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

Date: 6/15/21

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 6/15/21 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.

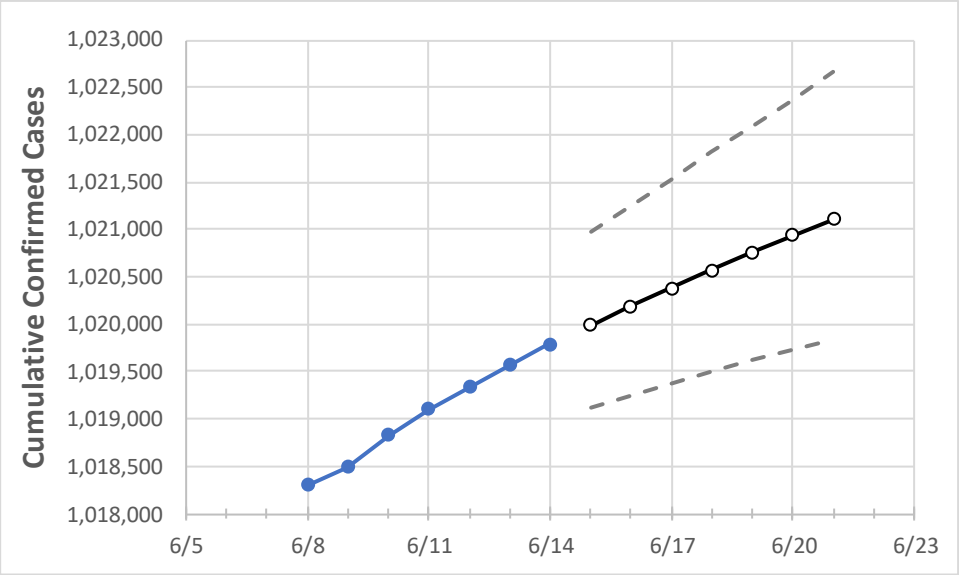
IEM's Modeling Lead

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:						
	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21
New Jersey	1,019,107	1,019,335	1,019,563	1,019,794	1,019,993	1,020,186	1,020,383	1,020,574	1,020,759	1,020,937	1,021,111

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:						
	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21
Bergen	104,508	104,531	104,553	104,574	104,594	104,614	104,633	104,651	104,670	104,688	104,706
Burlington	44,253	44,262	44,271	44,278	44,286	44,293	44,300	44,307	44,313	44,320	44,326
Camden	55,714	55,724	55,734	55,747	55,756	55,765	55,772	55,780	55,787	55,793	55,799
Essex	94,248	94,253	94,257	94,279	94,294	94,308	94,321	94,335	94,348	94,361	94,373
Gloucester	30,588	30,594	30,600	30,604	30,609	30,613	30,618	30,622	30,626	30,630	30,633
Hudson	88,116	88,139	88,161	88,197	88,217	88,238	88,258	88,277	88,297	88,317	88,338
Hunterdon	9,820	9,824	9,828	9,825	9,828	9,832	9,835	9,838	9,841	9,843	9,846
Mercer	34,079	34,085	34,090	34,099	34,106	34,112	34,118	34,124	34,129	34,135	34,140
Middlesex	92,392	92,408	92,423	92,439	92,456	92,472	92,489	92,505	92,520	92,535	92,549
Monmouth	75,661	75,688	75,715	75,737	75,754	75,771	75,787	75,804	75,821	75,838	75,854
Morris	50,210	50,220	50,230	50,237	50,247	50,257	50,267	50,276	50,285	50,294	50,303
Ocean	75,983	76,007	76,030	76,051	76,071	76,092	76,112	76,133	76,154	76,174	76,195
Passaic	73,063	73,085	73,107	73,129	73,146	73,164	73,181	73,198	73,214	73,230	73,245
Somerset	30,078	30,091	30,103	30,118	30,125	30,132	30,138	30,145	30,152	30,159	30,166
Sussex	14,031	14,035	14,039	14,036	14,040	14,043	14,047	14,050	14,053	14,057	14,060
Union	71,534	71,554	71,574	71,587	71,603	71,619	71,635	71,650	71,666	71,681	71,697
Warren	9,991	9,993	9,995	9,996	9,998	10,000	10,001	10,003	10,005	10,006	10,008

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:		
	6/11	6/12	6/13	6/14	6/16	6/18	6/20
Bergen	104,508	104,531	104,553	104,574	104,614 (20,923) [5,021] {2,511}	104,651 (20,930) [5,023] {2,512}	104,688 (20,938) [5,025] {2,513}
Burlington	44,253	44,262	44,271	44,278	44,293 (8,859) [2,126] {1,063}	44,307 (8,861) [2,127] {1,063}	44,320 (8,864) [2,127] {1,064}
Camden	55,714	55,724	55,734	55,747	55,765 (11,153) [2,677] {1,338}	55,780 (11,156) [2,677] {1,339}	55,793 (11,159) [2,678] {1,339}
Essex	94,248	94,253	94,257	94,279	94,308 (18,862) [4,527] {2,263}	94,335 (18,867) [4,528] {2,264}	94,361 (18,872) [4,529] {2,265}
Gloucester	30,588	30,594	30,600	30,604	30,613 (6,123) [1,469] {735}	30,622 (6,124) [1,470] {735}	30,630 (6,126) [1,470] {735}
Hudson	88,116	88,139	88,161	88,197	88,238 (17,648) [4,235] {2,118}	88,277 (17,655) [4,237] {2,119}	88,317 (17,663) [4,239] {2,120}
Hunterdon	9,820	9,824	9,828	9,825	9,832 (1,966) [472] {236}	9,838 (1,968) [472] {236}	9,843 (1,969) [472] {236}
Mercer	34,079	34,085	34,090	34,099	34,112 (6,822) [1,637] {819}	34,124 (6,825) [1,638] {819}	34,135 (6,827) [1,638] {819}
Middlesex	92,392	92,408	92,423	92,439	92,472 (18,494) [4,439] {2,219}	92,505 (18,501) [4,440] {2,220}	92,535 (18,507) [4,442] {2,221}
Monmouth	75,661	75,688	75,715	75,737	75,771 (15,154) [3,637] {1,818}	75,804 (15,161) [3,639] {1,819}	75,838 (15,168) [3,640] {1,820}
Morris	50,210	50,220	50,230	50,237	50,257 (10,051) [2,412] {1,206}	50,276 (10,055) [2,413] {1,207}	50,294 (10,059) [2,414] {1,207}
Ocean	75,983	76,007	76,030	76,051	76,092 (15,218) [3,652] {1,826}	76,133 (15,227) [3,654] {1,827}	76,174 (15,235) [3,656] {1,828}
Passaic	73,063	73,085	73,107	73,129	73,164 (14,633) [3,512] {1,756}	73,198 (14,640) [3,513] {1,757}	73,230 (14,646) [3,515] {1,758}
Somerset	30,078	30,091	30,103	30,118	30,132 (6,026) [1,446] {723}	30,145 (6,029) [1,447] {723}	30,159 (6,032) [1,448] {724}
Sussex	14,031	14,035	14,039	14,036	14,043 (2,809) [674] {337}	14,050 (2,810) [674] {337}	14,057 (2,811) [675] {337}
Union	71,534	71,554	71,574	71,587	71,619 (14,324) [3,438] {1,719}	71,650 (14,330) [3,439] {1,720}	71,681 (14,336) [3,441] {1,720}
Warren	9,991	9,993	9,995	9,996	10,000 (2,000) [480] {240}	10,003 (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.