IEM's AI Modeling: Short-term COVID-19 Projections
Date: 7/28/21

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 <u>not</u> 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 7/28/21 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
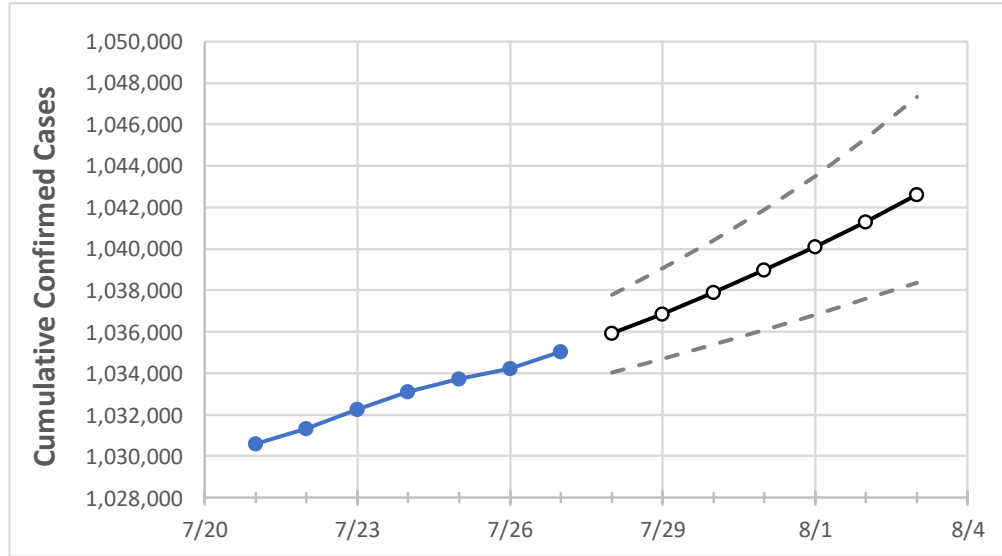
	Actual Confirmed Cases On:				Projected Cases For:						
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
New Jersey	1,033,116	1,033,712	1,034,233	1,035,027	1,035,924	1,036,875	1,037,892	1,038,978	1,040,107	1,041,305	1,042,597

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:						
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
Bergen	105,922	105,987	106,059	106,138	106,232	106,334	106,441	106,557	106,682	106,815	106,956
Burlington	44,860	44,894	44,920	44,970	45,017	45,068	45,123	45,182	45,244	45,312	45,385
Camden	56,466	56,488	56,510	56,559	56,594	56,631	56,668	56,707	56,748	56,790	56,833
Essex	95,415	95,466	95,514	95,598	95,689	95,785	95,890	95,997	96,112	96,233	96,367
Gloucester	30,988	31,005	31,016	31,066	31,096	31,128	31,164	31,202	31,243	31,287	31,334
Hudson	88,953	89,009	89,058	89,103	89,161	89,224	89,291	89,362	89,438	89,515	89,602
Hunterdon	10,008	10,013	10,021	10,024	10,032	10,040	10,049	10,058	10,067	10,076	10,086
Mercer	34,417	34,439	34,462	34,482	34,509	34,538	34,570	34,604	34,641	34,682	34,725
Middlesex	93,453	93,527	93,581	93,633	93,725	93,824	93,931	94,047	94,171	94,306	94,451
Monmouth	77,463	77,554	77,602	77,696	77,813	77,936	78,066	78,204	78,350	78,510	78,672
Morris	50,861	50,897	50,917	50,940	50,977	51,016	51,057	51,099	51,144	51,190	51,238
Ocean	77,421	77,454	77,511	77,588	77,667	77,750	77,839	77,932	78,027	78,130	78,237
Passaic	73,951	73,965	73,982	74,022	74,064	74,106	74,153	74,202	74,254	74,310	74,369
Somerset	30,566	30,578	30,608	30,623	30,652	30,682	30,715	30,749	30,785	30,823	30,864
Sussex	14,219	14,235	14,238	14,251	14,260	14,269	14,278	14,288	14,298	14,309	14,321
Union	72,374	72,404	72,429	72,473	72,522	72,574	72,628	72,687	72,747	72,811	72,880
Warren	10,104	10,106	10,109	10,113	10,117	10,121	10,126	10,130	10,135	10,139	10,144

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:		
	7/24	7/25	7/26	7/27	7/29	7/31	8/2
Bergen	105,922	105,987	106,059	106,138	106,334 (21,267) [5,104] {2,552}	106,557 (21,311) [5,115] {2,557}	106,815 (21,363) [5,127] {2,564}
Burlington	44,860	44,894	44,920	44,970	45,068 (9,014) [2,163] {1,082}	45,182 (9,036) [2,169] {1,084}	45,312 (9,062) [2,175] {1,087}
Camden	56,466	56,488	56,510	56,559	56,631 (11,326) [2,718] {1,359}	56,707 (11,341) [2,722] {1,361}	56,790 (11,358) [2,726] {1,363}
Essex	95,415	95,466	95,514	95,598	95,785 (19,157) [4,598] {2,299}	95,997 (19,199) [4,608] {2,304}	96,233 (19,247) [4,619] {2,310}
Gloucester	30,988	31,005	31,016	31,066	31,128 (6,226) [1,494] {747}	31,202 (6,240) [1,498] {749}	31,287 (6,257) [1,502] {751}
Hudson	88,953	89,009	89,058	89,103	89,224 (17,845) [4,283] {2,141}	89,362 (17,872) [4,289] {2,145}	89,515 (17,903) [4,297] {2,148}
Hunterdon	10,008	10,013	10,021	10,024	10,040 (2,008) [482] {241}	10,058 (2,012) [483] {241}	10,076 (2,015) [484] {242}
Mercer	34,417	34,439	34,462	34,482	34,538 (6,908) [1,658] {829}	34,604 (6,921) [1,661] {830}	34,682 (6,936) [1,665] {832}
Middlesex	93,453	93,527	93,581	93,633	93,824 (18,765) [4,504] {2,252}	94,047 (18,809) [4,514] {2,257}	94,306 (18,861) [4,527] {2,263}
Monmouth	77,463	77,554	77,602	77,696	77,936 (15,587) [3,741] {1,870}	78,204 (15,641) [3,754] {1,877}	78,510 (15,702) [3,768] {1,884}
Morris	50,861	50,897	50,917	50,940	51,016 (10,203) [2,449] {1,224}	51,099 (10,220) [2,453] {1,226}	51,190 (10,238) [2,457] {1,229}
Ocean	77,421	77,454	77,511	77,588	77,750 (15,550) [3,732] {1,866}	77,932 (15,586) [3,741] {1,870}	78,130 (15,626) [3,750] {1,875}
Passaic	73,951	73,965	73,982	74,022	74,106 (14,821) [3,557] {1,779}	74,202 (14,840) [3,562] {1,781}	74,310 (14,862) [3,567] {1,783}
Somerset	30,566	30,578	30,608	30,623	30,682 (6,136) [1,473] {736}	30,749 (6,150) [1,476] {738}	30,823 (6,165) [1,480] {740}
Sussex	14,219	14,235	14,238	14,251	14,269 (2,854) [685] {342}	14,288 (2,858) [686] {343}	14,309 (2,862) [687] {343}
Union	72,374	72,404	72,429	72,473	72,574 (14,515) [3,484] {1,742}	72,687 (14,537) [3,489] {1,744}	72,811 (14,562) [3,495] {1,747}
Warren	10,104	10,106	10,109	10,113	10,121 (2,024) [486] {243}	10,130 (2,026) [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.