

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

**Date: 9/23/20**

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 9/23/20 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.**

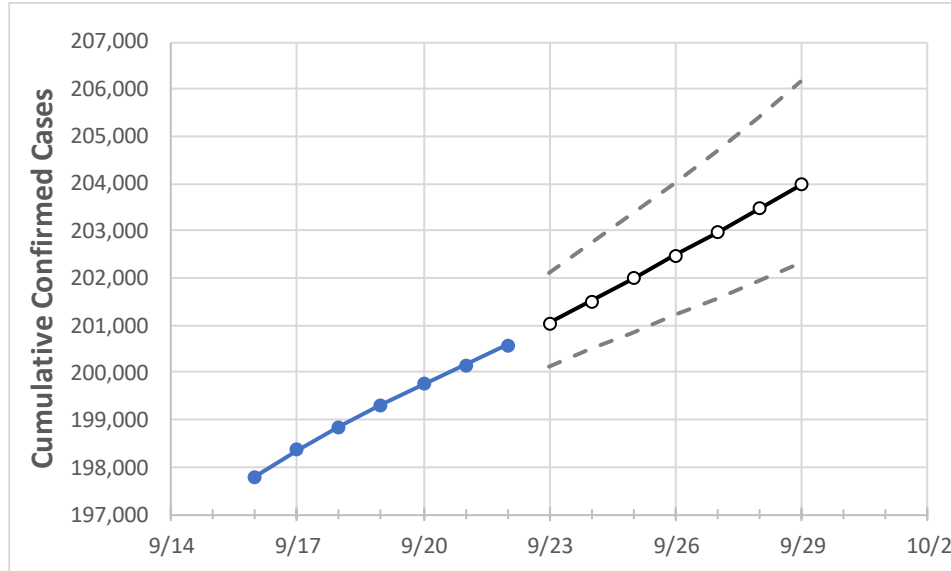
### **IEM's Modeling Lead**

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:							
	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	
New Jersey	199,309	199,762	200,154	200,580	201,042	201,511	201,988	202,473	202,965	203,465	203,973	

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:							
	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	
Bergen	22,145	22,168	22,197	22,251	22,277	22,304	22,330	22,357	22,385	22,413	22,441	
Burlington	6,901	6,930	6,946	6,974	7,003	7,034	7,064	7,096	7,128	7,161	7,194	
Camden	9,667	9,707	9,729	9,748	9,776	9,803	9,831	9,860	9,888	9,917	9,946	
Essex	20,803	20,833	20,854	20,874	20,897	20,920	20,944	20,967	20,991	21,014	21,038	
Gloucester	4,281	4,313	4,330	4,358	4,392	4,425	4,459	4,493	4,527	4,561	4,595	
Hudson	20,468	20,482	20,506	20,540	20,557	20,574	20,592	20,609	20,627	20,645	20,663	
Hunterdon	1,282	1,286	1,288	1,292	1,296	1,299	1,303	1,307	1,311	1,315	1,319	
Mercer	8,563	8,567	8,576	8,583	8,592	8,601	8,610	8,619	8,628	8,637	8,646	
Middlesex	19,050	19,089	19,116	19,158	19,202	19,247	19,294	19,342	19,391	19,442	19,495	
Monmouth	11,438	11,500	11,544	11,584	11,634	11,687	11,740	11,796	11,854	11,913	11,975	
Morris	7,718	7,742	7,763	7,775	7,788	7,802	7,815	7,829	7,844	7,859	7,874	
Ocean	12,182	12,241	12,317	12,382	12,457	12,536	12,618	12,704	12,794	12,888	12,987	
Passaic	18,799	18,822	18,832	18,846	18,865	18,884	18,903	18,921	18,940	18,958	18,976	
Somerset	5,685	5,691	5,703	5,709	5,725	5,742	5,760	5,778	5,797	5,817	5,837	
Sussex	1,450	1,452	1,453	1,456	1,458	1,460	1,462	1,464	1,467	1,469	1,471	
Union	17,415	17,440	17,466	17,505	17,526	17,548	17,571	17,595	17,619	17,643	17,669	
Warren	1,430	1,431	1,433	1,436	1,438	1,440	1,441	1,443	1,445	1,447	1,449	

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:											
	9/19	9/20	9/21	9/22	9/24				9/26				9/28			
Bergen	22,145	22,168	22,197	22,251	22,304	(4,461)	[1,071]	{535}	22,357	(4,471)	[1,073]	{537}	22,413	(4,483)	[1,076]	{538}
Burlington	6,901	6,930	6,946	6,974	7,034	(1,407)	[338]	{169}	7,096	(1,419)	[341]	{170}	7,161	(1,432)	[344]	{172}
Camden	9,667	9,707	9,729	9,748	9,803	(1,961)	[471]	{235}	9,860	(1,972)	[473]	{237}	9,917	(1,983)	[476]	{238}
Essex	20,803	20,833	20,854	20,874	20,920	(4,184)	[1,004]	{502}	20,967	(4,193)	[1,006]	{503}	21,014	(4,203)	[1,009]	{504}
Gloucester	4,281	4,313	4,330	4,358	4,425	(885)	[212]	{106}	4,493	(899)	[216]	{108}	4,561	(912)	[219]	{109}
Hudson	20,468	20,482	20,506	20,540	20,574	(4,115)	[988]	{494}	20,609	(4,122)	[989]	{495}	20,645	(4,129)	[991]	{495}
Hunterdon	1,282	1,286	1,288	1,292	1,299	(260)	[62]	{31}	1,307	(261)	[63]	{31}	1,315	(263)	[63]	{32}
Mercer	8,563	8,567	8,576	8,583	8,601	(1,720)	[413]	{206}	8,619	(1,724)	[414]	{207}	8,637	(1,727)	[415]	{207}
Middlesex	19,050	19,089	19,116	19,158	19,247	(3,849)	[924]	{462}	19,342	(3,868)	[928]	{464}	19,442	(3,888)	[933]	{467}
Monmouth	11,438	11,500	11,544	11,584	11,687	(2,337)	[561]	{280}	11,796	(2,359)	[566]	{283}	11,913	(2,383)	[572]	{286}
Morris	7,718	7,742	7,763	7,775	7,802	(1,560)	[374]	{187}	7,829	(1,566)	[376]	{188}	7,859	(1,572)	[377]	{189}
Ocean	12,182	12,241	12,317	12,382	12,536	(2,507)	[602]	{301}	12,704	(2,541)	[610]	{305}	12,888	(2,578)	[619]	{309}
Passaic	18,799	18,822	18,832	18,846	18,884	(3,777)	[906]	{453}	18,921	(3,784)	[908]	{454}	18,958	(3,792)	[910]	{455}
Somerset	5,685	5,691	5,703	5,709	5,742	(1,148)	[276]	{138}	5,778	(1,156)	[277]	{139}	5,817	(1,163)	[279]	{140}
Sussex	1,450	1,452	1,453	1,456	1,460	(292)	[70]	{35}	1,464	(293)	[70]	{35}	1,469	(294)	[71]	{35}
Union	17,415	17,440	17,466	17,505	17,548	(3,510)	[842]	{421}	17,595	(3,519)	[845]	{422}	17,643	(3,529)	[847]	{423}
Warren	1,430	1,431	1,433	1,436	1,440	(288)	[69]	{35}	1,443	(289)	[69]	{35}	1,447	(289)	[69]	{35}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.