IEM's AI Modeling: Short-term COVID-19 Projections
Date: 5/19/21

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 5/19/21 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.

Washington State Projections
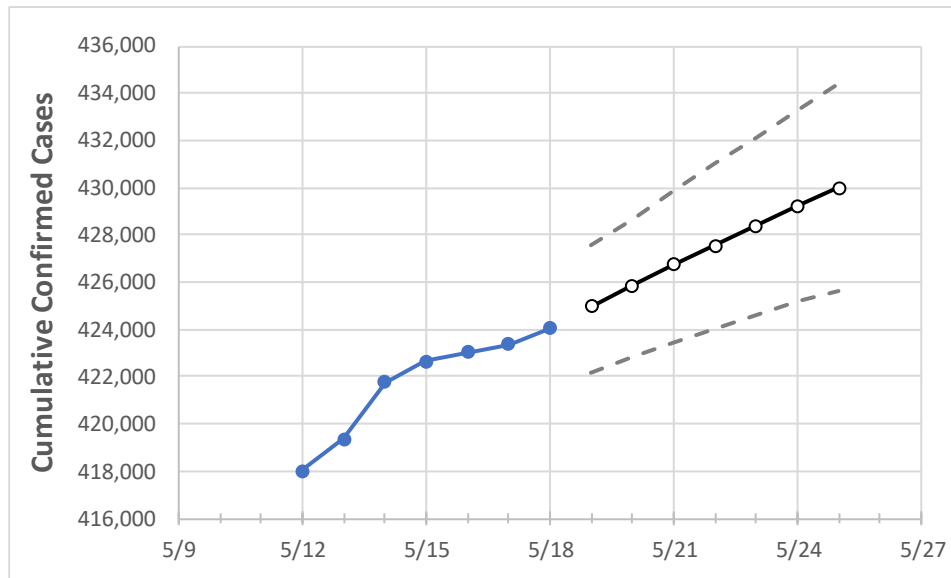
	Actual Confirmed Cases On:				Projected Cases For:						
	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25
Washington	422,665	423,024	423,382	424,050	424,965	425,850	426,727	427,559	428,397	429,220	430,011

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.

Washington Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25
Benton	16,991	17,005	17,019	17,033	17,049	17,065	17,081	17,096	17,110	17,124	17,138
Clark	23,885	23,923	23,960	24,012	24,077	24,137	24,197	24,259	24,316	24,373	24,431
Grant	8,902	8,915	8,927	8,938	8,954	8,969	8,984	8,999	9,013	9,028	9,042
Island	1,741	1,743	1,744	1,745	1,748	1,751	1,754	1,757	1,760	1,763	1,766
King	107,147	107,257	107,366	107,462	107,687	107,903	108,118	108,319	108,514	108,709	108,896
Kitsap	8,124	8,140	8,156	8,170	8,195	8,219	8,242	8,264	8,285	8,306	8,326
Pierce	52,757	52,753	52,749	52,833	53,107	53,386	53,671	53,967	54,262	54,556	54,853
Skagit	5,687	5,693	5,699	5,712	5,726	5,738	5,751	5,763	5,774	5,787	5,798
Snohomish	37,808	37,835	37,861	37,932	38,013	38,093	38,171	38,247	38,321	38,394	38,462
Spokane	42,980	43,043	43,105	43,227	43,331	43,436	43,541	43,646	43,753	43,862	43,969
Thurston	9,634	9,647	9,659	9,680	9,715	9,750	9,784	9,818	9,851	9,884	9,916
Whatcom	9,004	9,016	9,028	9,058	9,090	9,121	9,152	9,182	9,212	9,242	9,272
Yakima	29,807	29,825	29,842	29,849	29,863	29,875	29,888	29,899	29,910	29,921	29,931

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.*

Washington Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	5/15	5/16	5/17	5/18	5/20	5/22	5/24
Benton	16,991	17,005	17,019	17,033	17,065 (3,413) [819] {410}	17,096 (3,419) [821] {410}	17,124 (3,425) [822] {411}
Clark	23,885	23,923	23,960	24,012	24,137 (4,827) [1,159] {579}	24,259 (4,852) [1,164] {582}	24,373 (4,875) [1,170] {585}
Grant	8,902	8,915	8,927	8,938	8,969 (1,794) [431] {215}	8,999 (1,800) [432] {216}	9,028 (1,806) [433] {217}
Island	1,741	1,743	1,744	1,745	1,751 (350) [84] {42}	1,757 (351) [84] {42}	1,763 (353) [85] {42}
King	107,147	107,257	107,366	107,462	107,903 (21,581) [5,179] {2,590}	108,319 (21,664) [5,199] {2,600}	108,709 (21,742) [5,218] {2,609}
Kitsap	8,124	8,140	8,156	8,170	8,219 (1,644) [395] {197}	8,264 (1,653) [397] {198}	8,306 (1,661) [399] {199}
Pierce	52,757	52,753	52,749	52,833	53,386 (10,677) [2,563] {1,281}	53,967 (10,793) [2,590] {1,295}	54,556 (10,911) [2,619] {1,309}
Skagit	5,687	5,693	5,699	5,712	5,738 (1,148) [275] {138}	5,763 (1,153) [277] {138}	5,787 (1,157) [278] {139}
Snohomish	37,808	37,835	37,861	37,932	38,093 (7,619) [1,828] {914}	38,247 (7,649) [1,836] {918}	38,394 (7,679) [1,843] {921}
Spokane	42,980	43,043	43,105	43,227	43,436 (8,687) [2,085] {1,042}	43,646 (8,729) [2,095] {1,047}	43,862 (8,772) [2,105] {1,053}
Thurston	9,634	9,647	9,659	9,680	9,750 (1,950) [468] {234}	9,818 (1,964) [471] {236}	9,884 (1,977) [474] {237}
Whatcom	9,004	9,016	9,028	9,058	9,121 (1,824) [438] {219}	9,182 (1,836) [441] {220}	9,242 (1,848) [444] {222}
Yakima	29,807	29,825	29,842	29,849	29,875 (5,975) [1,434] {717}	29,899 (5,980) [1,435] {718}	29,921 (5,984) [1,436] {718}

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.