

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

Date: 4/12/21

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 4/12/21 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.

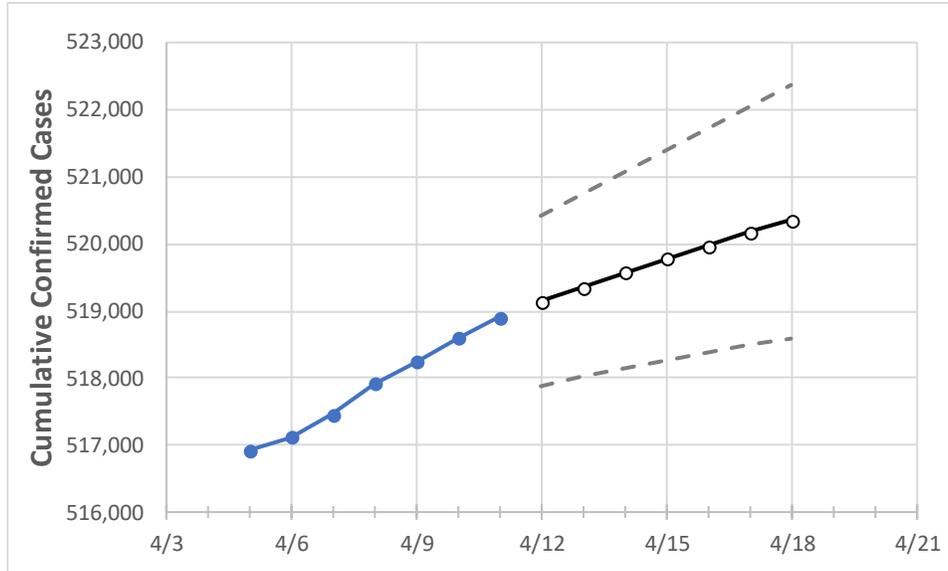
IEM's Modeling Lead

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.

Alabama State Projections



	Actual Confirmed Cases On:				Projected Cases For:							
	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	
Alabama	517,916	518,234	518,588	518,899	519,134	519,348	519,562	519,772	519,972	520,172	520,358	

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.

Alabama Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	
Jefferson	75,199	75,263	75,335	75,364	75,405	75,444	75,480	75,517	75,551	75,585	75,618	
Lee	15,480	15,491	15,510	15,524	15,531	15,540	15,547	15,555	15,562	15,569	15,576	
Madison	33,754	33,784	33,829	33,859	33,884	33,909	33,933	33,957	33,981	34,005	34,028	
Marshall	11,935	11,941	11,952	11,957	11,962	11,966	11,970	11,974	11,977	11,981	11,984	
Mobile	37,661	37,687	37,698	37,763	37,780	37,797	37,814	37,829	37,845	37,861	37,876	
Montgomery	23,905	23,928	23,942	23,962	23,978	23,994	24,008	24,022	24,036	24,049	24,061	
Shelby	23,085	23,088	23,094	23,106	23,115	23,123	23,131	23,138	23,145	23,151	23,157	
Tuscaloosa	25,221	25,231	25,245	25,266	25,281	25,295	25,309	25,322	25,335	25,347	25,359	

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.

Alabama Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	4/8	4/9	4/10	4/11	4/13			4/15			4/17					
Jefferson	75,199	75,263	75,335	75,364	75,444	(15,089)	[3,621]	{1,811}	75,517	(15,103)	[3,625]	{1,812}	75,585	(15,117)	[3,628]	{1,814}
Lee	15,480	15,491	15,510	15,524	15,540	(3,108)	[746]	{373}	15,555	(3,111)	[747]	{373}	15,569	(3,114)	[747]	{374}
Madison	33,754	33,784	33,829	33,859	33,909	(6,782)	[1,628]	{814}	33,957	(6,791)	[1,630]	{815}	34,005	(6,801)	[1,632]	{816}
Marshall	11,935	11,941	11,952	11,957	11,966	(2,393)	[574]	{287}	11,974	(2,395)	[575]	{287}	11,981	(2,396)	[575]	{288}
Mobile	37,661	37,687	37,698	37,763	37,797	(7,559)	[1,814]	{907}	37,829	(7,566)	[1,816]	{908}	37,861	(7,572)	[1,817]	{909}
Montgomery	23,905	23,928	23,942	23,962	23,994	(4,799)	[1,152]	{576}	24,022	(4,804)	[1,153]	{577}	24,049	(4,810)	[1,154]	{577}
Shelby	23,085	23,088	23,094	23,106	23,123	(4,625)	[1,110]	{555}	23,138	(4,628)	[1,111]	{555}	23,151	(4,630)	[1,111]	{556}
Tuscaloosa	25,221	25,231	25,245	25,266	25,295	(5,059)	[1,214]	{607}	25,322	(5,064)	[1,215]	{608}	25,347	(5,069)	[1,217]	{608}

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.