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

Date: 10/13/21

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 10/13/21 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.

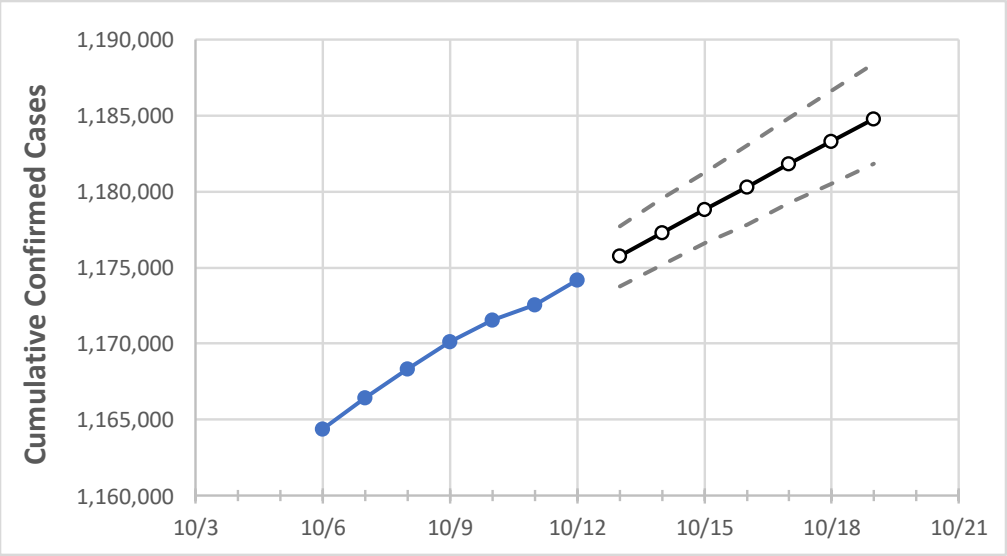
IEM's Modeling Lead

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:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
New Jersey	1,170,140	1,171,573	1,172,527	1,174,169	1,175,748	1,177,286	1,178,820	1,180,294	1,181,821	1,183,316	1,184,774

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:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
Bergen	117,750	117,873	117,928	118,050	118,176	118,303	118,425	118,547	118,671	118,793	118,910
Burlington	53,047	53,147	53,231	53,317	53,420	53,524	53,625	53,728	53,827	53,930	54,033
Camden	66,237	66,355	66,435	66,515	66,639	66,760	66,883	67,001	67,120	67,238	67,354
Essex	105,157	105,235	105,270	105,367	105,449	105,534	105,618	105,696	105,776	105,855	105,932
Gloucester	37,210	37,277	37,321	37,379	37,460	37,540	37,625	37,704	37,783	37,864	37,943
Hudson	96,304	96,377	96,423	96,470	96,530	96,590	96,648	96,704	96,761	96,820	96,874
Hunterdon	11,621	11,634	11,649	11,674	11,698	11,721	11,745	11,770	11,794	11,819	11,844
Mercer	38,578	38,624	38,648	38,699	38,744	38,789	38,834	38,877	38,921	38,963	39,007
Middlesex	104,389	104,473	104,546	104,680	104,786	104,890	104,995	105,097	105,201	105,301	105,402
Monmouth	90,100	90,201	90,262	90,397	90,521	90,641	90,759	90,877	90,993	91,105	91,219
Morris	56,826	56,893	56,934	57,005	57,078	57,151	57,223	57,296	57,368	57,441	57,513
Ocean	91,762	91,931	92,102	92,352	92,570	92,786	93,003	93,218	93,435	93,652	93,867
Passaic	80,440	80,537	80,579	80,654	80,725	80,797	80,865	80,935	81,005	81,073	81,140
Somerset	34,329	34,360	34,371	34,412	34,449	34,485	34,520	34,555	34,591	34,624	34,659
Sussex	16,566	16,596	16,618	16,669	16,715	16,759	16,805	16,850	16,896	16,943	16,988
Union	79,136	79,184	79,201	79,283	79,341	79,397	79,452	79,509	79,560	79,616	79,668
Warren	11,710	11,738	11,748	11,770	11,795	11,820	11,845	11,870	11,895	11,920	11,946

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:		
	10/9	10/10	10/11	10/12	10/14	10/16	10/18
Bergen	117,750	117,873	117,928	118,050	118,303 (23,661) [5,679] {2,839}	118,547 (23,709) [5,690] {2,845}	118,793 (23,759) [5,702] {2,851}
Burlington	53,047	53,147	53,231	53,317	53,524 (10,705) [2,569] {1,285}	53,728 (10,746) [2,579] {1,289}	53,930 (10,786) [2,589] {1,294}
Camden	66,237	66,355	66,435	66,515	66,760 (13,352) [3,204] {1,602}	67,001 (13,400) [3,216] {1,608}	67,238 (13,448) [3,227] {1,614}
Essex	105,157	105,235	105,270	105,367	105,534 (21,107) [5,066] {2,533}	105,696 (21,139) [5,073] {2,537}	105,855 (21,171) [5,081] {2,541}
Gloucester	37,210	37,277	37,321	37,379	37,540 (7,508) [1,802] {901}	37,704 (7,541) [1,810] {905}	37,864 (7,573) [1,817] {909}
Hudson	96,304	96,377	96,423	96,470	96,590 (19,318) [4,636] {2,318}	96,704 (19,341) [4,642] {2,321}	96,820 (19,364) [4,647] {2,324}
Hunterdon	11,621	11,634	11,649	11,674	11,721 (2,344) [563] {281}	11,770 (2,354) [565] {282}	11,819 (2,364) [567] {284}
Mercer	38,578	38,624	38,648	38,699	38,789 (7,758) [1,862] {931}	38,877 (7,775) [1,866] {933}	38,963 (7,793) [1,870] {935}
Middlesex	104,389	104,473	104,546	104,680	104,890 (20,978) [5,035] {2,517}	105,097 (21,019) [5,045] {2,522}	105,301 (21,060) [5,054] {2,527}
Monmouth	90,100	90,201	90,262	90,397	90,641 (18,128) [4,351] {2,175}	90,877 (18,175) [4,362] {2,181}	91,105 (18,221) [4,373] {2,187}
Morris	56,826	56,893	56,934	57,005	57,151 (11,430) [2,743] {1,372}	57,296 (11,459) [2,750] {1,375}	57,441 (11,488) [2,757] {1,379}
Ocean	91,762	91,931	92,102	92,352	92,786 (18,557) [4,454] {2,227}	93,218 (18,644) [4,474] {2,237}	93,652 (18,730) [4,495] {2,248}
Passaic	80,440	80,537	80,579	80,654	80,797 (16,159) [3,878] {1,939}	80,935 (16,187) [3,885] {1,942}	81,073 (16,215) [3,891] {1,946}
Somerset	34,329	34,360	34,371	34,412	34,485 (6,897) [1,655] {828}	34,555 (6,911) [1,659] {829}	34,624 (6,925) [1,662] {831}
Sussex	16,566	16,596	16,618	16,669	16,759 (3,352) [804] {402}	16,850 (3,370) [809] {404}	16,943 (3,389) [813] {407}
Union	79,136	79,184	79,201	79,283	79,397 (15,879) [3,811] {1,906}	79,509 (15,902) [3,816] {1,908}	79,616 (15,923) [3,822] {1,911}
Warren	11,710	11,738	11,748	11,770	11,820 (2,364) [567] {284}	11,870 (2,374) [570] {285}	11,920 (2,384) [572] {286}

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.