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

Date: 9/13/21

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 9/13/21 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.

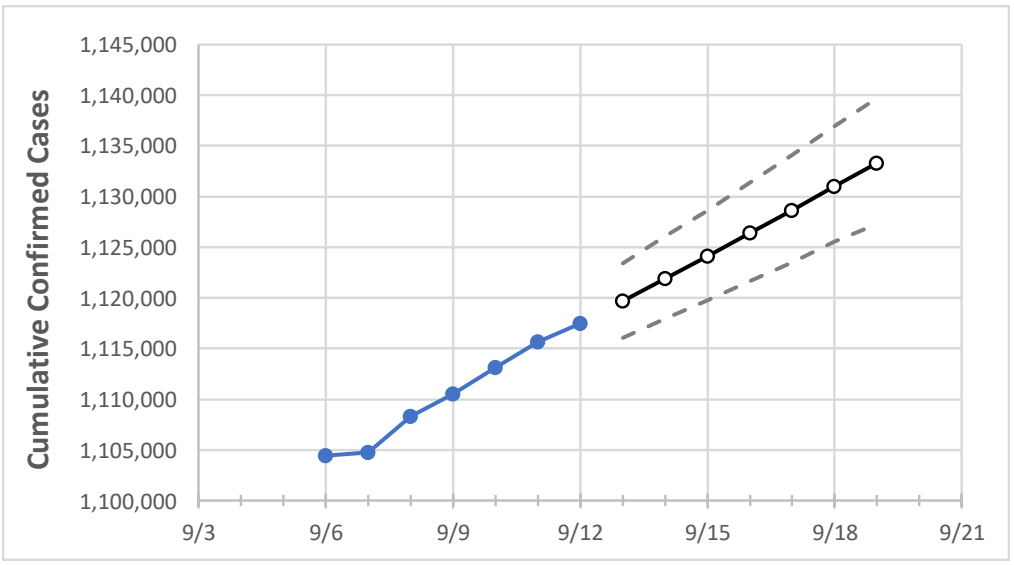
IEM's Modeling Lead

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:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
New Jersey	1,110,501	1,113,165	1,115,659	1,117,506	1,119,733	1,121,927	1,124,144	1,126,413	1,128,656	1,130,959	1,133,287

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:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Bergen	112,749	112,981	113,188	113,340	113,526	113,706	113,895	114,083	114,266	114,466	114,656
Burlington	49,529	49,678	49,802	49,907	50,036	50,164	50,292	50,423	50,556	50,688	50,823
Camden	61,587	61,770	61,919	62,071	62,237	62,402	62,560	62,728	62,903	63,072	63,248
Essex	101,323	101,539	101,737	101,836	101,983	102,129	102,277	102,423	102,573	102,731	102,878
Gloucester	34,148	34,276	34,370	34,472	34,573	34,671	34,774	34,876	34,980	35,088	35,191
Hudson	93,570	93,689	93,825	93,983	94,098	94,209	94,327	94,442	94,558	94,678	94,793
Hunterdon	10,921	10,953	10,983	10,999	11,024	11,049	11,074	11,099	11,125	11,151	11,177
Mercer	36,797	36,877	36,952	37,013	37,079	37,144	37,208	37,275	37,338	37,406	37,473
Middlesex	99,744	99,995	100,247	100,414	100,605	100,801	100,996	101,200	101,402	101,613	101,814
Monmouth	85,178	85,446	85,649	85,815	86,020	86,229	86,428	86,640	86,847	87,066	87,271
Morris	54,290	54,390	54,521	54,597	54,705	54,814	54,924	55,036	55,149	55,264	55,380
Ocean	84,921	85,184	85,452	85,603	85,844	86,095	86,344	86,592	86,856	87,113	87,373
Passaic	77,642	77,788	77,890	77,967	78,067	78,166	78,264	78,362	78,461	78,568	78,667
Somerset	32,758	32,820	32,895	32,936	32,995	33,054	33,110	33,170	33,230	33,291	33,350
Sussex	15,274	15,325	15,367	15,389	15,425	15,463	15,500	15,539	15,579	15,619	15,659
Union	76,390	76,533	76,639	76,746	76,852	76,954	77,054	77,159	77,264	77,368	77,474
Warren	10,924	10,958	11,004	11,026	11,059	11,092	11,125	11,159	11,193	11,230	11,265

