

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/15/21**

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 10/15/21 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.

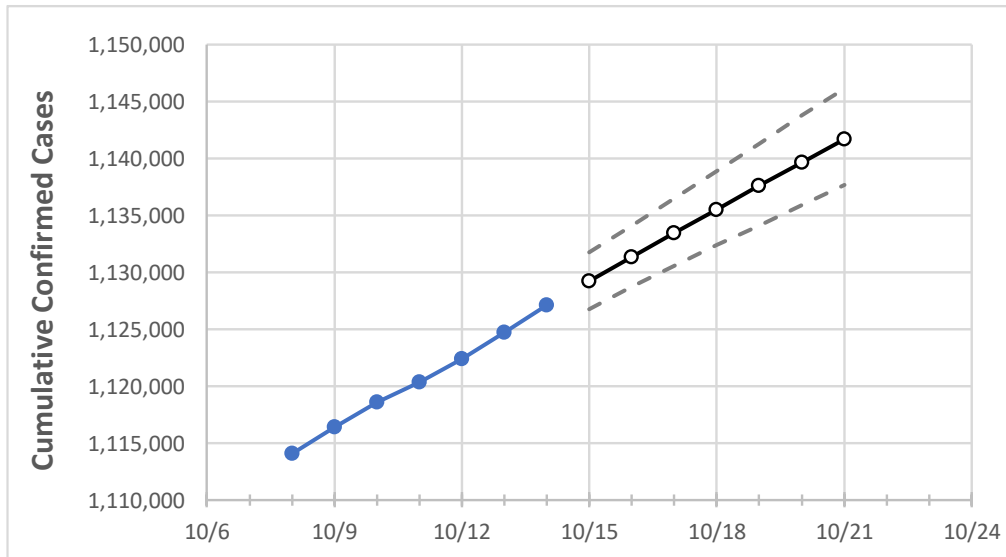
IEM's Modeling Lead

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.

Arizona State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21
Arizona	1,120,361	1,122,390	1,124,709	1,127,095	1,129,238	1,131,325	1,133,458	1,135,533	1,137,586	1,139,675	1,141,678

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.

Arizona Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21
Coconino	21,983	22,027	22,054	22,099	22,146	22,192	22,240	22,287	22,334	22,379	22,423
Maricopa	711,742	712,879	714,404	715,923	717,260	718,575	719,875	721,179	722,454	723,697	724,940
Navajo	20,237	20,282	20,344	20,385	20,435	20,487	20,539	20,592	20,644	20,697	20,750
Pima	138,398	138,627	138,833	139,075	139,339	139,601	139,868	140,132	140,394	140,662	140,918
Pinal	70,346	70,743	70,897	71,059	71,202	71,345	71,499	71,638	71,773	71,914	72,064

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.

Arizona Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	10/11	10/12	10/13	10/14	10/16				10/18				10/20			
Coconino	21,983	22,027	22,054	22,099	22,192	(4,438)	[1,065]	{533}	22,287	(4,457)	[1,070]	{535}	22,379	(4,476)	[1,074]	{537}
Maricopa	711,742	712,879	714,404	715,923	718,575	(143,715)	[34,492]	{17,246}	721,179	(144,236)	[34,617]	{17,308}	723,697	(144,739)	[34,737]	{17,369}
Navajo	20,237	20,282	20,344	20,385	20,487	(4,097)	[983]	{492}	20,592	(4,118)	[988]	{494}	20,697	(4,139)	[993]	{497}
Pima	138,398	138,627	138,833	139,075	139,601	(27,920)	[6,701]	{3,350}	140,132	(28,026)	[6,726]	{3,363}	140,662	(28,132)	[6,752]	{3,376}
Pinal	70,346	70,743	70,897	71,059	71,345	(14,269)	[3,425]	{1,712}	71,638	(14,328)	[3,439]	{1,719}	71,914	(14,383)	[3,452]	{1,726}

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.