

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

**Date: 3/2/22**

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 3/2/22 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.**

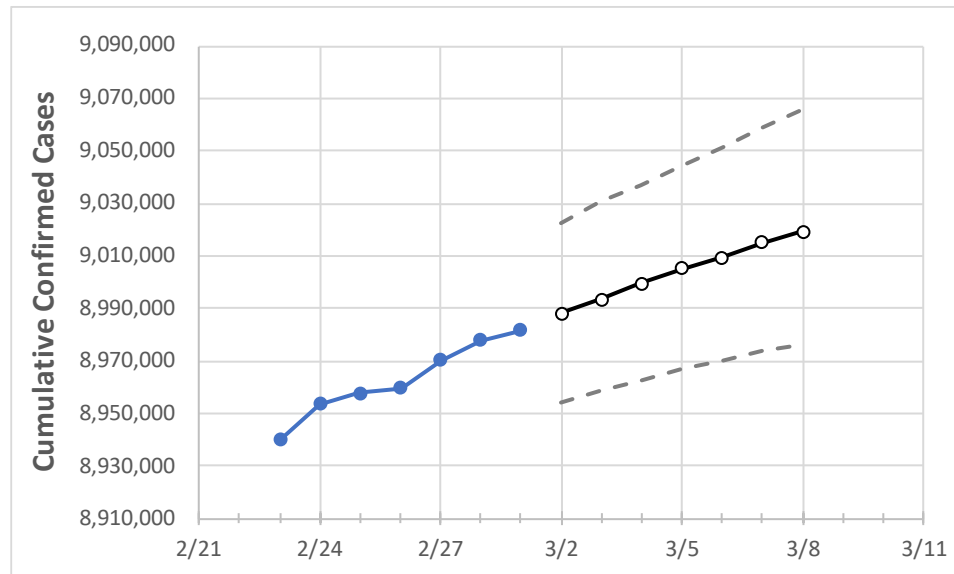
### **IEM's Modeling Lead**

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.

## California State Projections



	Actual Confirmed Cases On:				Projected Cases For:							
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	
California	8,959,694	8,970,299	8,977,766	8,981,736	8,988,012	8,993,471	8,999,373	9,005,058	9,009,411	9,014,920	9,019,418	

*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.*

## California Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8
Alameda	264,883	265,135	265,225	265,226	265,615	266,001	266,362	266,790	267,104	267,471	267,788
Contra Costa	197,776	197,942	198,029	198,029	198,229	198,382	198,563	198,729	198,864	199,035	199,174
Fresno	247,745	247,984	248,106	248,109	248,314	248,507	248,676	248,851	249,016	249,160	249,333
Kern	236,124	236,484	236,843	237,530	238,026	238,504	238,976	239,435	239,892	240,335	240,762
Lake	11,298	11,325	11,330	11,330	11,349	11,368	11,387	11,405	11,422	11,438	11,455
Los Angeles	2,793,776	2,795,168	2,796,560	2,797,628	2,799,094	2,800,477	2,801,832	2,803,041	2,804,271	2,805,448	2,806,465
Marin	34,898	34,933	34,952	34,952	34,974	34,998	35,021	35,042	35,061	35,082	35,100
Monterey	90,644	90,724	90,738	90,739	90,886	91,013	91,127	91,251	91,362	91,485	91,571
Orange	580,727	580,950	581,172	581,352	581,558	581,736	581,897	582,064	582,208	582,371	582,509
Placer	69,135	69,189	69,200	69,200	69,247	69,292	69,331	69,371	69,412	69,448	69,483
Riverside	613,136	613,469	613,527	613,530	613,838	614,173	614,439	614,726	615,013	615,306	615,512
Sacramento	299,277	299,473	299,584	299,586	299,799	300,007	300,224	300,419	300,581	300,803	300,957
San Bernardino	579,901	580,164	580,247	580,261	580,493	580,754	580,962	581,176	581,358	581,572	581,731
San Diego	784,919	785,490	786,060	786,060	786,763	787,457	788,158	788,792	789,482	790,077	790,684
San Francisco	131,878	131,961	132,036	132,036	132,205	132,376	132,506	132,698	132,829	132,965	133,098
San Joaquin	173,630	173,762	173,781	173,782	173,889	173,993	174,107	174,198	174,311	174,407	174,489
San Luis Obispo	55,130	55,199	55,200	55,201	55,255	55,307	55,352	55,402	55,447	55,488	55,530
San Mateo	124,982	125,110	125,167	125,167	125,274	125,383	125,479	125,573	125,668	125,763	125,843
Santa Barbara	89,707	89,780	89,806	89,807	89,868	89,929	89,980	90,034	90,085	90,135	90,179
Santa Clara	318,650	318,937	319,111	319,114	319,369	319,643	319,906	320,132	320,350	320,572	320,780
Santa Cruz	48,207	48,282	48,318	48,318	48,380	48,444	48,500	48,556	48,615	48,666	48,714
Solano	85,801	85,898	85,927	85,951	86,053	86,190	86,277	86,403	86,511	86,601	86,723
Sonoma	83,851	83,964	83,981	83,981	84,068	84,161	84,230	84,311	84,385	84,457	84,521
Ventura	180,679	180,802	180,756	180,757	180,851	180,950	181,030	181,116	181,197	181,269	181,342

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.