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:		
	9/9	9/10	9/11	9/12	9/14	9/16	9/18
Bergen	112,749	112,981	113,188	113,340	113,706 (22,741) [5,458] {2,729}	114,083 (22,817) [5,476] {2,738}	114,466 (22,893) [5,494] {2,747}
Burlington	49,529	49,678	49,802	49,907	50,164 (10,033) [2,408] {1,204}	50,423 (10,085) [2,420] {1,210}	50,688 (10,138) [2,433] {1,217}
Camden	61,587	61,770	61,919	62,071	62,402 (12,480) [2,995] {1,498}	62,728 (12,546) [3,011] {1,505}	63,072 (12,614) [3,027] {1,514}
Essex	101,323	101,539	101,737	101,836	102,129 (20,426) [4,902] {2,451}	102,423 (20,485) [4,916] {2,458}	102,731 (20,546) [4,931] {2,466}
Gloucester	34,148	34,276	34,370	34,472	34,671 (6,934) [1,664] {832}	34,876 (6,975) [1,674] {837}	35,088 (7,018) [1,684] {842}
Hudson	93,570	93,689	93,825	93,983	94,209 (18,842) [4,522] {2,261}	94,442 (18,888) [4,533] {2,267}	94,678 (18,936) [4,545] {2,272}
Hunterdon	10,921	10,953	10,983	10,999	11,049 (2,210) [530] {265}	11,099 (2,220) [533] {266}	11,151 (2,230) [535] {268}
Mercer	36,797	36,877	36,952	37,013	37,144 (7,429) [1,783] {891}	37,275 (7,455) [1,789] {895}	37,406 (7,481) [1,795] {898}
Middlesex	99,744	99,995	100,247	100,414	100,801 (20,160) [4,838] {2,419}	101,200 (20,240) [4,858] {2,429}	101,613 (20,323) [4,877] {2,439}
Monmouth	85,178	85,446	85,649	85,815	86,229 (17,246) [4,139] {2,069}	86,640 (17,328) [4,159] {2,079}	87,066 (17,413) [4,179] {2,090}
Morris	54,290	54,390	54,521	54,597	54,814 (10,963) [2,631] {1,316}	55,036 (11,007) [2,642] {1,321}	55,264 (11,053) [2,653] {1,326}
Ocean	84,921	85,184	85,452	85,603	86,095 (17,219) [4,133] {2,066}	86,592 (17,318) [4,156] {2,078}	87,113 (17,423) [4,181] {2,091}
Passaic	77,642	77,788	77,890	77,967	78,166 (15,633) [3,752] {1,876}	78,362 (15,672) [3,761] {1,881}	78,568 (15,714) [3,771] {1,886}
Somerset	32,758	32,820	32,895	32,936	33,054 (6,611) [1,587] {793}	33,170 (6,634) [1,592] {796}	33,291 (6,658) [1,598] {799}
Sussex	15,274	15,325	15,367	15,389	15,463 (3,093) [742] {371}	15,539 (3,108) [746] {373}	15,619 (3,124) [750] {375}
Union	76,390	76,533	76,639	76,746	76,954 (15,391) [3,694] {1,847}	77,159 (15,432) [3,704] {1,852}	77,368 (15,474) [3,714] {1,857}
Warren	10,924	10,958	11,004	11,026	11,092 (2,218) [532] {266}	11,159 (2,232) [536] {268}	11,230 (2,246) [539] {270}

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.