

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

**Date: 8/4/21**

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 8/4/21 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.**

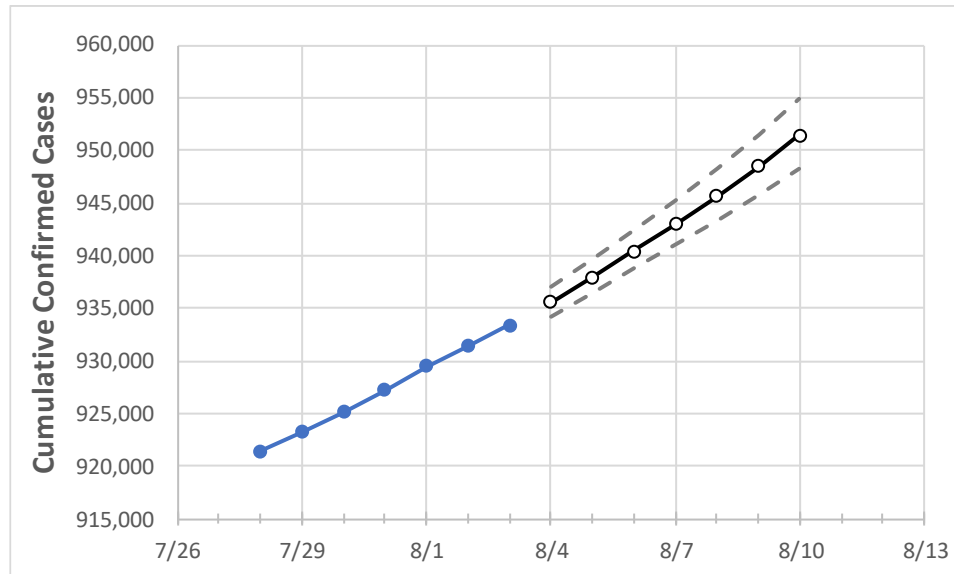
### **IEM's Modeling Lead**

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:						
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10
Arizona	927,235	929,541	931,387	933,361	935,611	937,953	940,407	942,962	945,645	948,463	951,430

*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:						
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10
Coconino	18,571	18,603	18,621	18,672	18,711	18,751	18,795	18,841	18,889	18,942	18,997
Maricopa	582,153	584,002	585,497	586,764	588,402	590,136	591,943	593,854	595,851	597,995	600,217
Navajo	17,243	17,274	17,294	17,311	17,340	17,370	17,400	17,430	17,463	17,496	17,530
Pima	120,316	120,357	120,505	120,634	120,780	120,932	121,084	121,247	121,415	121,579	121,763
Pinal	56,408	56,549	56,555	56,906	57,085	57,268	57,465	57,673	57,885	58,110	58,349

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:											
	7/31	8/1	8/2	8/3	8/5				8/7				8/9			
Coconino	18,571	18,603	18,621	18,672	18,751	(3,750)	[900]	{450}	18,841	(3,768)	[904]	{452}	18,942	(3,788)	[909]	{455}
Maricopa	582,153	584,002	585,497	586,764	590,136	(118,027)	[28,327]	{14,163}	593,854	(118,771)	[28,505]	{14,252}	597,995	(119,599)	[28,704]	{14,352}
Navajo	17,243	17,274	17,294	17,311	17,370	(3,474)	[834]	{417}	17,430	(3,486)	[837]	{418}	17,496	(3,499)	[840]	{420}
Pima	120,316	120,357	120,505	120,634	120,932	(24,186)	[5,805]	{2,902}	121,247	(24,249)	[5,820]	{2,910}	121,579	(24,316)	[5,836]	{2,918}
Pinal	56,408	56,549	56,555	56,906	57,268	(11,454)	[2,749]	{1,374}	57,673	(11,535)	[2,768]	{1,384}	58,110	(11,622)	[2,789]	{1,395}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.