

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

Date: 7/21/21

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 7/21/21 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.

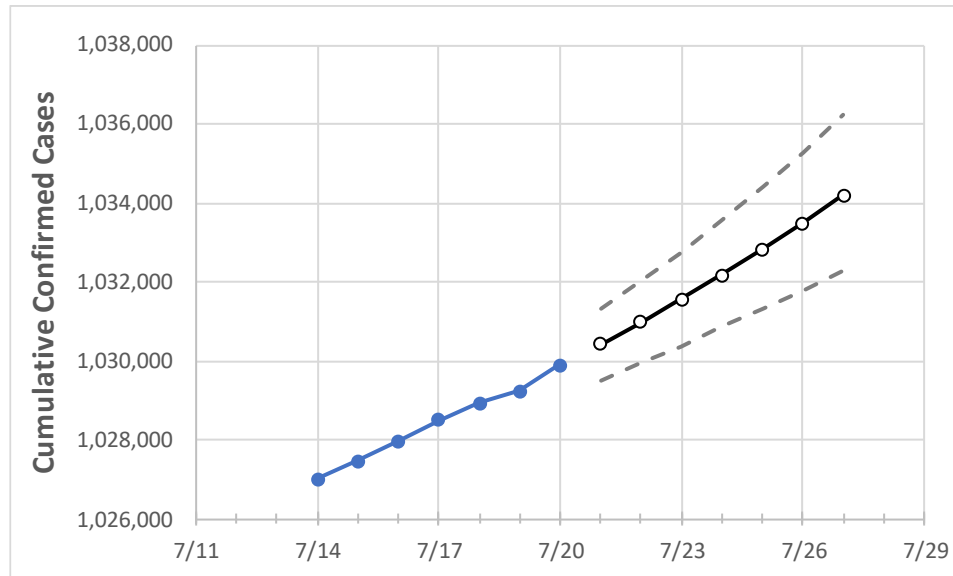
IEM's Modeling Lead

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:						
	7/17	7/18	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27
New Jersey	1,028,503	1,028,931	1,029,243	1,029,901	1,030,432	1,030,985	1,031,572	1,032,182	1,032,823	1,033,492	1,034,191

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:						
	7/17	7/18	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27
Bergen	105,485	105,517	105,547	105,595	105,642	105,691	105,742	105,795	105,850	105,908	105,969
Burlington	44,652	44,671	44,681	44,704	44,726	44,749	44,773	44,797	44,823	44,849	44,877
Camden	56,264	56,288	56,310	56,332	56,358	56,384	56,413	56,441	56,470	56,500	56,529
Essex	94,920	94,971	94,999	95,089	95,154	95,226	95,302	95,384	95,473	95,571	95,679
Gloucester	30,856	30,863	30,870	30,903	30,917	30,931	30,947	30,963	30,981	30,999	31,017
Hudson	88,678	88,715	88,751	88,797	88,834	88,873	88,914	88,959	89,007	89,057	89,108
Hunterdon	9,960	9,966	9,967	9,975	9,981	9,986	9,992	9,997	10,003	10,009	10,016
Mercer	34,303	34,314	34,326	34,347	34,362	34,379	34,396	34,414	34,434	34,456	34,480
Middlesex	92,984	93,033	93,067	93,128	93,169	93,212	93,258	93,307	93,359	93,414	93,470
Monmouth	76,808	76,861	76,883	76,968	77,024	77,082	77,142	77,204	77,265	77,330	77,394
Morris	50,645	50,665	50,675	50,706	50,733	50,761	50,791	50,823	50,856	50,889	50,923
Ocean	77,013	77,048	77,074	77,119	77,159	77,199	77,240	77,284	77,327	77,371	77,415
Passaic	73,688	73,718	73,734	73,768	73,794	73,821	73,849	73,879	73,908	73,939	73,970
Somerset	30,408	30,420	30,430	30,460	30,477	30,495	30,512	30,532	30,552	30,573	30,594
Sussex	14,183	14,184	14,186	14,193	14,197	14,202	14,207	14,211	14,216	14,220	14,225
Union	72,101	72,112	72,128	72,162	72,189	72,216	72,244	72,273	72,303	72,334	72,367
Warren	10,089	10,090	10,098	10,104	10,109	10,115	10,120	10,126	10,132	10,139	10,146

