

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

Date: 1/28/22

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 1/28/22 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.**

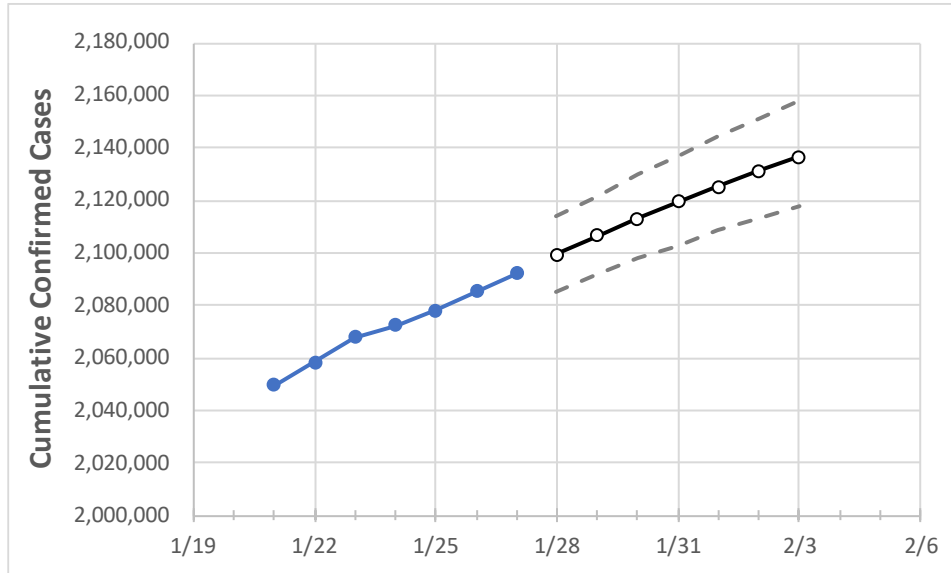
### IEM's Modeling Lead

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:						
	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3

New Jersey 2,072,536 2,078,258 2,085,385 2,092,109 2,099,456 2,106,429 2,112,941 2,119,443 2,125,351 2,131,111 2,136,605

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:						
	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3
Bergen	209,422	209,989	210,648	211,102	211,821	212,517	213,174	213,771	214,369	214,936	215,480
Burlington	95,042	95,355	95,770	96,250	96,704	97,128	97,515	97,920	98,295	98,666	99,026
Camden	118,439	118,816	119,239	119,743	120,353	120,933	121,510	122,015	122,533	123,043	123,532
Essex	203,037	203,352	203,789	204,254	204,740	205,194	205,593	205,996	206,367	206,712	207,038
Gloucester	65,448	65,623	65,901	66,218	66,520	66,829	67,118	67,397	67,666	67,921	68,176
Hudson	161,871	162,196	162,857	163,217	163,824	164,430	164,977	165,493	165,964	166,443	166,897
Hunterdon	22,808	22,899	22,960	23,093	23,202	23,310	23,410	23,508	23,604	23,700	23,784
Mercer	70,774	71,037	71,310	71,604	71,941	72,270	72,589	72,887	73,171	73,458	73,709
Middlesex	178,036	178,525	179,039	179,551	180,127	180,676	181,195	181,680	182,159	182,590	183,038
Monmouth	154,821	155,249	155,755	156,224	156,712	157,193	157,628	158,060	158,470	158,856	159,244
Morris	111,568	111,862	112,155	112,553	113,051	113,527	113,993	114,435	114,826	115,274	115,632
Ocean	152,845	153,328	153,978	154,550	155,137	155,717	156,277	156,800	157,314	157,813	158,279
Passaic	137,452	137,743	138,154	138,439	138,839	139,179	139,535	139,848	140,168	140,467	140,730
Somerset	63,646	63,774	63,969	64,175	64,401	64,617	64,821	65,012	65,193	65,380	65,543
Sussex	31,928	32,028	32,137	32,287	32,412	32,529	32,647	32,753	32,859	32,959	33,054
Union	135,549	135,824	136,298	136,582	136,917	137,221	137,542	137,809	138,092	138,348	138,590
Warren	22,470	22,538	22,603	22,692	22,784	22,872	22,953	23,037	23,112	23,189	23,258

