IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/1/21

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 10/1/21 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
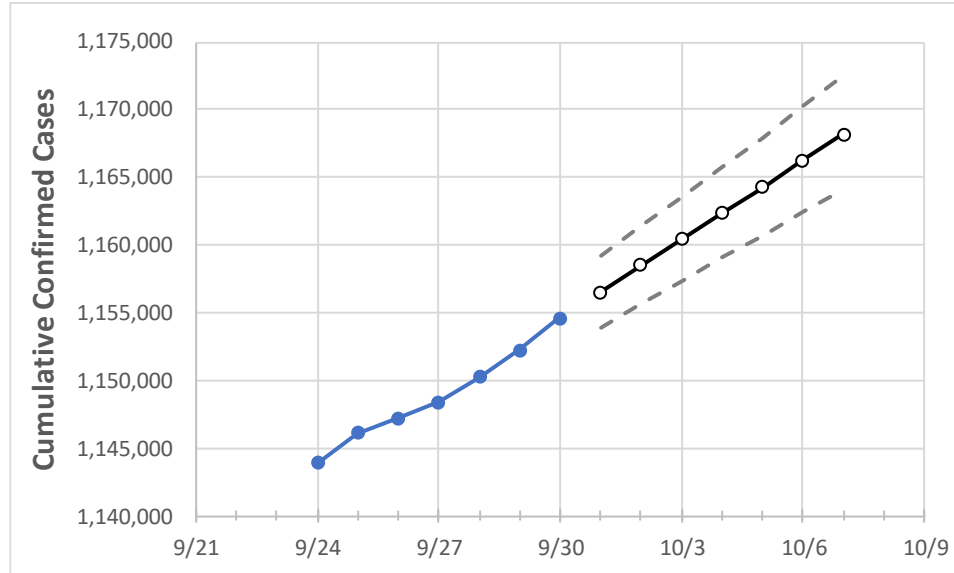
	Actual Confirmed Cases On:				Projected Cases For:						
	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7
New Jersey	1,148,358	1,150,246	1,152,243	1,154,570	1,156,548	1,158,510	1,160,407	1,162,385	1,164,300	1,166,287	1,168,190

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:						
	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7
Bergen	115,960	116,094	116,280	116,488	116,663	116,839	117,012	117,189	117,365	117,542	117,717
Burlington	51,689	51,810	51,932	52,064	52,181	52,296	52,414	52,530	52,644	52,762	52,878
Camden	64,456	64,649	64,781	64,993	65,164	65,333	65,504	65,670	65,848	66,021	66,199
Essex	103,920	104,021	104,162	104,293	104,422	104,546	104,668	104,789	104,914	105,035	105,161
Gloucester	35,978	36,131	36,257	36,382	36,492	36,602	36,714	36,823	36,936	37,048	37,164
Hudson	95,450	95,515	95,589	95,687	95,771	95,855	95,935	96,017	96,098	96,182	96,260
Hunterdon	11,324	11,340	11,367	11,397	11,419	11,441	11,462	11,484	11,506	11,528	11,550
Mercer	37,942	38,002	38,058	38,119	38,176	38,234	38,293	38,350	38,407	38,468	38,524
Middlesex	102,859	103,015	103,140	103,308	103,456	103,591	103,734	103,871	104,007	104,150	104,282
Monmouth	88,308	88,459	88,640	88,842	88,997	89,149	89,302	89,449	89,600	89,751	89,902
Morris	55,834	55,911	55,986	56,081	56,155	56,228	56,302	56,375	56,446	56,518	56,589
Ocean	89,077	89,302	89,547	89,783	90,015	90,245	90,473	90,702	90,925	91,159	91,390
Passaic	79,513	79,565	79,662	79,754	79,848	79,941	80,034	80,128	80,218	80,314	80,406
Somerset	33,777	33,826	33,886	33,950	34,003	34,056	34,108	34,162	34,214	34,268	34,319
Sussex	16,007	16,043	16,093	16,143	16,189	16,237	16,282	16,329	16,376	16,425	16,474
Union	78,259	78,358	78,425	78,543	78,640	78,740	78,837	78,934	79,034	79,131	79,230
Warren	11,387	11,417	11,441	11,477	11,501	11,524	11,549	11,573	11,596	11,620	11,643

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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:		
	9/27	9/28	9/29	9/30	10/2	10/4	10/6
Bergen	115,960	116,094	116,280	116,488	116,839 (23,368) [5,608] {2,804}	117,189 (23,438) [5,625] {2,813}	117,542 (23,508) [5,642] {2,821}
Burlington	51,689	51,810	51,932	52,064	52,296 (10,459) [2,510] {1,255}	52,530 (10,506) [2,521] {1,261}	52,762 (10,552) [2,533] {1,266}
Camden	64,456	64,649	64,781	64,993	65,333 (13,067) [3,136] {1,568}	65,670 (13,134) [3,152] {1,576}	66,021 (13,204) [3,169] {1,584}
Essex	103,920	104,021	104,162	104,293	104,546 (20,909) [5,018] {2,509}	104,789 (20,958) [5,030] {2,515}	105,035 (21,007) [5,042] {2,521}
Gloucester	35,978	36,131	36,257	36,382	36,602 (7,320) [1,757] {878}	36,823 (7,365) [1,768] {884}	37,048 (7,410) [1,778] {889}
Hudson	95,450	95,515	95,589	95,687	95,855 (19,171) [4,601] {2,301}	96,017 (19,203) [4,609] {2,304}	96,182 (19,236) [4,617] {2,308}
Hunterdon	11,324	11,340	11,367	11,397	11,441 (2,288) [549] {275}	11,484 (2,297) [551] {276}	11,528 (2,306) [553] {277}
Mercer	37,942	38,002	38,058	38,119	38,234 (7,647) [1,835] {918}	38,350 (7,670) [1,841] {920}	38,468 (7,694) [1,846] {923}
Middlesex	102,859	103,015	103,140	103,308	103,591 (20,718) [4,972] {2,486}	103,871 (20,774) [4,986] {2,493}	104,150 (20,830) [4,999] {2,500}
Monmouth	88,308	88,459	88,640	88,842	89,149 (17,830) [4,279] {2,140}	89,449 (17,890) [4,294] {2,147}	89,751 (17,950) [4,308] {2,154}
Morris	55,834	55,911	55,986	56,081	56,228 (11,246) [2,699] {1,349}	56,375 (11,275) [2,706] {1,353}	56,518 (11,304) [2,713] {1,356}
Ocean	89,077	89,302	89,547	89,783	90,245 (18,049) [4,332] {2,166}	90,702 (18,140) [4,354] {2,177}	91,159 (18,232) [4,376] {2,188}
Passaic	79,513	79,565	79,662	79,754	79,941 (15,988) [3,837] {1,919}	80,128 (16,026) [3,846] {1,923}	80,314 (16,063) [3,855] {1,928}
Somerset	33,777	33,826	33,886	33,950	34,056 (6,811) [1,635] {817}	34,162 (6,832) [1,640] {820}	34,268 (6,854) [1,645] {822}
Sussex	16,007	16,043	16,093	16,143	16,237 (3,247) [779] {390}	16,329 (3,266) [784] {392}	16,425 (3,285) [788] {394}
Union	78,259	78,358	78,425	78,543	78,740 (15,748) [3,780] {1,890}	78,934 (15,787) [3,789] {1,894}	79,131 (15,826) [3,798] {1,899}
Warren	11,387	11,417	11,441	11,477	11,524 (2,305) [553] {277}	11,573 (2,315) [555] {278}	11,620 (2,324) [558] {279}

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.