IEM's AI Modeling: Short-term COVID-19 Projections
Date: 4/2/21

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 4/2/21 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
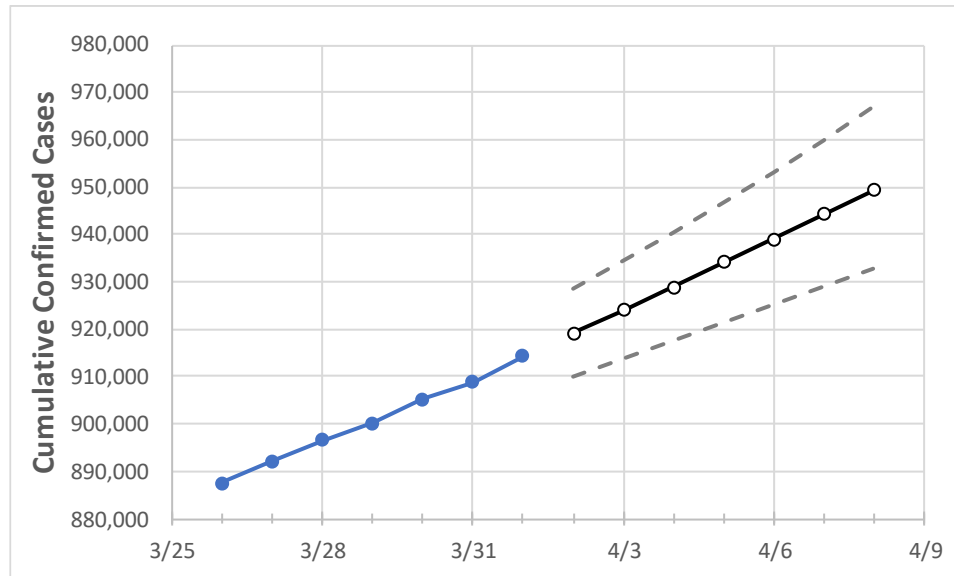
	Actual Confirmed Cases On:				Projected Cases For:						
	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	4/7	4/8
New Jersey	900,273	905,144	908,816	914,422	919,128	924,073	928,984	934,050	939,064	944,249	949,403

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:						
	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	4/7	4/8
Bergen	90,376	90,918	91,488	92,021	92,572	93,131	93,691	94,267	94,846	95,439	96,039
Burlington	39,490	39,691	39,852	40,095	40,301	40,512	40,727	40,953	41,181	41,410	41,648
Camden	48,400	48,597	48,722	49,000	49,198	49,403	49,615	49,834	50,061	50,286	50,514
Essex	84,148	84,678	84,985	85,661	86,171	86,691	87,212	87,755	88,318	88,881	89,455
Gloucester	26,677	26,801	26,928	27,041	27,163	27,289	27,417	27,543	27,676	27,809	27,946
Hudson	79,054	79,431	79,682	80,204	80,621	81,036	81,460	81,890	82,318	82,755	83,196
Hunterdon	8,203	8,270	8,331	8,401	8,467	8,536	8,605	8,678	8,752	8,827	8,905
Mercer	30,627	30,783	30,849	30,999	31,125	31,254	31,385	31,519	31,651	31,789	31,927
Middlesex	82,649	83,056	83,332	83,813	84,239	84,682	85,122	85,569	86,021	86,479	86,948
Monmouth	67,270	67,701	67,982	68,357	68,739	69,123	69,515	69,904	70,292	70,686	71,081
Morris	44,401	44,681	44,885	45,171	45,406	45,642	45,881	46,119	46,352	46,585	46,822
Ocean	67,801	68,094	68,375	68,765	69,120	69,475	69,838	70,200	70,565	70,920	71,290
Passaic	63,717	64,116	64,455	64,836	65,150	65,474	65,796	66,129	66,463	66,814	67,170
Somerset	26,429	26,610	26,720	26,887	27,046	27,206	27,369	27,533	27,700	27,867	28,040
Sussex	11,329	11,424	11,528	11,689	11,817	11,950	12,088	12,227	12,371	12,522	12,675
Union	63,599	63,926	64,169	64,600	64,895	65,198	65,507	65,814	66,133	66,462	66,795
Warren	8,320	8,388	8,437	8,512	8,570	8,628	8,688	8,747	8,808	8,871	8,936

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:		
	3/29	3/30	3/31	4/1	4/3	4/5	4/7
Bergen	90,376	90,918	91,488	92,021	93,131 (18,626) [4,470] {2,235}	94,267 (18,853) [4,525] {2,262}	95,439 (19,088) [4,581] {2,291}
Burlington	39,490	39,691	39,852	40,095	40,512 (8,102) [1,945] {972}	40,953 (8,191) [1,966] {983}	41,410 (8,282) [1,988] {994}
Camden	48,400	48,597	48,722	49,000	49,403 (9,881) [2,371] {1,186}	49,834 (9,967) [2,392] {1,196}	50,286 (10,057) [2,414] {1,207}
Essex	84,148	84,678	84,985	85,661	86,691 (17,338) [4,161] {2,081}	87,755 (17,551) [4,212] {2,106}	88,881 (17,776) [4,266] {2,133}
Gloucester	26,677	26,801	26,928	27,041	27,289 (5,458) [1,310] {655}	27,543 (5,509) [1,322] {661}	27,809 (5,562) [1,335] {667}
Hudson	79,054	79,431	79,682	80,204	81,036 (16,207) [3,890] {1,945}	81,890 (16,378) [3,931] {1,965}	82,755 (16,551) [3,972] {1,986}
Hunterdon	8,203	8,270	8,331	8,401	8,536 (1,707) [410] {205}	8,678 (1,736) [417] {208}	8,827 (1,765) [424] {212}
Mercer	30,627	30,783	30,849	30,999	31,254 (6,251) [1,500] {750}	31,519 (6,304) [1,513] {756}	31,789 (6,358) [1,526] {763}
Middlesex	82,649	83,056	83,332	83,813	84,682 (16,936) [4,065] {2,032}	85,569 (17,114) [4,107] {2,054}	86,479 (17,296) [4,151] {2,076}
Monmouth	67,270	67,701	67,982	68,357	69,123 (13,825) [3,318] {1,659}	69,904 (13,981) [3,355] {1,678}	70,686 (14,137) [3,393] {1,696}
Morris	44,401	44,681	44,885	45,171	45,642 (9,128) [2,191] {1,095}	46,119 (9,224) [2,214] {1,107}	46,585 (9,317) [2,236] {1,118}
Ocean	67,801	68,094	68,375	68,765	69,475 (13,895) [3,335] {1,667}	70,200 (14,040) [3,370] {1,685}	70,920 (14,184) [3,404] {1,702}
Passaic	63,717	64,116	64,455	64,836	65,474 (13,095) [3,143] {1,571}	66,129 (13,226) [3,174] {1,587}	66,814 (13,363) [3,207] {1,604}
Somerset	26,429	26,610	26,720	26,887	27,206 (5,441) [1,306] {653}	27,533 (5,507) [1,322] {661}	27,867 (5,573) [1,338] {669}
Sussex	11,329	11,424	11,528	11,689	11,950 (2,390) [574] {287}	12,227 (2,445) [587] {293}	12,522 (2,504) [601] {301}
Union	63,599	63,926	64,169	64,600	65,198 (13,040) [3,130] {1,565}	65,814 (13,163) [3,159] {1,580}	66,462 (13,292) [3,190] {1,595}
Warren	8,320	8,388	8,437	8,512	8,628 (1,726) [414] {207}	8,747 (1,749) [420] {210}	8,871 (1,774) [426] {213}

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.