

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

Date: 2/26/21

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 2/26/21 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.

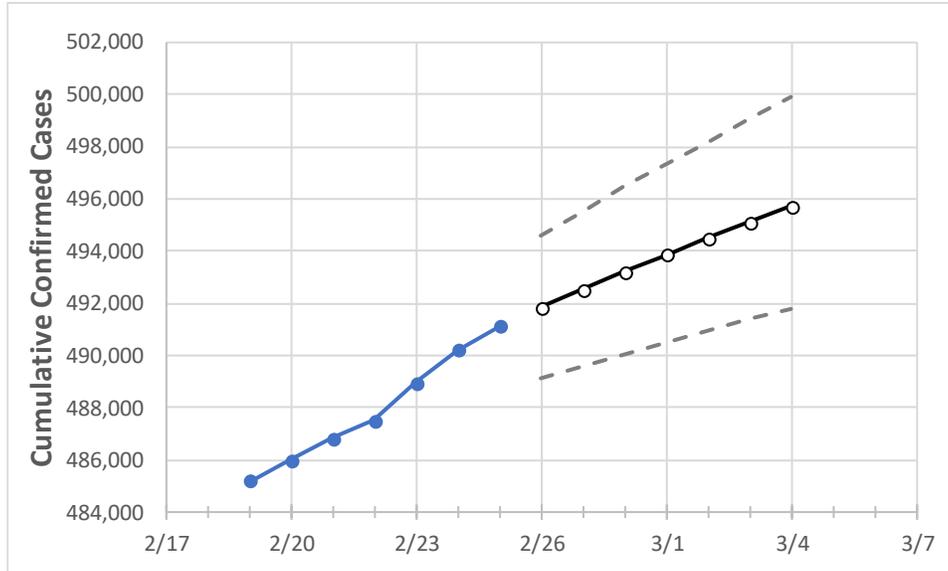
IEM's Modeling Lead

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:						
	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4
Alabama	487,520	488,973	490,220	491,110	491,846	492,542	493,210	493,870	494,508	495,119	495,722

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:						
	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4
Jefferson	70,249	70,332	70,466	70,629	70,710	70,789	70,866	70,940	71,012	71,081	71,147
Lee	14,809	14,827	14,883	14,900	14,919	14,938	14,956	14,973	14,990	15,005	15,020
Madison	32,008	32,088	32,203	32,255	32,313	32,368	32,421	32,473	32,523	32,573	32,620
Marshall	11,179	11,197	11,212	11,226	11,234	11,242	11,251	11,258	11,266	11,273	11,279
Mobile	35,378	35,725	35,810	35,894	35,979	36,063	36,146	36,229	36,315	36,397	36,475
Montgomery	22,319	22,369	22,417	22,462	22,500	22,535	22,569	22,603	22,636	22,667	22,697
Shelby	21,656	21,714	21,773	21,820	21,862	21,903	21,944	21,983	22,021	22,058	22,095
Tuscaloosa	23,860	23,913	23,961	23,996	24,037	24,075	24,113	24,147	24,179	24,214	24,245

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:											
	2/22	2/23	2/24	2/25	2/27			3/1			3/3					
Jefferson	70,249	70,332	70,466	70,629	70,789	(14,158)	[3,398]	{1,699}	70,940	(14,188)	[3,405]	{1,703}	71,081	(14,216)	[3,412]	{1,706}
Lee	14,809	14,827	14,883	14,900	14,938	(2,988)	[717]	{359}	14,973	(2,995)	[719]	{359}	15,005	(3,001)	[720]	{360}
Madison	32,008	32,088	32,203	32,255	32,368	(6,474)	[1,554]	{777}	32,473	(6,495)	[1,559]	{779}	32,573	(6,515)	[1,563]	{782}
Marshall	11,179	11,197	11,212	11,226	11,242	(2,248)	[540]	{270}	11,258	(2,252)	[540]	{270}	11,273	(2,255)	[541]	{271}
Mobile	35,378	35,725	35,810	35,894	36,063	(7,213)	[1,731]	{866}	36,229	(7,246)	[1,739]	{870}	36,397	(7,279)	[1,747]	{874}
Montgomery	22,319	22,369	22,417	22,462	22,535	(4,507)	[1,082]	{541}	22,603	(4,521)	[1,085]	{542}	22,667	(4,533)	[1,088]	{544}
Shelby	21,656	21,714	21,773	21,820	21,903	(4,381)	[1,051]	{526}	21,983	(4,397)	[1,055]	{528}	22,058	(4,412)	[1,059]	{529}
Tuscaloosa	23,860	23,913	23,961	23,996	24,075	(4,815)	[1,156]	{578}	24,147	(4,829)	[1,159]	{580}	24,214	(4,843)	[1,162]	{581}

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.