,115]	{557}	23,380	(4,676)	[1,122]	{561}
Burlington	7,327	7,343	7,367	7,442	7,497	(1,499)	[360]	{180}	7,553	(1,511)	[363]	{181}	7,611	(1,522)	[365]	{183}
Camden	10,149	10,170	10,199	10,286	10,357	(2,071)	[497]	{249}	10,432	(2,086)	[501]	{250}	10,509	(2,102)	[504]	{252}
Essex	21,365	21,407	21,453	21,539	21,645	(4,329)	[1,039]	{519}	21,760	(4,352)	[1,044]	{522}	21,884	(4,377)	[1,050]	{525}
Gloucester	4,796	4,812	4,830	4,877	4,921	(984)	[236]	{118}	4,965	(993)	[238]	{119}	5,007	(1,001)	[240]	{120}
Hudson	20,914	20,954	20,989	21,042	21,124	(4,225)	[1,014]	{507}	21,213	(4,243)	[1,018]	{509}	21,310	(4,262)	[1,023]	{511}
Hunterdon	1,398	1,400	1,410	1,431	1,449	(290)	[70]	{35}	1,469	(294)	[71]	{35}	1,492	(298)	[72]	{36}
Mercer	8,732	8,742	8,752	8,773	8,798	(1,760)	[422]	{211}	8,824	(1,765)	[424]	{212}	8,850	(1,770)	[425]	{212}
Middlesex	19,943	19,990	20,033	20,134	20,279	(4,056)	[973]	{487}	20,433	(4,087)	[981]	{490}	20,595	(4,119)	[989]	{494}
Monmouth	12,280	12,386	12,467	12,588	12,754	(2,551)	[612]	{306}	12,935	(2,587)	[621]	{310}	13,133	(2,627)	[630]	{315}
Morris	7,999	8,011	8,025	8,061	8,102	(1,620)	[389]	{194}	8,146	(1,629)	[391]	{195}	8,192	(1,638)	[393]	{197}
Ocean	14,363	14,489	14,538	14,814	15,192	(3,038)	[729]	{365}	15,607	(3,121)	[749]	{375}	16,063	(3,213)	[771]	{386}
Passaic	19,269	19,315	19,343	19,418	19,499	(3,900)	[936]	{468}	19,586	(3,917)	[940]	{470}	19,677	(3,935)	[945]	{472}
Somerset	5,911	5,934	5,935	5,967	5,989	(1,198)	[287]	{144}	6,010	(1,202)	[288]	{144}	6,032	(1,206)	[290]	{145}
Sussex	1,539	1,547	1,553	1,559	1,567	(313)	[75]	{38}	1,576	(315)	[76]	{38}	1,586	(317)	[76]	{38}
Union	17,903	17,944	17,978	18,061	18,161	(3,632)	[872]	{436}	18,270	(3,654)	[877]	{438}	18,390	(3,678)	[883]	{441}
Warren	1,461	1,463	1,465	1,471	1,477	(295)	[71]	{35}	1,483	(297)	[71]	{36}	1,490	(298)	[72]	{36}

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.