

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/15/20**

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 10/15/20 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.

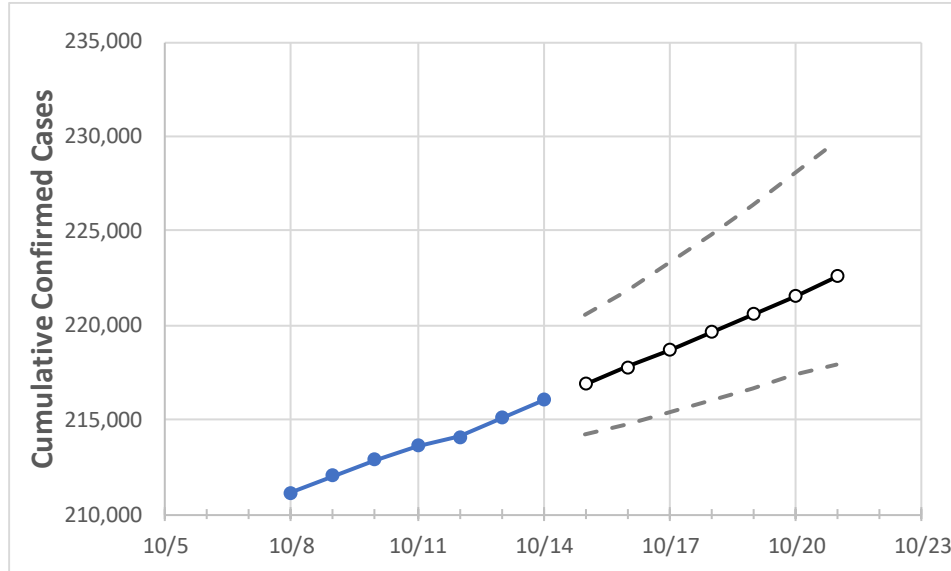
IEM's Modeling Lead

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:							
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21	
New Jersey	213,628	214,097	215,085	216,023	216,887	217,774	218,683	219,616	220,574	221,556	222,565	

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:							
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21	
Bergen	23,173	23,221	23,323	23,391	23,473	23,559	23,649	23,743	23,841	23,944	24,051	
Burlington	7,545	7,559	7,598	7,662	7,694	7,726	7,758	7,791	7,825	7,859	7,894	
Camden	10,470	10,494	10,553	10,590	10,635	10,682	10,730	10,779	10,830	10,882	10,935	
Essex	21,760	21,821	21,913	22,018	22,111	22,209	22,314	22,426	22,544	22,670	22,804	
Gloucester	4,972	4,981	5,008	5,043	5,062	5,080	5,099	5,117	5,134	5,152	5,169	
Hudson	21,183	21,222	21,286	21,347	21,405	21,465	21,529	21,596	21,665	21,739	21,815	
Hunterdon	1,451	1,457	1,461	1,466	1,473	1,481	1,489	1,497	1,505	1,514	1,523	
Mercer	8,820	8,829	8,850	8,866	8,881	8,897	8,914	8,930	8,947	8,965	8,983	
Middlesex	20,361	20,394	20,475	20,552	20,623	20,695	20,768	20,843	20,919	20,997	21,075	
Monmouth	12,811	12,851	12,936	13,020	13,109	13,200	13,295	13,392	13,493	13,597	13,704	
Morris	8,154	8,167	8,215	8,230	8,256	8,282	8,310	8,338	8,367	8,397	8,427	
Ocean	15,170	15,255	15,375	15,578	15,711	15,845	15,982	16,121	16,262	16,405	16,550	
Passaic	19,605	19,627	19,693	19,768	19,825	19,884	19,946	20,010	20,078	20,148	20,221	
Somerset	6,018	6,023	6,045	6,060	6,071	6,081	6,092	6,102	6,113	6,123	6,133	
Sussex	1,579	1,581	1,584	1,584	1,587	1,591	1,594	1,598	1,601	1,605	1,608	
Union	18,206	18,247	18,316	18,375	18,437	18,501	18,569	18,640	18,713	18,791	18,871	
Warren	1,480	1,484	1,488	1,493	1,497	1,501	1,505	1,510	1,515	1,519	1,524	

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:											
	10/11	10/12	10/13	10/14	10/16				10/18				10/20			
Bergen	23,173	23,221	23,323	23,391	23,559	(4,712)	[1,131]	{565}	23,743	(4,749)	[1,140]	{570}	23,944	(4,789)	[1,149]	{575}
Burlington	7,545	7,559	7,598	7,662	7,726	(1,545)	[371]	{185}	7,791	(1,558)	[374]	{187}	7,859	(1,572)	[377]	{189}
Camden	10,470	10,494	10,553	10,590	10,682	(2,136)	[513]	{256}	10,779	(2,156)	[517]	{259}	10,882	(2,176)	[522]	{261}
Essex	21,760	21,821	21,913	22,018	22,209	(4,442)	[1,066]	{533}	22,426	(4,485)	[1,076]	{538}	22,670	(4,534)	[1,088]	{544}
Gloucester	4,972	4,981	5,008	5,043	5,080	(1,016)	[244]	{122}	5,117	(1,023)	[246]	{123}	5,152	(1,030)	[247]	{124}
Hudson	21,183	21,222	21,286	21,347	21,465	(4,293)	[1,030]	{515}	21,596	(4,319)	[1,037]	{518}	21,739	(4,348)	[1,043]	{522}
Hunterdon	1,451	1,457	1,461	1,466	1,481	(296)	[71]	{36}	1,497	(299)	[72]	{36}	1,514	(303)	[73]	{36}
Mercer	8,820	8,829	8,850	8,866	8,897	(1,779)	[427]	{214}	8,930	(1,786)	[429]	{214}	8,965	(1,793)	[430]	{215}
Middlesex	20,361	20,394	20,475	20,552	20,695	(4,139)	[993]	{497}	20,843	(4,169)	[1,000]	{500}	20,997	(4,199)	[1,008]	{504}
Monmouth	12,811	12,851	12,936	13,020	13,200	(2,640)	[634]	{317}	13,392	(2,678)	[643]	{321}	13,597	(2,719)	[653]	{326}
Morris	8,154	8,167	8,215	8,230	8,282	(1,656)	[398]	{199}	8,338	(1,668)	[400]	{200}	8,397	(1,679)	[403]	{202}
Ocean	15,170	15,255	15,375	15,578	15,845	(3,169)	[761]	{380}	16,121	(3,224)	[774]	{387}	16,405	(3,281)	[787]	{394}
Passaic	19,605	19,627	19,693	19,768	19,884	(3,977)	[954]	{477}	20,010	(4,002)	[960]	{480}	20,148	(4,030)	[967]	{484}
Somerset	6,018	6,023	6,045	6,060	6,081	(1,216)	[292]	{146}	6,102	(1,220)	[293]	{146}	6,123	(1,225)	[294]	{147}
Sussex	1,579	1,581	1,584	1,584	1,591	(318)	[76]	{38}	1,598	(320)	[77]	{38}	1,605	(321)	[77]	{39}
Union	18,206	18,247	18,316	18,375	18,501	(3,700)	[888]	{444}	18,640	(3,728)	[895]	{447}	18,791	(3,758)	[902]	{451}
Warren	1,480	1,484	1,488	1,493	1,501	(300)	[72]	{36}	1,510	(302)	[72]	{36}	1,519	(304)	[73]	{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.