IEM's AI Modeling: Short-term COVID-19 Projections
Date: 6/30/20

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 6/30/20 10 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
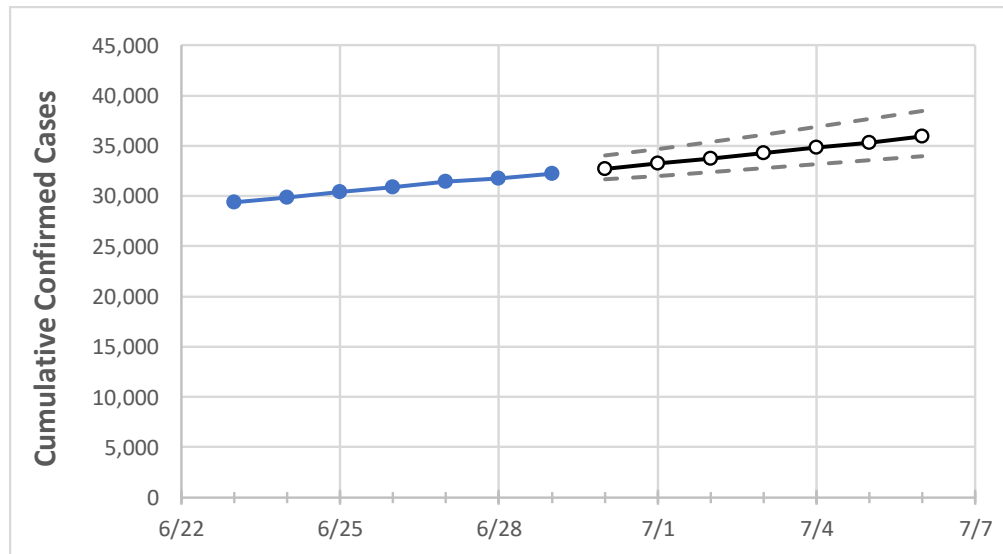
	Actual Confirmed Cases On:				Projected Cases For:						
	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6
Washington	30,855	31,404	31,751	32,253	32,734	33,228	33,736	34,257	34,793	35,343	35,909

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 20%, and are often within 10%, of actual confirmed cases.

Washington Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6
Benton	1,581	1,657	1,686	1,718	1,761	1,807	1,854	1,902	1,953	2,006	2,061
Clark	685	692	697	700	705	710	715	720	725	730	736
Grant	447	457	472	487	507	521	536	552	566	580	595
Island	192	192	192	192	193	194	194	195	196	197	198
King	9,672	9,809	9,895	10,019	10,117	10,220	10,328	10,441	10,559	10,682	10,812
Kitsap	205	211	212	212	216	220	225	230	236	242	249
Pierce	2,421	2,465	2,485	2,510	2,537	2,565	2,595	2,626	2,659	2,693	2,730
Skagit	493	502	503	512	515	518	521	525	528	532	536
Snohomish	3,406	3,431	3,438	3,463	3,486	3,510	3,535	3,561	3,587	3,615	3,644
Spokane	1,144	1,179	1,193	1,236	1,265	1,296	1,328	1,362	1,397	1,435	1,474
Thurston	228	230	237	241	244	248	252	255	259	263	267
Whatcom	588	599	600	615	628	642	656	672	689	708	728
Yakima	6,759	6,828	6,920	7,008	7,102	7,196	7,290	7,383	7,476	7,569	7,662

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:		
	6/26	6/27	6/28	6/29	7/1	7/3	7/5
Benton	1,581	1,657	1,686	1,718	1,807 (361) [87] {43}	1,902 (380) [91] {46}	2,006 (401) [96] {48}
Clark	685	692	697	700	710 (142) [34] {17}	720 (144) [35] {17}	730 (146) [35] {18}
Grant	447	457	472	487	521 (104) [25] {13}	552 (110) [26] {13}	580 (116) [28] {14}
Island	192	192	192	192	194 (39) [9] {5}	195 (39) [9] {5}	197 (39) [9] {5}
King	9,672	9,809	9,895	10,019	10,220 (2,044) [491] {245}	10,441 (2,088) [501] {251}	10,682 (2,136) [513] {2
Kitsap	205	211	212	212	220 (44) [11] {5}	230 (46) [11] {6}	242 (48) [12] {6}
Pierce	2,421	2,465	2,485	2,510	2,565 (513) [123] {62}	2,626 (525) [126] {63}	2,693 (539) [129] {6
Skagit	493	502	503	512	518 (104) [25] {12}	525 (105) [25] {13}	532 (106) [26] {13}
Snohomish	3,406	3,431	3,438	3,463	3,510 (702) [168] {84}	3,561 (712) [171] {85}	3,615 (723) [174] {8
Spokane	1,144	1,179	1,193	1,236	1,296 (259) [62] {31}	1,362 (272) [65] {33}	1,435 (287) [69] {34
Thurston	228	230	237	241	248 (50) [12] {6}	255 (51) [12] {6}	263 (53) [13] {6}
Whatcom	588	599	600	615	642 (128) [31] {15}	672 (134) [32] {16}	708 (142) [34] {17}
Yakima	6,759	6,828	6,920	7,008	7,196 (1,439) [345] {173}	7,383 (1,477) [354] {177}	7,569 (1,514) [363] {1

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.