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

Date: 8/6/21

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 8/6/21 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.

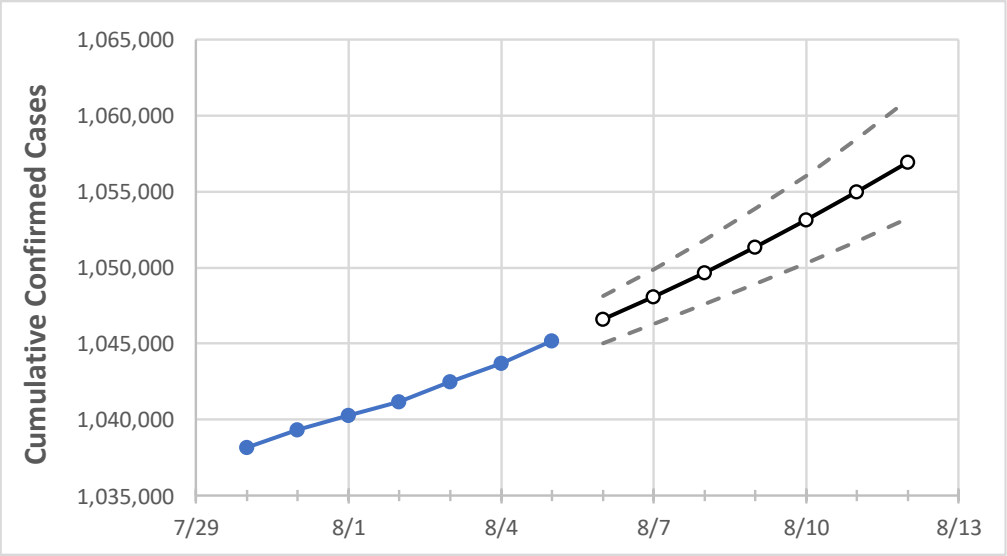
IEM's Modeling Lead

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:						
	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12
New Jersey	1,041,159	1,042,472	1,043,702	1,045,168	1,046,583	1,048,077	1,049,674	1,051,352	1,053,124	1,054,973	1,056,949

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:						
	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12
Bergen	106,777	106,906	107,009	107,133	107,266	107,406	107,552	107,704	107,862	108,028	108,201
Burlington	45,311	45,378	45,473	45,567	45,662	45,765	45,876	45,996	46,125	46,265	46,414
Camden	56,885	56,974	57,038	57,167	57,265	57,372	57,488	57,616	57,754	57,902	58,068
Essex	96,134	96,249	96,365	96,480	96,592	96,711	96,838	96,968	97,103	97,246	97,394
Gloucester	31,261	31,336	31,364	31,418	31,469	31,526	31,584	31,647	31,714	31,787	31,864
Hudson	89,583	89,702	89,766	89,857	89,967	90,083	90,210	90,343	90,485	90,636	90,797
Hunterdon	10,096	10,108	10,124	10,158	10,179	10,203	10,228	10,255	10,285	10,317	10,353
Mercer	34,660	34,692	34,711	34,740	34,773	34,809	34,845	34,883	34,923	34,965	35,008
Middlesex	94,145	94,256	94,362	94,486	94,599	94,717	94,842	94,969	95,102	95,244	95,389
Monmouth	78,434	78,591	78,754	78,923	79,088	79,259	79,439	79,624	79,817	80,021	80,231
Morris	51,184	51,227	51,285	51,357	51,414	51,475	51,538	51,605	51,673	51,746	51,821
Ocean	78,073	78,141	78,252	78,359	78,461	78,567	78,678	78,792	78,913	79,037	79,166
Passaic	74,315	74,381	74,455	74,521	74,591	74,663	74,739	74,819	74,905	74,995	75,089
Somerset	30,800	30,844	30,883	30,925	30,967	31,010	31,057	31,106	31,157	31,210	31,265
Sussex	14,330	14,346	14,365	14,388	14,410	14,433	14,458	14,485	14,515	14,546	14,580
Union	72,813	72,857	72,909	73,000	73,069	73,139	73,214	73,292	73,372	73,455	73,544
Warren	10,144	10,154	10,163	10,176	10,186	10,198	10,210	10,223	10,238	10,253	10,270

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:		
	8/2	8/3	8/4	8/5	8/7	8/9	8/11
Bergen	106,777	106,906	107,009	107,133	107,406 (21,481) [5,156] {2,578}	107,704 (21,541) [5,170] {2,585}	108,028 (21,606) [5,185] {2,593}
Burlington	45,311	45,378	45,473	45,567	45,765 (9,153) [2,197] {1,098}	45,996 (9,199) [2,208] {1,104}	46,265 (9,253) [2,221] {1,110}
Camden	56,885	56,974	57,038	57,167	57,372 (11,474) [2,754] {1,377}	57,616 (11,523) [2,766] {1,383}	57,902 (11,580) [2,779] {1,390}
Essex	96,134	96,249	96,365	96,480	96,711 (19,342) [4,642] {2,321}	96,968 (19,394) [4,654] {2,327}	97,246 (19,449) [4,668] {2,334}
Gloucester	31,261	31,336	31,364	31,418	31,526 (6,305) [1,513] {757}	31,647 (6,329) [1,519] {760}	31,787 (6,357) [1,526] {763}
Hudson	89,583	89,702	89,766	89,857	90,083 (18,017) [4,324] {2,162}	90,343 (18,069) [4,336] {2,168}	90,636 (18,127) [4,351] {2,175}
Hunterdon	10,096	10,108	10,124	10,158	10,203 (2,041) [490] {245}	10,255 (2,051) [492] {246}	10,317 (2,063) [495] {248}
Mercer	34,660	34,692	34,711	34,740	34,809 (6,962) [1,671] {835}	34,883 (6,977) [1,674] {837}	34,965 (6,993) [1,678] {839}
Middlesex	94,145	94,256	94,362	94,486	94,717 (18,943) [4,546] {2,273}	94,969 (18,994) [4,559] {2,279}	95,244 (19,049) [4,572] {2,286}
Monmouth	78,434	78,591	78,754	78,923	79,259 (15,852) [3,804] {1,902}	79,624 (15,925) [3,822] {1,911}	80,021 (16,004) [3,841] {1,921}
Morris	51,184	51,227	51,285	51,357	51,475 (10,295) [2,471] {1,235}	51,605 (10,321) [2,477] {1,239}	51,746 (10,349) [2,484] {1,242}
Ocean	78,073	78,141	78,252	78,359	78,567 (15,713) [3,771] {1,886}	78,792 (15,758) [3,782] {1,891}	79,037 (15,807) [3,794] {1,897}
Passaic	74,315	74,381	74,455	74,521	74,663 (14,933) [3,584] {1,792}	74,819 (14,964) [3,591] {1,796}	74,995 (14,999) [3,600] {1,800}
Somerset	30,800	30,844	30,883	30,925	31,010 (6,202) [1,489] {744}	31,106 (6,221) [1,493] {747}	31,210 (6,242) [1,498] {749}
Sussex	14,330	14,346	14,365	14,388	14,433 (2,887) [693] {346}	14,485 (2,897) [695] {348}	14,546 (2,909) [698] {349}
Union	72,813	72,857	72,909	73,000	73,139 (14,628) [3,511] {1,755}	73,292 (14,658) [3,518] {1,759}	73,455 (14,691) [3,526] {1,763}
Warren	10,144	10,154	10,163	10,176	10,198 (2,040) [489] {245}	10,223 (2,045) [491] {245}	10,253 (2,051) [492] {246}

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.