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:											
	1/24	1/25	1/26	1/27	1/29				1/31				2/2			
Bergen	209,422	209,989	210,648	211,102	212,517	(42,503)	[10,201]	{5,100}	213,771	(42,754)	[10,261]	{5,131}	214,936	(42,987)	[10,317]	{5,158}
Burlington	95,042	95,355	95,770	96,250	97,128	(19,426)	[4,662]	{2,331}	97,920	(19,584)	[4,700]	{2,350}	98,666	(19,733)	[4,736]	{2,368}
Camden	118,439	118,816	119,239	119,743	120,933	(24,187)	[5,805]	{2,902}	122,015	(24,403)	[5,857]	{2,928}	123,043	(24,609)	[5,906]	{2,953}
Essex	203,037	203,352	203,789	204,254	205,194	(41,039)	[9,849]	{4,925}	205,996	(41,199)	[9,888]	{4,944}	206,712	(41,342)	[9,922]	{4,961}
Gloucester	65,448	65,623	65,901	66,218	66,829	(13,366)	[3,208]	{1,604}	67,397	(13,479)	[3,235]	{1,618}	67,921	(13,584)	[3,260]	{1,630}
Hudson	161,871	162,196	162,857	163,217	164,430	(32,886)	[7,893]	{3,946}	165,493	(33,099)	[7,944]	{3,972}	166,443	(33,289)	[7,989]	{3,995}
Hunterdon	22,808	22,899	22,960	23,093	23,310	(4,662)	[1,119]	{559}	23,508	(4,702)	[1,128]	{564}	23,700	(4,740)	[1,138]	{569}
Mercer	70,774	71,037	71,310	71,604	72,270	(14,454)	[3,469]	{1,734}	72,887	(14,577)	[3,499]	{1,749}	73,458	(14,692)	[3,526]	{1,763}
Middlesex	178,036	178,525	179,039	179,551	180,676	(36,135)	[8,672]	{4,336}	181,680	(36,336)	[8,721]	{4,360}	182,590	(36,518)	[8,764]	{4,382}
Monmouth	154,821	155,249	155,755	156,224	157,193	(31,439)	[7,545]	{3,773}	158,060	(31,612)	[7,587]	{3,793}	158,856	(31,771)	[7,625]	{3,813}
Morris	111,568	111,862	112,155	112,553	113,527	(22,705)	[5,449]	{2,725}	114,435	(22,887)	[5,493]	{2,746}	115,274	(23,055)	[5,533]	{2,767}
Ocean	152,845	153,328	153,978	154,550	155,717	(31,143)	[7,474]	{3,737}	156,800	(31,360)	[7,526]	{3,763}	157,813	(31,563)	[7,575]	{3,788}
Passaic	137,452	137,743	138,154	138,439	139,179	(27,836)	[6,681]	{3,340}	139,848	(27,970)	[6,713]	{3,356}	140,467	(28,093)	[6,742]	{3,371}
Somerset	63,646	63,774	63,969	64,175	64,617	(12,923)	[3,102]	{1,551}	65,012	(13,002)	[3,121]	{1,560}	65,380	(13,076)	[3,138]	{1,569}
Sussex	31,928	32,028	32,137	32,287	32,529	(6,506)	[1,561]	{781}	32,753	(6,551)	[1,572]	{786}	32,959	(6,592)	[1,582]	{791}
Union	135,549	135,824	136,298	136,582	137,221	(27,444)	[6,587]	{3,293}	137,809	(27,562)	[6,615]	{3,307}	138,348	(27,670)	[6,641]	{3,320}
Warren	22,470	22,538	22,603	22,692	22,872	(4,574)	[1,098]	{549}	23,037	(4,607)	[1,106]	{553}	23,189	(4,638)	[1,113]	{557}

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.