

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

Date: 3/22/21

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 3/22/21 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.

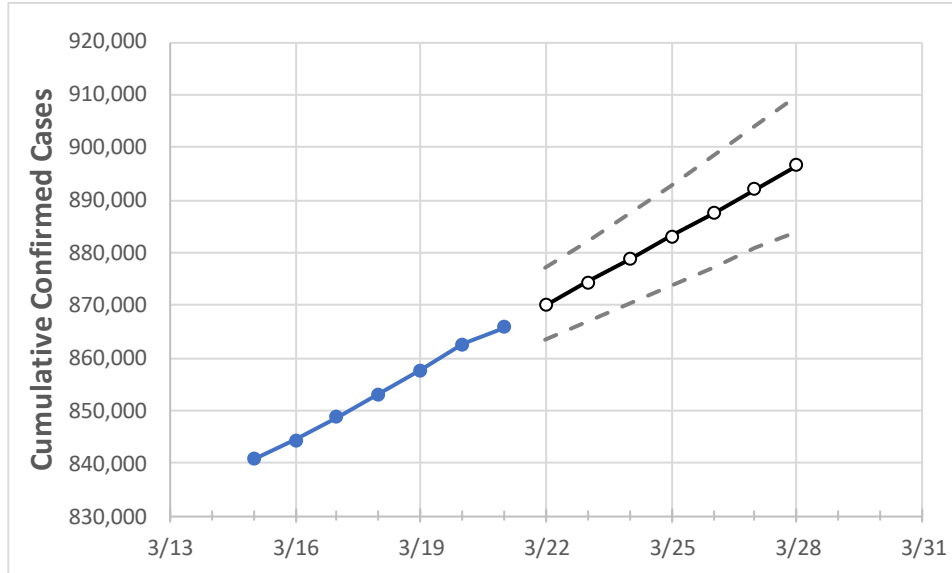
IEM's Modeling Lead

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:					
	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28

New Jersey 853,188 857,739 862,648 865,886 870,039 874,357 878,716 883,163 887,511 892,014 896,519

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

New Jersey Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28
Bergen	85,044	85,586	86,106	86,467	86,943	87,423	87,906	88,401	88,899	89,408	89,904
Burlington	37,675	37,844	38,004	38,116	38,261	38,410	38,558	38,708	38,859	39,010	39,163
Camden	46,496	46,639	46,885	47,005	47,161	47,322	47,488	47,645	47,813	47,981	48,154
Essex	79,541	79,950	80,358	80,704	81,110	81,523	81,945	82,382	82,827	83,274	83,724
Gloucester	25,536	25,651	25,775	25,844	25,941	26,039	26,138	26,239	26,344	26,448	26,559
Hudson	74,909	75,218	75,757	76,017	76,365	76,722	77,071	77,432	77,798	78,164	78,528
Hunterdon	7,629	7,679	7,717	7,752	7,798	7,844	7,891	7,939	7,988	8,037	8,087
Mercer	29,423	29,515	29,659	29,756	29,861	29,967	30,075	30,182	30,293	30,407	30,520
Middlesex	78,287	78,719	79,134	79,447	79,829	80,220	80,616	81,018	81,428	81,850	82,274
Monmouth	63,054	63,415	63,919	64,209	64,589	64,975	65,366	65,764	66,160	66,566	66,975
Morris	41,744	42,009	42,348	42,586	42,894	43,210	43,532	43,851	44,180	44,523	44,872
Ocean	64,004	64,374	64,706	64,985	65,308	65,633	65,956	66,282	66,611	66,942	67,279
Passaic	60,899	61,257	61,482	61,662	61,923	62,186	62,454	62,726	63,008	63,286	63,581
Somerset	24,879	25,004	25,168	25,268	25,401	25,539	25,674	25,811	25,951	26,094	26,238
Sussex	10,250	10,343	10,435	10,502	10,592	10,684	10,781	10,879	10,982	11,089	11,195
Union	60,820	61,090	61,390	61,593	61,847	62,108	62,374	62,640	62,914	63,187	63,458
Warren	7,781	7,840	7,909	7,951	8,003	8,056	8,112	8,167	8,225	8,284	8,344

