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

Date: 3/2/21

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 3/2/21 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.

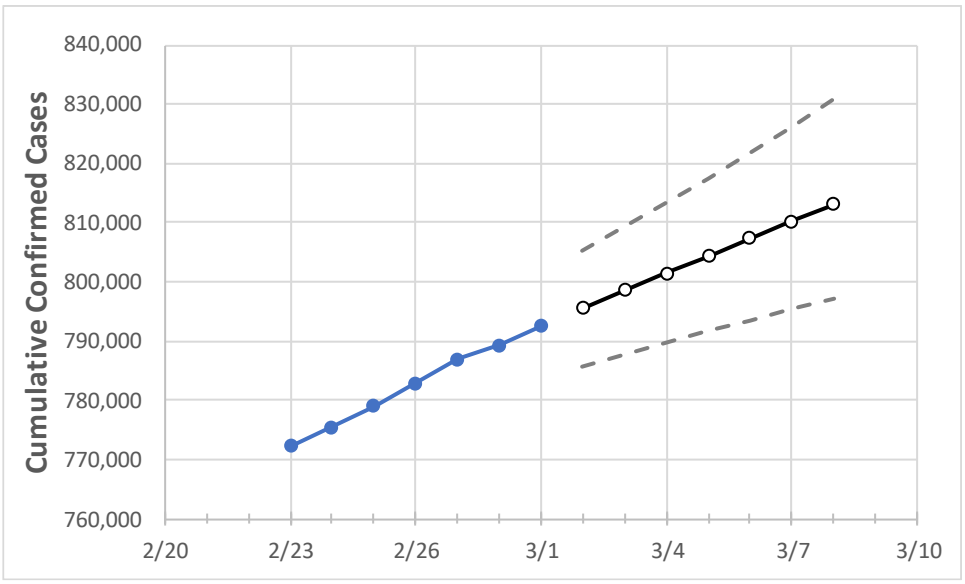
IEM's Modeling Lead

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:						
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8
New Jersey	782,833	786,967	789,356	792,496	795,478	798,543	801,462	804,337	807,321	810,213	813,151

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:						
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8
Bergen	76,862	77,290	77,537	78,040	78,429	78,809	79,196	79,586	79,975	80,367	80,766
Burlington	35,130	35,273	35,369	35,483	35,592	35,699	35,808	35,914	36,021	36,128	36,229
Camden	43,889	44,055	44,149	44,301	44,426	44,548	44,669	44,792	44,914	45,033	45,151
Essex	73,078	73,506	73,718	73,995	74,265	74,539	74,811	75,083	75,358	75,637	75,911
Gloucester	23,997	24,099	24,145	24,235	24,302	24,369	24,435	24,501	24,566	24,629	24,693
Hudson	68,672	69,078	69,277	69,600	69,901	70,201	70,500	70,810	71,114	71,410	71,709
Hunterdon	6,852	6,898	6,927	6,951	6,981	7,012	7,042	7,071	7,100	7,129	7,157
Mercer	27,577	27,702	27,790	27,881	27,965	28,046	28,126	28,207	28,285	28,366	28,444
Middlesex	72,088	72,399	72,617	72,848	73,081	73,321	73,558	73,788	74,010	74,230	74,456
Monmouth	56,380	56,659	56,878	57,157	57,427	57,688	57,957	58,222	58,483	58,752	59,011
Morris	37,152	37,408	37,542	37,727	37,875	38,022	38,170	38,313	38,452	38,591	38,731
Ocean	58,116	58,439	58,624	58,875	59,124	59,370	59,605	59,843	60,076	60,303	60,525
Passaic	56,437	56,670	56,840	56,986	57,142	57,296	57,455	57,605	57,758	57,911	58,059
Somerset	22,656	22,765	22,825	22,926	23,023	23,120	23,216	23,313	23,410	23,507	23,602
Sussex	9,018	9,102	9,127	9,173	9,212	9,248	9,285	9,321	9,355	9,389	9,424
Union	56,275	56,591	56,756	56,976	57,172	57,373	57,567	57,761	57,954	58,151	58,342
Warren	6,983	7,032	7,063	7,102	7,136	7,170	7,205	7,240	7,275	7,311	7,347

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:		
	2/26	2/27	2/28	3/1	3/3	3/5	3/7
Bergen	76,862	77,290	77,537	78,040	78,809 (15,762) [3,783] {1,891}	79,586 (15,917) [3,820] {1,910}	80,367 (16,073) [3,858] {1,929}
Burlington	35,130	35,273	35,369	35,483	35,699 (7,140) [1,714] {857}	35,914 (7,183) [1,724] {862}	36,128 (7,226) [1,734] {867}
Camden	43,889	44,055	44,149	44,301	44,548 (8,910) [2,138] {1,069}	44,792 (8,958) [2,150] {1,075}	45,033 (9,007) [2,162] {1,081}
Essex	73,078	73,506	73,718	73,995	74,539 (14,908) [3,578] {1,789}	75,083 (15,017) [3,604] {1,802}	75,637 (15,127) [3,631] {1,815}
Gloucester	23,997	24,099	24,145	24,235	24,369 (4,874) [1,170] {585}	24,501 (4,900) [1,176] {588}	24,629 (4,926) [1,182] {591}
Hudson	68,672	69,078	69,277	69,600	70,201 (14,040) [3,370] {1,685}	70,810 (14,162) [3,399] {1,699}	71,410 (14,282) [3,428] {1,714}
Hunterdon	6,852	6,898	6,927	6,951	7,012 (1,402) [337] {168}	7,071 (1,414) [339] {170}	7,129 (1,426) [342] {171}
Mercer	27,577	27,702	27,790	27,881	28,046 (5,609) [1,346] {673}	28,207 (5,641) [1,354] {677}	28,366 (5,673) [1,362] {681}
Middlesex	72,088	72,399	72,617	72,848	73,321 (14,664) [3,519] {1,760}	73,788 (14,758) [3,542] {1,771}	74,230 (14,846) [3,563] {1,782}
Monmouth	56,380	56,659	56,878	57,157	57,688 (11,538) [2,769] {1,385}	58,222 (11,644) [2,795] {1,397}	58,752 (11,750) [2,820] {1,410}
Morris	37,152	37,408	37,542	37,727	38,022 (7,604) [1,825] {913}	38,313 (7,663) [1,839] {920}	38,591 (7,718) [1,852] {926}
Ocean	58,116	58,439	58,624	58,875	59,370 (11,874) [2,850] {1,425}	59,843 (11,969) [2,872] {1,436}	60,303 (12,061) [2,895] {1,447}
Passaic	56,437	56,670	56,840	56,986	57,296 (11,459) [2,750] {1,375}	57,605 (11,521) [2,765] {1,383}	57,911 (11,582) [2,780] {1,390}
Somerset	22,656	22,765	22,825	22,926	23,120 (4,624) [1,110] {555}	23,313 (4,663) [1,119] {560}	23,507 (4,701) [1,128] {564}
Sussex	9,018	9,102	9,127	9,173	9,248 (1,850) [444] {222}	9,321 (1,864) [447] {224}	9,389 (1,878) [451] {225}
Union	56,275	56,591	56,756	56,976	57,373 (11,475) [2,754] {1,377}	57,761 (11,552) [2,773] {1,386}	58,151 (11,630) [2,791] {1,396}
Warren	6,983	7,032	7,063	7,102	7,170 (1,434) [344] {172}	7,240 (1,448) [348] {174}	7,311 (1,462) [351] {175}

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.