

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 6/25/21**

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 6/25/21 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.**

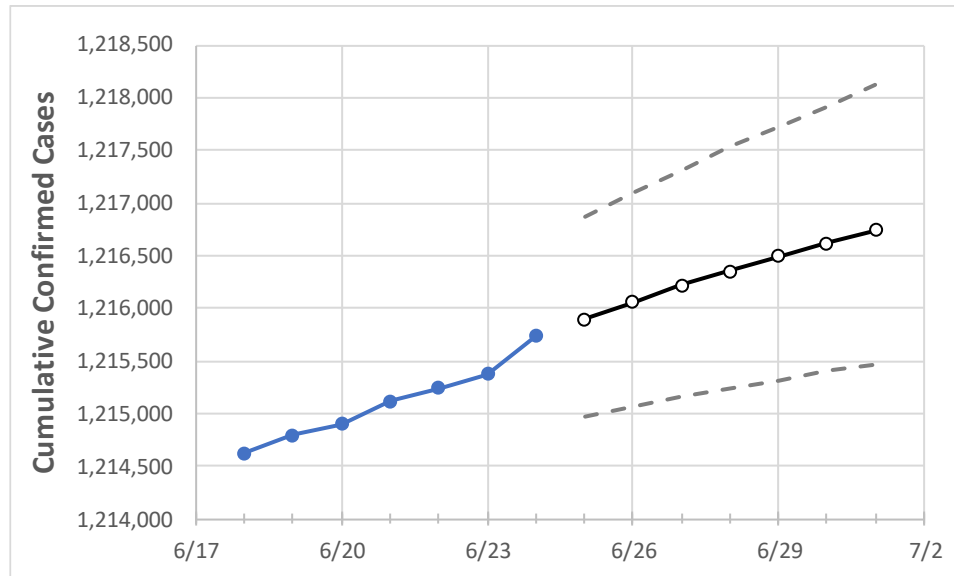
**IEM's Modeling Lead**

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.

## Pennsylvania State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1
Pennsylvania	1,215,116	1,215,239	1,215,374	1,215,735	1,215,898	1,216,062	1,216,214	1,216,356	1,216,490	1,216,620	1,216,743

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.

## Pennsylvania Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1
Allegheny	101,780	101,795	101,801	101,821	101,831	101,840	101,848	101,856	101,864	101,871	101,878
Berks	48,404	48,414	48,432	48,435	48,445	48,454	48,463	48,472	48,480	48,488	48,496
Bucks	60,776	60,782	60,785	60,797	60,801	60,805	60,809	60,812	60,816	60,819	60,822
Butler	17,601	17,602	17,605	17,607	17,610	17,612	17,614	17,617	17,619	17,621	17,623
Chester	40,774	40,787	40,795	40,793	40,799	40,804	40,810	40,815	40,820	40,825	40,829
Delaware	52,375	52,349	52,356	52,358	52,365	52,371	52,377	52,383	52,389	52,395	52,400
Lackawanna	18,535	18,539	18,540	18,545	18,548	18,551	18,553	18,556	18,558	18,561	18,563
Lancaster	55,365	55,371	55,375	55,380	55,384	55,388	55,392	55,395	55,399	55,401	55,404
Lehigh	39,824	39,828	39,835	39,845	39,850	39,854	39,859	39,863	39,867	39,871	39,875
Luzerne	32,054	32,067	32,074	32,085	32,091	32,097	32,102	32,108	32,113	32,118	32,122
Monroe	14,805	14,808	14,810	14,814	14,818	14,821	14,824	14,827	14,831	14,834	14,837
Montgomery	70,369	70,368	70,370	70,371	70,377	70,382	70,387	70,392	70,396	70,400	70,405
Northampton	35,849	35,853	35,855	35,865	35,870	35,875	35,879	35,884	35,888	35,893	35,897
Philadelphia	154,286	154,348	154,411	154,473	154,504	154,533	154,563	154,590	154,618	154,644	154,671
Westmoreland	34,381	34,383	34,386	34,398	34,405	34,411	34,418	34,424	34,430	34,436	34,442
York	46,951	46,960	46,971	46,976	46,988	47,000	47,011	47,022	47,031	47,041	47,050

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.

### Pennsylvania Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	6/21	6/22	6/23	6/24	6/26			6/28			6/30					
Allegheny	101,780	101,795	101,801	101,821	101,840	(20,368)	[4,888]	{2,444}	101,856	(20,371)	[4,889]	{2,445}	101,871	(20,374)	[4,890]	{2,445}
Berks	48,404	48,414	48,432	48,435	48,454	(9,691)	[2,326]	{1,163}	48,472	(9,694)	[2,327]	{1,163}	48,488	(9,698)	[2,327]	{1,164}
Bucks	60,776	60,782	60,785	60,797	60,805	(12,161)	[2,919]	{1,459}	60,812	(12,162)	[2,919]	{1,459}	60,819	(12,164)	[2,919]	{1,460}
Butler	17,601	17,602	17,605	17,607	17,612	(3,522)	[845]	{423}	17,617	(3,523)	[846]	{423}	17,621	(3,524)	[846]	{423}
Chester	40,774	40,787	40,795	40,793	40,804	(8,161)	[1,959]	{979}	40,815	(8,163)	[1,959]	{980}	40,825	(8,165)	[1,960]	{980}
Delaware	52,375	52,349	52,356	52,358	52,371	(10,474)	[2,514]	{1,257}	52,383	(10,477)	[2,514]	{1,257}	52,395	(10,479)	[2,515]	{1,257}
Lackawanna	18,535	18,539	18,540	18,545	18,551	(3,710)	[890]	{445}	18,556	(3,711)	[891]	{445}	18,561	(3,712)	[891]	{445}
Lancaster	55,365	55,371	55,375	55,380	55,388	(11,078)	[2,659]	{1,329}	55,395	(11,079)	[2,659]	{1,329}	55,401	(11,080)	[2,659]	{1,330}
Lehigh	39,824	39,828	39,835	39,845	39,854	(7,971)	[1,913]	{957}	39,863	(7,973)	[1,913]	{957}	39,871	(7,974)	[1,914]	{957}
Luzerne	32,054	32,067	32,074	32,085	32,097	(6,419)	[1,541]	{770}	32,108	(6,422)	[1,541]	{771}	32,118	(6,424)	[1,542]	{771}
Monroe	14,805	14,808	14,810	14,814	14,821	(2,964)	[711]	{356}	14,827	(2,965)	[712]	{356}	14,834	(2,967)	[712]	{356}
Montgomery	70,369	70,368	70,370	70,371	70,382	(14,076)	[3,378]	{1,689}	70,392	(14,078)	[3,379]	{1,689}	70,400	(14,080)	[3,379]	{1,690}
Northampton	35,849	35,853	35,855	35,865	35,875	(7,175)	[1,722]	{861}	35,884	(7,177)	[1,722]	{861}	35,893	(7,179)	[1,723]	{861}
Philadelphia	154,286	154,348	154,411	154,473	154,533	(30,907)	[7,418]	{3,709}	154,590	(30,918)	[7,420]	{3,710}	154,644	(30,929)	[7,423]	{3,711}
Westmoreland	34,381	34,383	34,386	34,398	34,411	(6,882)	[1,652]	{826}	34,424	(6,885)	[1,652]	{826}	34,436	(6,887)	[1,653]	{826}
York	46,951	46,960	46,971	46,976	47,000	(9,400)	[2,256]	{1,128}	47,022	(9,404)	[2,257]	{1,129}	47,041	(9,408)	[2,258]	{1,129}

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.