### California Medical Demand by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	2/26	2/27	2/28	3/1	3/3			3/5			3/7					
Alameda	264,883	265,135	265,225	265,226	266,001	(53,200)	[12,768]	{6,384}	266,790	(53,358)	[12,806]	{6,403}	267,471	(53,494)	[12,839]	{6,419}
Contra Costa	197,776	197,942	198,029	198,029	198,382	(39,676)	[9,522]	{4,761}	198,729	(39,746)	[9,539]	{4,770}	199,035	(39,807)	[9,554]	{4,777}
Fresno	247,745	247,984	248,106	248,109	248,507	(49,701)	[11,928]	{5,964}	248,851	(49,770)	[11,945]	{5,972}	249,160	(49,832)	[11,960]	{5,980}
Kern	236,124	236,484	236,843	237,530	238,504	(47,701)	[11,448]	{5,724}	239,435	(47,887)	[11,493]	{5,746}	240,335	(48,067)	[11,536]	{5,768}
Lake	11,298	11,325	11,330	11,330	11,368	(2,274)	[546]	{273}	11,405	(2,281)	[547]	{274}	11,438	(2,288)	[549]	{275}
Los Angeles	2,793,776	2,795,168	2,796,560	2,797,628	2,800,477	(560,095)	[134,423]	{67,211}	2,803,041	(560,608)	[134,546]	{67,273}	2,805,448	(561,090)	[134,661]	{67,331}
Marin	34,898	34,933	34,952	34,952	34,998	(7,000)	[1,680]	{840}	35,042	(7,008)	[1,682]	{841}	35,082	(7,016)	[1,684]	{842}
Monterey	90,644	90,724	90,738	90,739	91,013	(18,203)	[4,369]	{2,184}	91,251	(18,250)	[4,380]	{2,190}	91,485	(18,297)	[4,391]	{2,196}
Orange	580,727	580,950	581,172	581,352	581,736	(116,347)	[27,923]	{13,962}	582,064	(116,413)	[27,939]	{13,970}	582,371	(116,474)	[27,954]	{13,977}
Placer	69,135	69,189	69,200	69,200	69,292	(13,858)	[3,326]	{1,663}	69,371	(13,874)	[3,330]	{1,665}	69,448	(13,890)	[3,333]	{1,667}
Riverside	613,136	613,469	613,527	613,530	614,173	(122,835)	[29,480]	{14,740}	614,726	(122,945)	[29,507]	{14,753}	615,306	(123,061)	[29,535]	{14,767}
Sacramento	299,277	299,473	299,584	299,586	300,007	(60,001)	[14,400]	{7,200}	300,419	(60,084)	[14,420]	{7,210}	300,803	(60,161)	[14,439]	{7,219}
San Bernardino	579,901	580,164	580,247	580,261	580,754	(116,151)	[27,876]	{13,938}	581,176	(116,235)	[27,896]	{13,948}	581,572	(116,314)	[27,915]	{13,958}
San Diego	784,919	785,490	786,060	786,060	787,457	(157,491)	[37,798]	{18,899}	788,792	(157,758)	[37,862]	{18,931}	790,077	(158,015)	[37,924]	{18,962}
San Francisco	131,878	131,961	132,036	132,036	132,376	(26,475)	[6,354]	{3,177}	132,698	(26,540)	[6,370]	{3,185}	132,965	(26,593)	[6,382]	{3,191}
San Joaquin	173,630	173,762	173,781	173,782	173,993	(34,799)	[8,352]	{4,176}	174,198	(34,840)	[8,361]	{4,181}	174,407	(34,881)	[8,372]	{4,186}
San Luis Obispo	55,130	55,199	55,200	55,201	55,307	(11,061)	[2,655]	{1,327}	55,402	(11,080)	[2,659]	{1,330}	55,488	(11,098)	[2,663]	{1,332}
San Mateo	124,982	125,110	125,167	125,167	125,383	(25,077)	[6,018]	{3,009}	125,573	(25,115)	[6,027]	{3,014}	125,763	(25,153)	[6,037]	{3,018}
Santa Barbara	89,707	89,780	89,806	89,807	89,929	(17,986)	[4,317]	{2,158}	90,034	(18,007)	[4,322]	{2,161}	90,135	(18,027)	[4,327]	{2,163}
Santa Clara	318,650	318,937	319,111	319,114	319,643	(63,929)	[15,343]	{7,671}	320,132	(64,026)	[15,366]	{7,683}	320,572	(64,114)	[15,387]	{7,694}
Santa Cruz	48,207	48,282	48,318	48,318	48,444	(9,689)	[2,325]	{1,163}	48,556	(9,711)	[2,331]	{1,165}	48,666	(9,733)	[2,336]	{1,168}
Solano	85,801	85,898	85,927	85,951	86,190	(17,238)	[4,137]	{2,069}	86,403	(17,281)	[4,147]	{2,074}	86,601	(17,320)	[4,157]	{2,078}
Sonoma	83,851	83,964	83,981	83,981	84,161	(16,832)	[4,040]	{2,020}	84,311	(16,862)	[4,047]	{2,023}	84,457	(16,891)	[4,054]	{2,027}
Ventura	180,679	180,802	180,756	180,757	180,950	(36,190)	[8,686]	{4,343}	181,116	(36,223)	[8,694]	{4,347}	181,269	(36,254)	[8,701]	{4,350}

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.