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:											
	3/18	3/19	3/20	3/21	3/23			3/25			3/27					
Bergen	85,044	85,586	86,106	86,467	87,423	(17,485)	[4,196]	{2,098}	88,401	(17,680)	[4,243]	{2,122}	89,408	(17,882)	[4,292]	{2,146}
Burlington	37,675	37,844	38,004	38,116	38,410	(7,682)	[1,844]	{922}	38,708	(7,742)	[1,858]	{929}	39,010	(7,802)	[1,872]	{936}
Camden	46,496	46,639	46,885	47,005	47,322	(9,464)	[2,271]	{1,136}	47,645	(9,529)	[2,287]	{1,143}	47,981	(9,596)	[2,303]	{1,152}
Essex	79,541	79,950	80,358	80,704	81,523	(16,305)	[3,913]	{1,957}	82,382	(16,476)	[3,954]	{1,977}	83,274	(16,655)	[3,997]	{1,999}
Gloucester	25,536	25,651	25,775	25,844	26,039	(5,208)	[1,250]	{625}	26,239	(5,248)	[1,259]	{630}	26,448	(5,290)	[1,270]	{635}
Hudson	74,909	75,218	75,757	76,017	76,722	(15,344)	[3,683]	{1,841}	77,432	(15,486)	[3,717]	{1,858}	78,164	(15,633)	[3,752]	{1,876}
Hunterdon	7,629	7,679	7,717	7,752	7,844	(1,569)	[377]	{188}	7,939	(1,588)	[381]	{191}	8,037	(1,607)	[386]	{193}
Mercer	29,423	29,515	29,659	29,756	29,967	(5,993)	[1,438]	{719}	30,182	(6,036)	[1,449]	{724}	30,407	(6,081)	[1,460]	{730}
Middlesex	78,287	78,719	79,134	79,447	80,220	(16,044)	[3,851]	{1,925}	81,018	(16,204)	[3,889]	{1,944}	81,850	(16,370)	[3,929]	{1,964}
Monmouth	63,054	63,415	63,919	64,209	64,975	(12,995)	[3,119]	{1,559}	65,764	(13,153)	[3,157]	{1,578}	66,566	(13,313)	[3,195]	{1,598}
Morris	41,744	42,009	42,348	42,586	43,210	(8,642)	[2,074]	{1,037}	43,851	(8,770)	[2,105]	{1,052}	44,523	(8,905)	[2,137]	{1,069}
Ocean	64,004	64,374	64,706	64,985	65,633	(13,127)	[3,150]	{1,575}	66,282	(13,256)	[3,182]	{1,591}	66,942	(13,388)	[3,213]	{1,607}
Passaic	60,899	61,257	61,482	61,662	62,186	(12,437)	[2,985]	{1,492}	62,726	(12,545)	[3,011]	{1,505}	63,286	(12,657)	[3,038]	{1,519}
Somerset	24,879	25,004	25,168	25,268	25,539	(5,108)	[1,226]	{613}	25,811	(5,162)	[1,239]	{619}	26,094	(5,219)	[1,253]	{626}
Sussex	10,250	10,343	10,435	10,502	10,684	(2,137)	[513]	{256}	10,879	(2,176)	[522]	{261}	11,089	(2,218)	[532]	{266}
Union	60,820	61,090	61,390	61,593	62,108	(12,422)	[2,981]	{1,491}	62,640	(12,528)	[3,007]	{1,503}	63,187	(12,637)	[3,033]	{1,516}
Warren	7,781	7,840	7,909	7,951	8,056	(1,611)	[387]	{193}	8,167	(1,633)	[392]	{196}	8,284	(1,657)	[398]	{199}

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.