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

Date: 8/18/21

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 8/18/21 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.

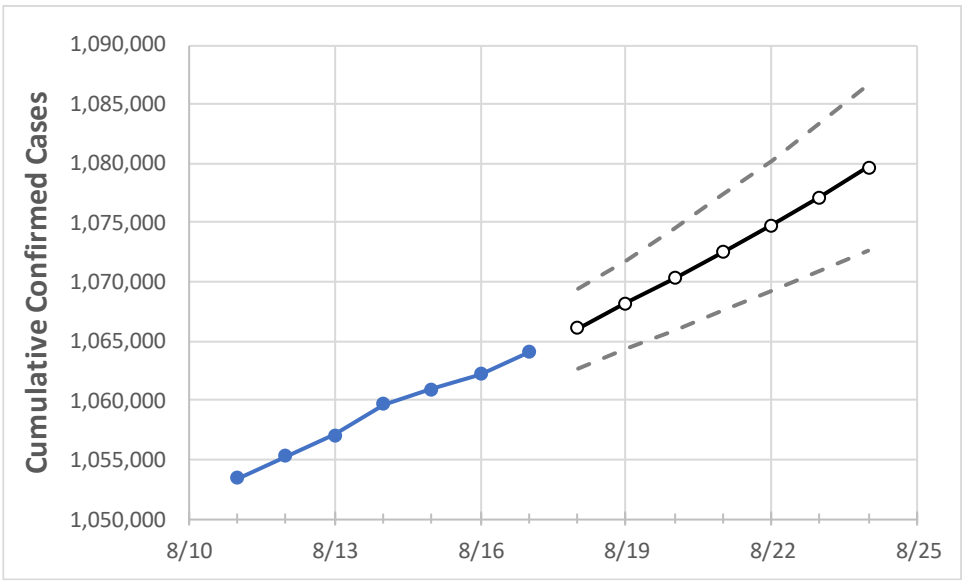
IEM's Modeling Lead

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:						
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24
New Jersey	1,059,660	1,060,934	1,062,238	1,064,059	1,066,072	1,068,160	1,070,332	1,072,526	1,074,814	1,077,168	1,079,681

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:						
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24
Bergen	108,434	108,442	108,537	108,738	108,894	109,047	109,205	109,365	109,533	109,704	109,879
Burlington	46,429	46,505	46,601	46,687	46,804	46,924	47,049	47,179	47,312	47,453	47,596
Camden	58,127	58,201	58,312	58,374	58,497	58,623	58,752	58,886	59,024	59,170	59,316
Essex	97,646	97,778	97,891	98,055	98,219	98,386	98,563	98,745	98,931	99,122	99,323
Gloucester	31,920	31,960	32,037	32,091	32,164	32,241	32,323	32,405	32,490	32,578	32,671
Hudson	90,827	90,932	90,976	91,096	91,212	91,331	91,452	91,575	91,701	91,828	91,959
Hunterdon	10,336	10,347	10,362	10,381	10,404	10,427	10,451	10,477	10,503	10,530	10,557
Mercer	35,211	35,247	35,283	35,339	35,403	35,470	35,541	35,617	35,694	35,776	35,862
Middlesex	95,615	95,700	95,796	95,949	96,099	96,252	96,409	96,575	96,743	96,922	97,103
Monmouth	80,350	80,456	80,605	80,753	80,924	81,096	81,269	81,449	81,631	81,813	82,000
Morris	51,990	52,052	52,087	52,171	52,258	52,350	52,445	52,543	52,644	52,748	52,854
Ocean	79,888	80,014	80,149	80,379	80,554	80,737	80,931	81,132	81,345	81,566	81,799
Passaic	75,111	75,181	75,220	75,323	75,407	75,491	75,581	75,670	75,763	75,856	75,955
Somerset	31,360	31,408	31,428	31,491	31,550	31,613	31,679	31,746	31,817	31,890	31,965
Sussex	14,538	14,551	14,562	14,592	14,610	14,629	14,648	14,667	14,688	14,708	14,729
Union	73,793	73,864	73,939	74,053	74,162	74,273	74,391	74,511	74,638	74,766	74,898
Warren	10,274	10,285	10,302	10,322	10,342	10,363	10,386	10,411	10,438	10,466	10,496

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:		
	8/14	8/15	8/16	8/17	8/19	8/21	8/23
Bergen	108,434	108,442	108,537	108,738	109,047 (21,809) [5,234] {2,617}	109,365 (21,873) [5,250] {2,625}	109,704 (21,941) [5,266] {2,633}
Burlington	46,429	46,505	46,601	46,687	46,924 (9,385) [2,252] {1,126}	47,179 (9,436) [2,265] {1,132}	47,453 (9,491) [2,278] {1,139}
Camden	58,127	58,201	58,312	58,374	58,623 (11,725) [2,814] {1,407}	58,886 (11,777) [2,827] {1,413}	59,170 (11,834) [2,840] {1,420}
Essex	97,646	97,778	97,891	98,055	98,386 (19,677) [4,723] {2,361}	98,745 (19,749) [4,740] {2,370}	99,122 (19,824) [4,758] {2,379}
Gloucester	31,920	31,960	32,037	32,091	32,241 (6,448) [1,548] {774}	32,405 (6,481) [1,555] {778}	32,578 (6,516) [1,564] {782}
Hudson	90,827	90,932	90,976	91,096	91,331 (18,266) [4,384] {2,192}	91,575 (18,315) [4,396] {2,198}	91,828 (18,366) [4,408] {2,204}
Hunterdon	10,336	10,347	10,362	10,381	10,427 (2,085) [501] {250}	10,477 (2,095) [503] {251}	10,530 (2,106) [505] {253}
Mercer	35,211	35,247	35,283	35,339	35,470 (7,094) [1,703] {851}	35,617 (7,123) [1,710] {855}	35,776 (7,155) [1,717] {859}
Middlesex	95,615	95,700	95,796	95,949	96,252 (19,250) [4,620] {2,310}	96,575 (19,315) [4,636] {2,318}	96,922 (19,384) [4,652] {2,326}
Monmouth	80,350	80,456	80,605	80,753	81,096 (16,219) [3,893] {1,946}	81,449 (16,290) [3,910] {1,955}	81,813 (16,363) [3,927] {1,964}
Morris	51,990	52,052	52,087	52,171	52,350 (10,470) [2,513] {1,256}	52,543 (10,509) [2,522] {1,261}	52,748 (10,550) [2,532] {1,266}
Ocean	79,888	80,014	80,149	80,379	80,737 (16,147) [3,875] {1,938}	81,132 (16,226) [3,894] {1,947}	81,566 (16,313) [3,915] {1,958}
Passaic	75,111	75,181	75,220	75,323	75,491 (15,098) [3,624] {1,812}	75,670 (15,134) [3,632] {1,816}	75,856 (15,171) [3,641] {1,821}
Somerset	31,360	31,408	31,428	31,491	31,613 (6,323) [1,517] {759}	31,746 (6,349) [1,524] {762}	31,890 (6,378) [1,531] {765}
Sussex	14,538	14,551	14,562	14,592	14,629 (2,926) [702] {351}	14,667 (2,933) [704] {352}	14,708 (2,942) [706] {353}
Union	73,793	73,864	73,939	74,053	74,273 (14,855) [3,565] {1,783}	74,511 (14,902) [3,577] {1,788}	74,766 (14,953) [3,589] {1,794}
Warren	10,274	10,285	10,302	10,322	10,363 (2,073) [497] {249}	10,411 (2,082) [500] {250}	10,466 (2,093) [502] {251}

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.