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

Date: 6/17/21

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 6/17/21 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.

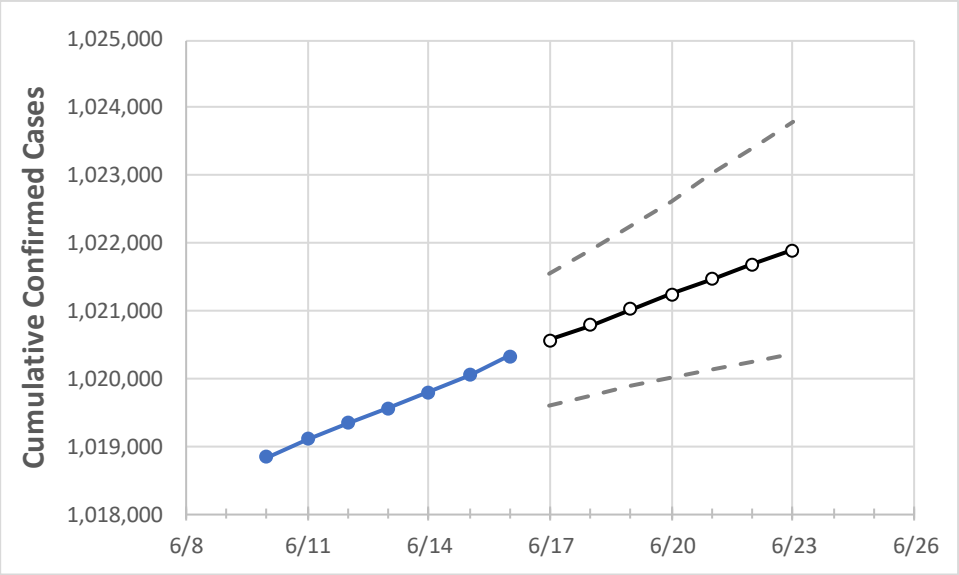
IEM's Modeling Lead

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:						
	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22	6/23
New Jersey	1,019,563	1,019,794	1,020,043	1,020,326	1,020,566	1,020,793	1,021,024	1,021,245	1,021,464	1,021,686	1,021,898

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:						
	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22	6/23
Bergen	104,553	104,574	104,610	104,634	104,660	104,685	104,711	104,737	104,764	104,790	104,815
Burlington	44,271	44,278	44,283	44,296	44,305	44,314	44,323	44,332	44,340	44,349	44,357
Camden	55,734	55,747	55,763	55,780	55,789	55,797	55,805	55,813	55,820	55,828	55,834
Essex	94,257	94,279	94,317	94,343	94,359	94,374	94,389	94,402	94,416	94,429	94,442
Gloucester	30,600	30,604	30,606	30,620	30,625	30,630	30,635	30,640	30,645	30,650	30,654
Hudson	88,161	88,197	88,230	88,243	88,270	88,297	88,325	88,354	88,382	88,411	88,441
Hunterdon	9,828	9,825	9,826	9,827	9,830	9,832	9,835	9,837	9,840	9,842	9,845
Mercer	34,090	34,099	34,107	34,116	34,123	34,129	34,135	34,141	34,147	34,153	34,159
Middlesex	92,423	92,439	92,481	92,499	92,517	92,537	92,555	92,574	92,592	92,610	92,627
Monmouth	75,715	75,737	75,660	75,683	75,707	75,732	75,757	75,782	75,808	75,834	75,861
Morris	50,230	50,237	50,250	50,259	50,269	50,279	50,289	50,299	50,308	50,318	50,328
Ocean	76,030	76,051	76,095	76,137	76,169	76,202	76,236	76,271	76,307	76,343	76,382
Passaic	73,107	73,129	73,165	73,187	73,207	73,228	73,249	73,269	73,289	73,310	73,330
Somerset	30,103	30,118	30,127	30,139	30,150	30,161	30,173	30,185	30,198	30,212	30,225
Sussex	14,039	14,036	14,041	14,044	14,048	14,053	14,057	14,061	14,065	14,069	14,073
Union	71,574	71,587	71,607	71,625	71,644	71,663	71,682	71,700	71,719	71,738	71,757
Warren	9,995	9,996	9,998	9,998	9,999	10,001	10,002	10,004	10,005	10,006	10,007

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:		
	6/13	6/14	6/15	6/16	6/18	6/20	6/22
Bergen	104,553	104,574	104,610	104,634	104,685 (20,937) [5,025] {2,512}	104,737 (20,947) [5,027] {2,514}	104,790 (20,958) [5,030] {2,515}
Burlington	44,271	44,278	44,283	44,296	44,314 (8,863) [2,127] {1,064}	44,332 (8,866) [2,128] {1,064}	44,349 (8,870) [2,129] {1,064}
Camden	55,734	55,747	55,763	55,780	55,797 (11,159) [2,678] {1,339}	55,813 (11,163) [2,679] {1,340}	55,828 (11,166) [2,680] {1,340}
Essex	94,257	94,279	94,317	94,343	94,374 (18,875) [4,530] {2,265}	94,402 (18,880) [4,531] {2,266}	94,429 (18,886) [4,533] {2,266}
Gloucester	30,600	30,604	30,606	30,620	30,630 (6,126) [1,470] {735}	30,640 (6,128) [1,471] {735}	30,650 (6,130) [1,471] {736}
Hudson	88,161	88,197	88,230	88,243	88,297 (17,659) [4,238] {2,119}	88,354 (17,671) [4,241] {2,120}	88,411 (17,682) [4,244] {2,122}
Hunterdon	9,828	9,825	9,826	9,827	9,832 (1,966) [472] {236}	9,837 (1,967) [472] {236}	9,842 (1,968) [472] {236}
Mercer	34,090	34,099	34,107	34,116	34,129 (6,826) [1,638] {819}	34,141 (6,828) [1,639] {819}	34,153 (6,831) [1,639] {820}
Middlesex	92,423	92,439	92,481	92,499	92,537 (18,507) [4,442] {2,221}	92,574 (18,515) [4,444] {2,222}	92,610 (18,522) [4,445] {2,223}
Monmouth	75,715	75,737	75,660	75,683	75,732 (15,146) [3,635] {1,818}	75,782 (15,156) [3,638] {1,819}	75,834 (15,167) [3,640] {1,820}
Morris	50,230	50,237	50,250	50,259	50,279 (10,056) [2,413] {1,207}	50,299 (10,060) [2,414] {1,207}	50,318 (10,064) [2,415] {1,208}
Ocean	76,030	76,051	76,095	76,137	76,202 (15,240) [3,658] {1,829}	76,271 (15,254) [3,661] {1,831}	76,343 (15,269) [3,664] {1,832}
Passaic	73,107	73,129	73,165	73,187	73,228 (14,646) [3,515] {1,757}	73,269 (14,654) [3,517] {1,758}	73,310 (14,662) [3,519] {1,759}
Somerset	30,103	30,118	30,127	30,139	30,161 (6,032) [1,448] {724}	30,185 (6,037) [1,449] {724}	30,212 (6,042) [1,450] {725}
Sussex	14,039	14,036	14,041	14,044	14,053 (2,811) [675] {337}	14,061 (2,812) [675] {337}	14,069 (2,814) [675] {338}
Union	71,574	71,587	71,607	71,625	71,663 (14,333) [3,440] {1,720}	71,700 (14,340) [3,442] {1,721}	71,738 (14,348) [3,443] {1,722}
Warren	9,995	9,996	9,998	9,998	10,001 (2,000) [480] {240}	10,004 (2,001) [480] {240}	10,006 (2,001) [480] {240}

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.