IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/19/21

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 3/19/21 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
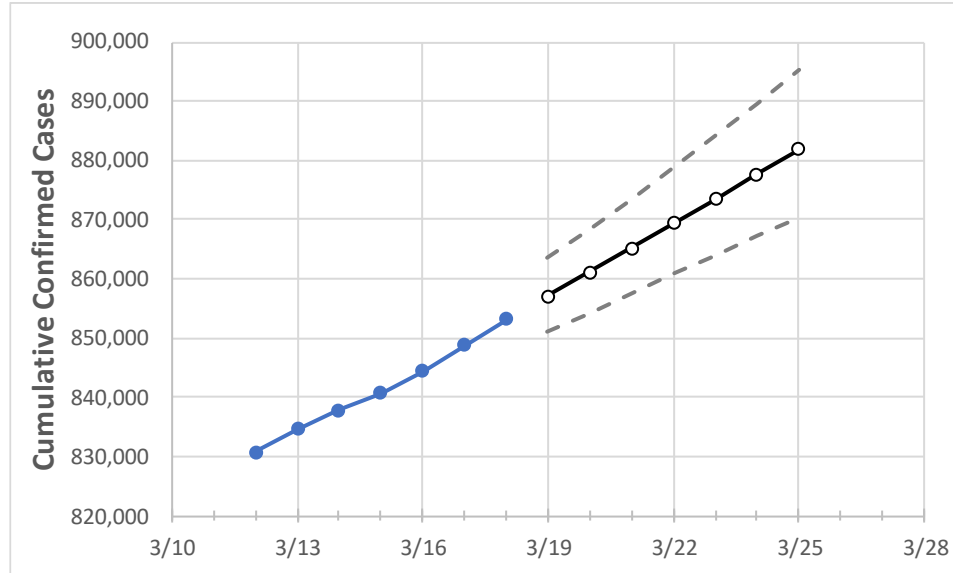
	Actual Confirmed Cases On:				Projected Cases For:						
	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25
New Jersey	840,685	844,398	848,727	853,188	857,129	861,166	865,216	869,355	873,486	877,688	881,959

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:						
	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25
Bergen	83,594	84,076	84,573	85,044	85,497	85,948	86,414	86,870	87,351	87,838	88,308
Burlington	37,226	37,336	37,508	37,675	37,814	37,951	38,093	38,235	38,376	38,519	38,666
Camden	45,994	46,111	46,318	46,496	46,640	46,789	46,937	47,088	47,240	47,391	47,550
Essex	78,308	78,676	79,098	79,541	79,927	80,313	80,708	81,101	81,511	81,935	82,357
Gloucester	25,243	25,318	25,433	25,536	25,619	25,707	25,795	25,885	25,973	26,068	26,161
Hudson	73,816	74,064	74,437	74,909	75,236	75,566	75,902	76,241	76,575	76,916	77,253
Hunterdon	7,490	7,523	7,580	7,629	7,675	7,721	7,768	7,817	7,867	7,918	7,969
Mercer	29,126	29,195	29,315	29,423	29,520	29,618	29,713	29,813	29,914	30,014	30,115
Middlesex	77,082	77,485	77,871	78,287	78,654	79,017	79,388	79,763	80,151	80,541	80,932
Monmouth	61,940	62,277	62,683	63,054	63,422	63,794	64,167	64,541	64,932	65,315	65,708
Morris	40,975	41,199	41,464	41,744	42,044	42,346	42,653	42,976	43,305	43,641	43,996
Ocean	63,049	63,358	63,683	64,004	64,312	64,623	64,929	65,245	65,559	65,875	66,184
Passaic	60,111	60,392	60,625	60,899	61,156	61,417	61,683	61,950	62,228	62,502	62,786
Somerset	24,495	24,618	24,725	24,879	25,009	25,144	25,280	25,422	25,564	25,709	25,854
Sussex	10,011	10,061	10,137	10,250	10,331	10,416	10,502	10,589	10,679	10,776	10,870
Union	60,047	60,286	60,518	60,820	61,063	61,307	61,554	61,802	62,054	62,307	62,563
Warren	7,624	7,658	7,726	7,781	7,827	7,874	7,920	7,969	8,018	8,069	8,122

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:		
	3/15	3/16	3/17	3/18	3/20	3/22	3/24
Bergen	83,594	84,076	84,573	85,044	85,948 (17,190) [4,126] {2,063}	86,870 (17,374) [4,170] {2,085}	87,838 (17,568) [4,216] {2,108}
Burlington	37,226	37,336	37,508	37,675	37,951 (7,590) [1,822] {911}	38,235 (7,647) [1,835] {918}	38,519 (7,704) [1,849] {924}
Camden	45,994	46,111	46,318	46,496	46,789 (9,358) [2,246] {1,123}	47,088 (9,418) [2,260] {1,130}	47,391 (9,478) [2,275] {1,137}
Essex	78,308	78,676	79,098	79,541	80,313 (16,063) [3,855] {1,928}	81,101 (16,220) [3,893] {1,946}	81,935 (16,387) [3,933] {1,966}
Gloucester	25,243	25,318	25,433	25,536	25,707 (5,141) [1,234] {617}	25,885 (5,177) [1,242] {621}	26,068 (5,214) [1,251] {626}
Hudson	73,816	74,064	74,437	74,909	75,566 (15,113) [3,627] {1,814}	76,241 (15,248) [3,660] {1,830}	76,916 (15,383) [3,692] {1,846}
Hunterdon	7,490	7,523	7,580	7,629	7,721 (1,544) [371] {185}	7,817 (1,563) [375] {188}	7,918 (1,584) [380] {190}
Mercer	29,126	29,195	29,315	29,423	29,618 (5,924) [1,422] {711}	29,813 (5,963) [1,431] {716}	30,014 (6,003) [1,441] {720}
Middlesex	77,082	77,485	77,871	78,287	79,017 (15,803) [3,793] {1,896}	79,763 (15,953) [3,829] {1,914}	80,541 (16,108) [3,866] {1,933}
Monmouth	61,940	62,277	62,683	63,054	63,794 (12,759) [3,062] {1,531}	64,541 (12,908) [3,098] {1,549}	65,315 (13,063) [3,135] {1,568}
Morris	40,975	41,199	41,464	41,744	42,346 (8,469) [2,033] {1,016}	42,976 (8,595) [2,063] {1,031}	43,641 (8,728) [2,095] {1,047}
Ocean	63,049	63,358	63,683	64,004	64,623 (12,925) [3,102] {1,551}	65,245 (13,049) [3,132] {1,566}	65,875 (13,175) [3,162] {1,581}
Passaic	60,111	60,392	60,625	60,899	61,417 (12,283) [2,948] {1,474}	61,950 (12,390) [2,974] {1,487}	62,502 (12,500) [3,000] {1,500}
Somerset	24,495	24,618	24,725	24,879	25,144 (5,029) [1,207] {603}	25,422 (5,084) [1,220] {610}	25,709 (5,142) [1,234] {617}
Sussex	10,011	10,061	10,137	10,250	10,416 (2,083) [500] {250}	10,589 (2,118) [508] {254}	10,776 (2,155) [517] {259}
Union	60,047	60,286	60,518	60,820	61,307 (12,261) [2,943] {1,471}	61,802 (12,360) [2,967] {1,483}	62,307 (12,461) [2,991] {1,495}
Warren	7,624	7,658	7,726	7,781	7,874 (1,575) [378] {189}	7,969 (1,594) [383] {191}	8,069 (1,614) [387] {194}

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.