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:											
	7/17	7/18	7/19	7/20	7/22				7/24				7/26			
Bergen	105,485	105,517	105,547	105,595	105,691	(21,138)	[5,073]	{2,537}	105,795	(21,159)	[5,078]	{2,539}	105,908	(21,182)	[5,084]	{2,542}
Burlington	44,652	44,671	44,681	44,704	44,749	(8,950)	[2,148]	{1,074}	44,797	(8,959)	[2,150]	{1,075}	44,849	(8,970)	[2,153]	{1,076}
Camden	56,264	56,288	56,310	56,332	56,384	(11,277)	[2,706]	{1,353}	56,441	(11,288)	[2,709]	{1,355}	56,500	(11,300)	[2,712]	{1,356}
Essex	94,920	94,971	94,999	95,089	95,226	(19,045)	[4,571]	{2,285}	95,384	(19,077)	[4,578]	{2,289}	95,571	(19,114)	[4,587]	{2,294}
Gloucester	30,856	30,863	30,870	30,903	30,931	(6,186)	[1,485]	{742}	30,963	(6,193)	[1,486]	{743}	30,999	(6,200)	[1,488]	{744}
Hudson	88,678	88,715	88,751	88,797	88,873	(17,775)	[4,266]	{2,133}	88,959	(17,792)	[4,270]	{2,135}	89,057	(17,811)	[4,275]	{2,137}
Hunterdon	9,960	9,966	9,967	9,975	9,986	(1,997)	[479]	{240}	9,997	(1,999)	[480]	{240}	10,009	(2,002)	[480]	{240}
Mercer	34,303	34,314	34,326	34,347	34,379	(6,876)	[1,650]	{825}	34,414	(6,883)	[1,652]	{826}	34,456	(6,891)	[1,654]	{827}
Middlesex	92,984	93,033	93,067	93,128	93,212	(18,642)	[4,474]	{2,237}	93,307	(18,661)	[4,479]	{2,239}	93,414	(18,683)	[4,484]	{2,242}
Monmouth	76,808	76,861	76,883	76,968	77,082	(15,416)	[3,700]	{1,850}	77,204	(15,441)	[3,706]	{1,853}	77,330	(15,466)	[3,712]	{1,856}
Morris	50,645	50,665	50,675	50,706	50,761	(10,152)	[2,437]	{1,218}	50,823	(10,165)	[2,440]	{1,220}	50,889	(10,178)	[2,443]	{1,221}
Ocean	77,013	77,048	77,074	77,119	77,199	(15,440)	[3,706]	{1,853}	77,284	(15,457)	[3,710]	{1,855}	77,371	(15,474)	[3,714]	{1,857}
Passaic	73,688	73,718	73,734	73,768	73,821	(14,764)	[3,543]	{1,772}	73,879	(14,776)	[3,546]	{1,773}	73,939	(14,788)	[3,549]	{1,775}
Somerset	30,408	30,420	30,430	30,460	30,495	(6,099)	[1,464]	{732}	30,532	(6,106)	[1,466]	{733}	30,573	(6,115)	[1,468]	{734}
Sussex	14,183	14,184	14,186	14,193	14,202	(2,840)	[682]	{341}	14,211	(2,842)	[682]	{341}	14,220	(2,844)	[683]	{341}
Union	72,101	72,112	72,128	72,162	72,216	(14,443)	[3,466]	{1,733}	72,273	(14,455)	[3,469]	{1,735}	72,334	(14,467)	[3,472]	{1,736}
Warren	10,089	10,090	10,098	10,104	10,115	(2,023)	[485]	{243}	10,126	(2,025)	[486]	{243}	10,139	(2,028)	[487]	{243}

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.