IEM's AI Modeling: Short-term COVID-19 Projections
Date: 9/8/21

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 9/8/21 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
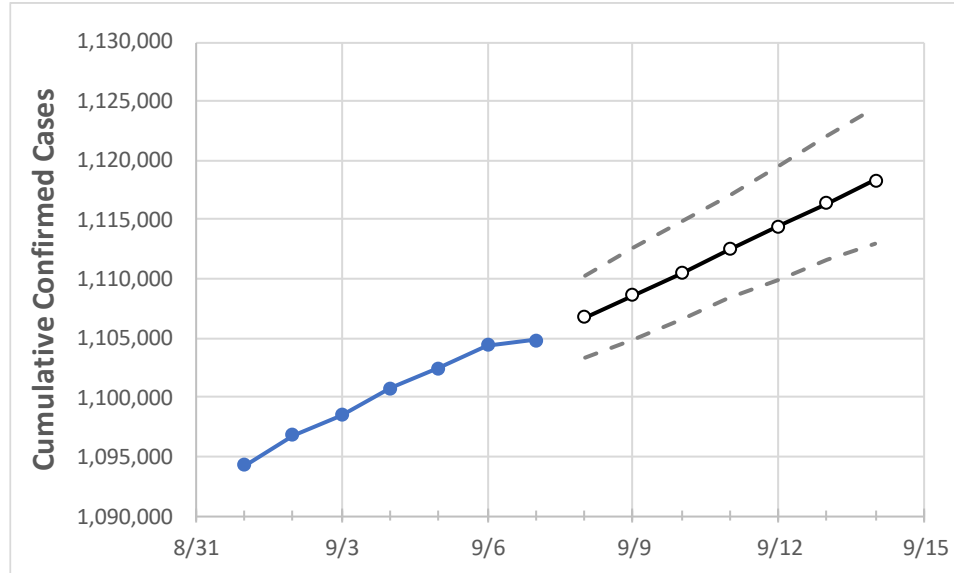
	Actual Confirmed Cases On:				Projected Cases For:						
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14
New Jersey	1,100,774	1,102,488	1,104,439	1,104,793	1,106,747	1,108,614	1,110,513	1,112,508	1,114,412	1,116,375	1,118,305

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:						
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14
Bergen	111,922	112,069	112,228	112,265	112,427	112,585	112,740	112,900	113,056	113,219	113,374
Burlington	48,963	49,034	49,164	49,175	49,295	49,415	49,534	49,659	49,779	49,901	50,023
Camden	60,899	61,016	61,189	61,195	61,342	61,488	61,642	61,787	61,940	62,096	62,251
Essex	100,669	100,780	100,884	100,911	101,028	101,154	101,276	101,404	101,517	101,639	101,758
Gloucester	33,711	33,775	33,857	33,862	33,945	34,030	34,108	34,195	34,278	34,364	34,451
Hudson	93,029	93,126	93,228	93,270	93,354	93,437	93,521	93,603	93,684	93,767	93,848
Hunterdon	10,816	10,832	10,856	10,869	10,893	10,917	10,940	10,964	10,988	11,012	11,037
Mercer	36,514	36,582	36,634	36,641	36,703	36,762	36,823	36,883	36,945	37,008	37,067
Middlesex	98,930	99,059	99,207	99,220	99,378	99,534	99,685	99,841	100,003	100,163	100,322
Monmouth	84,262	84,400	84,568	84,599	84,776	84,955	85,137	85,309	85,486	85,667	85,856
Morris	53,807	53,903	54,013	54,023	54,122	54,218	54,315	54,416	54,516	54,619	54,723
Ocean	83,876	84,096	84,322	84,370	84,590	84,816	85,035	85,262	85,498	85,731	85,964
Passaic	77,202	77,303	77,363	77,381	77,472	77,559	77,648	77,736	77,822	77,913	78,002
Somerset	32,472	32,521	32,583	32,592	32,641	32,693	32,744	32,794	32,844	32,897	32,947
Sussex	15,117	15,162	15,185	15,194	15,228	15,261	15,293	15,328	15,363	15,400	15,434
Union	75,901	75,988	76,096	76,120	76,211	76,297	76,382	76,470	76,554	76,641	76,726
Warren	10,780	10,804	10,837	10,843	10,870	10,896	10,924	10,949	10,977	11,005	11,034

