

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

Date: 10/27/20

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 10/27/20 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.

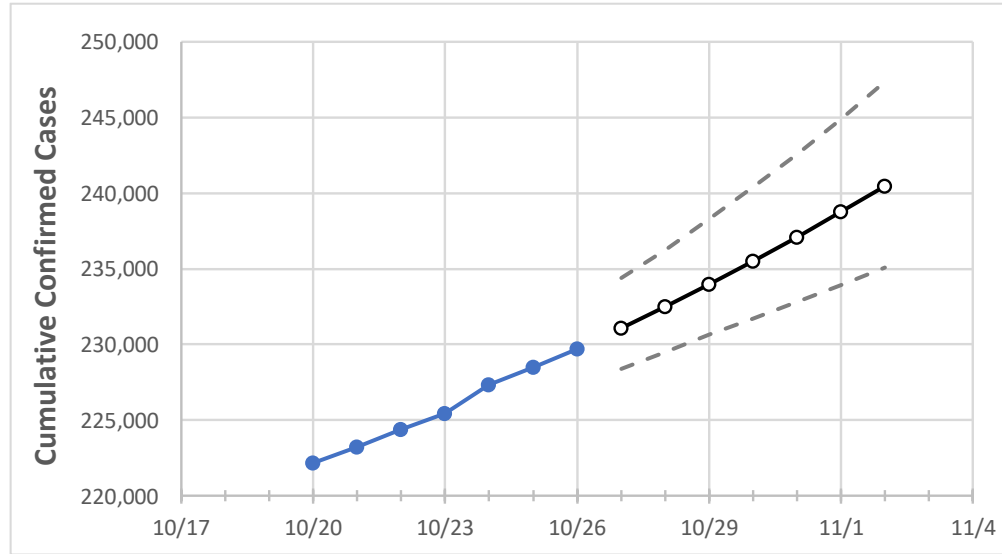
IEM's Modeling Lead

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:						
	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2
New Jersey	225,430	227,339	228,468	229,684	231,065	232,496	233,978	235,514	237,104	238,751	240,457

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:						
	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2
Bergen	24,259	24,408	24,527	24,648	24,783	24,925	25,072	25,226	25,386	25,554	25,729
Burlington	8,075	8,160	8,201	8,280	8,345	8,412	8,483	8,556	8,632	8,711	8,794
Camden	11,115	11,239	11,280	11,336	11,405	11,476	11,549	11,625	11,703	11,784	11,867
Essex	23,253	23,609	23,771	23,931	24,170	24,427	24,703	24,999	25,318	25,659	26,026
Gloucester	5,327	5,381	5,403	5,435	5,469	5,503	5,539	5,575	5,611	5,648	5,686
Hudson	22,236	22,432	22,573	22,646	22,795	22,955	23,124	23,305	23,498	23,703	23,922
Hunterdon	1,515	1,525	1,533	1,548	1,555	1,562	1,569	1,576	1,583	1,591	1,599
Mercer	9,072	9,116	9,146	9,174	9,205	9,238	9,273	9,309	9,347	9,387	9,428
Middlesex	21,415	21,578	21,668	21,783	21,903	22,028	22,156	22,289	22,426	22,569	22,715
Monmouth	13,620	13,692	13,747	13,807	13,870	13,932	13,994	14,056	14,118	14,179	14,241
Morris	8,721	8,785	8,859	8,919	8,995	9,077	9,164	9,257	9,356	9,462	9,576
Ocean	16,358	16,433	16,477	16,534	16,592	16,649	16,702	16,754	16,804	16,852	16,897
Passaic	20,264	20,362	20,444	20,554	20,636	20,720	20,808	20,899	20,994	21,092	21,193
Somerset	6,255	6,305	6,329	6,371	6,401	6,433	6,467	6,502	6,539	6,579	6,620
Sussex	1,651	1,663	1,677	1,681	1,689	1,698	1,706	1,715	1,725	1,735	1,745
Union	19,252	19,449	19,559	19,682	19,836	19,999	20,173	20,358	20,555	20,765	20,988
Warren	1,529	1,541	1,554	1,562	1,568	1,574	1,581	1,588	1,595	1,603	1,611

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:											
	10/23	10/24	10/25	10/26	10/28				10/30				11/1			
Bergen	24,259	24,408	24,527	24,648	24,925	(4,985)	[1,196]	{598}	25,226	(5,045)	[1,211]	{605}	25,554	(5,111)	[1,227]	{613}
Burlington	8,075	8,160	8,201	8,280	8,412	(1,682)	[404]	{202}	8,556	(1,711)	[411]	{205}	8,711	(1,742)	[418]	{209}
Camden	11,115	11,239	11,280	11,336	11,476	(2,295)	[551]	{275}	11,625	(2,325)	[558]	{279}	11,784	(2,357)	[566]	{283}
Essex	23,253	23,609	23,771	23,931	24,427	(4,885)	[1,172]	{586}	24,999	(5,000)	[1,200]	{600}	25,659	(5,132)	[1,232]	{616}
Gloucester	5,327	5,381	5,403	5,435	5,503	(1,101)	[264]	{132}	5,575	(1,115)	[268]	{134}	5,648	(1,130)	[271]	{136}
Hudson	22,236	22,432	22,573	22,646	22,955	(4,591)	[1,102]	{551}	23,305	(4,661)	[1,119]	{559}	23,703	(4,741)	[1,138]	{569}
Hunterdon	1,515	1,525	1,533	1,548	1,562	(312)	[75]	{37}	1,576	(315)	[76]	{38}	1,591	(318)	[76]	{38}
Mercer	9,072	9,116	9,146	9,174	9,238	(1,848)	[443]	{222}	9,309	(1,862)	[447]	{223}	9,387	(1,877)	[451]	{225}
Middlesex	21,415	21,578	21,668	21,783	22,028	(4,406)	[1,057]	{529}	22,289	(4,458)	[1,070]	{535}	22,569	(4,514)	[1,083]	{542}
Monmouth	13,620	13,692	13,747	13,807	13,932	(2,786)	[669]	{334}	14,056	(2,811)	[675]	{337}	14,179	(2,836)	[681]	{340}
Morris	8,721	8,785	8,859	8,919	9,077	(1,815)	[436]	{218}	9,257	(1,851)	[444]	{222}	9,462	(1,892)	[454]	{227}
Ocean	16,358	16,433	16,477	16,534	16,649	(3,330)	[799]	{400}	16,754	(3,351)	[804]	{402}	16,852	(3,370)	[809]	{404}
Passaic	20,264	20,362	20,444	20,554	20,720	(4,144)	[995]	{497}	20,899	(4,180)	[1,003]	{502}	21,092	(4,218)	[1,012]	{506}
Somerset	6,255	6,305	6,329	6,371	6,433	(1,287)	[309]	{154}	6,502	(1,300)	[312]	{156}	6,579	(1,316)	[316]	{158}
Sussex	1,651	1,663	1,677	1,681	1,698	(340)	[81]	{41}	1,715	(343)	[82]	{41}	1,735	(347)	[83]	{42}
Union	19,252	19,449	19,559	19,682	19,999	(4,000)	[960]	{480}	20,358	(4,072)	[977]	{489}	20,765	(4,153)	[997]	{498}
Warren	1,529	1,541	1,554	1,562	1,574	(315)	[76]	{38}	1,588	(318)	[76]	{38}	1,603	(321)	[77]	{38}

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.