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:		
	9/4	9/5	9/6	9/7	9/9	9/11	9/13
Bergen	111,922	112,069	112,228	112,265	112,585 (22,517) [5,404] {2,702}	112,900 (22,580) [5,419] {2,710}	113,219 (22,644) [5,435] {2,717}
Burlington	48,963	49,034	49,164	49,175	49,415 (9,883) [2,372] {1,186}	49,659 (9,932) [2,384] {1,192}	49,901 (9,980) [2,395] {1,198}
Camden	60,899	61,016	61,189	61,195	61,488 (12,298) [2,951] {1,476}	61,787 (12,357) [2,966] {1,483}	62,096 (12,419) [2,981] {1,490}
Essex	100,669	100,780	100,884	100,911	101,154 (20,231) [4,855] {2,428}	101,404 (20,281) [4,867] {2,434}	101,639 (20,328) [4,879] {2,439}
Gloucester	33,711	33,775	33,857	33,862	34,030 (6,806) [1,633] {817}	34,195 (6,839) [1,641] {821}	34,364 (6,873) [1,649] {825}
Hudson	93,029	93,126	93,228	93,270	93,437 (18,687) [4,485] {2,242}	93,603 (18,721) [4,493] {2,246}	93,767 (18,753) [4,501] {2,250}
Hunterdon	10,816	10,832	10,856	10,869	10,917 (2,183) [524] {262}	10,964 (2,193) [526] {263}	11,012 (2,202) [529] {264}
Mercer	36,514	36,582	36,634	36,641	36,762 (7,352) [1,765] {882}	36,883 (7,377) [1,770] {885}	37,008 (7,402) [1,776] {888}
Middlesex	98,930	99,059	99,207	99,220	99,534 (19,907) [4,778] {2,389}	99,841 (19,968) [4,792] {2,396}	100,163 (20,033) [4,808] {2,404}
Monmouth	84,262	84,400	84,568	84,599	84,955 (16,991) [4,078] {2,039}	85,309 (17,062) [4,095] {2,047}	85,667 (17,133) [4,112] {2,056}
Morris	53,807	53,903	54,013	54,023	54,218 (10,844) [2,602] {1,301}	54,416 (10,883) [2,612] {1,306}	54,619 (10,924) [2,622] {1,311}
Ocean	83,876	84,096	84,322	84,370	84,816 (16,963) [4,071] {2,036}	85,262 (17,052) [4,093] {2,046}	85,731 (17,146) [4,115] {2,058}
Passaic	77,202	77,303	77,363	77,381	77,559 (15,512) [3,723] {1,861}	77,736 (15,547) [3,731] {1,866}	77,913 (15,583) [3,740] {1,870}
Somerset	32,472	32,521	32,583	32,592	32,693 (6,539) [1,569] {785}	32,794 (6,559) [1,574] {787}	32,897 (6,579) [1,579] {790}
Sussex	15,117	15,162	15,185	15,194	15,261 (3,052) [733] {366}	15,328 (3,066) [736] {368}	15,400 (3,080) [739] {370}
Union	75,901	75,988	76,096	76,120	76,297 (15,259) [3,662] {1,831}	76,470 (15,294) [3,671] {1,835}	76,641 (15,328) [3,679] {1,839}
Warren	10,780	10,804	10,837	10,843	10,896 (2,179) [523] {261}	10,949 (2,190) [526] {263}	11,005 (2,201) [528] {264}

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.