

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 5/10/21**

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 5/10/21 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.**

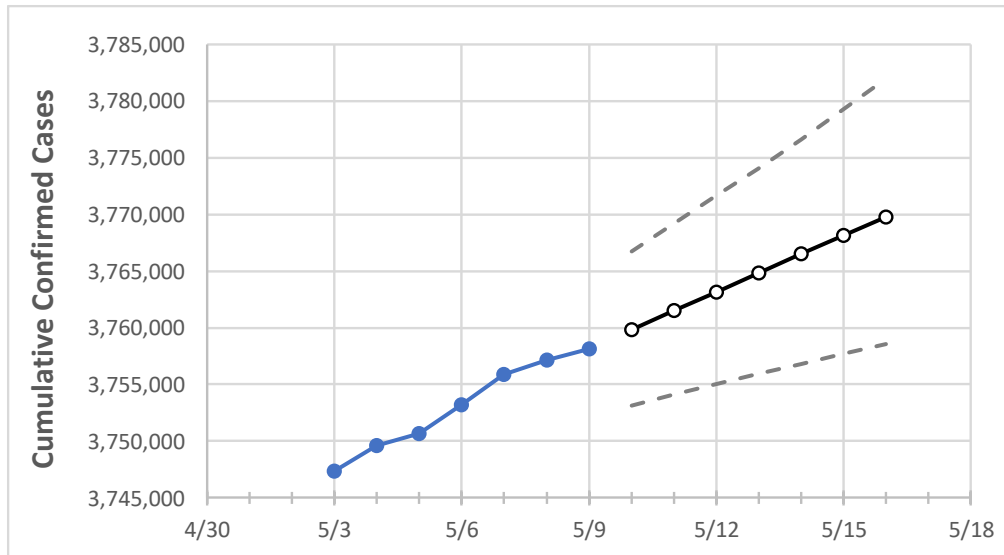
**IEM's Modeling Lead**

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.

## California State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16
California	3,753,173	3,755,869	3,757,115	3,758,137	3,759,852	3,761,531	3,763,160	3,764,799	3,766,501	3,768,135	3,769,729

*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:						
	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16
Alameda	87,407	87,485	87,585	87,633	87,704	87,773	87,840	87,908	87,972	88,035	88,096
Contra Costa	68,279	68,437	68,503	68,582	68,647	68,711	68,776	68,839	68,902	68,963	69,023
Fresno	101,491	101,536	101,625	101,676	101,723	101,770	101,817	101,863	101,909	101,955	102,002
Kern	108,887	108,968	108,993	109,031	109,084	109,134	109,185	109,232	109,281	109,329	109,379
Lake	3,458	3,465	3,467	3,470	3,473	3,477	3,480	3,484	3,488	3,491	3,495
Los Angeles	1,234,746	1,235,150	1,235,422	1,235,651	1,235,903	1,236,148	1,236,391	1,236,630	1,236,858	1,237,086	1,237,310
Marin	14,009	14,030	14,034	14,037	14,046	14,054	14,063	14,072	14,080	14,089	14,097
Monterey	43,506	43,563	43,563	43,563	43,579	43,596	43,613	43,631	43,649	43,667	43,686
Orange	270,569	270,625	270,705	270,744	270,809	270,871	270,933	270,993	271,051	271,107	271,163
Placer	22,532	22,550	22,550	22,550	22,589	22,628	22,667	22,706	22,744	22,784	22,823
Riverside	298,968	299,064	299,064	299,064	299,141	299,215	299,290	299,365	299,438	299,509	299,580
Sacramento	104,058	104,176	104,192	104,208	104,326	104,446	104,558	104,681	104,792	104,915	105,033
San Bernardino	296,324	296,425	296,514	296,596	296,665	296,732	296,797	296,862	296,927	296,989	297,053
San Diego	277,323	277,533	277,759	277,949	278,181	278,420	278,669	278,927	279,189	279,459	279,740
San Francisco	36,577	36,599	36,616	36,642	36,663	36,684	36,704	36,724	36,743	36,761	36,780
San Joaquin	72,784	73,009	73,009	73,009	73,089	73,163	73,240	73,315	73,397	73,478	73,558
San Luis Obispo	21,243	21,282	21,282	21,282	21,292	21,303	21,313	21,323	21,332	21,341	21,350
San Mateo	41,755	41,802	41,844	41,871	41,906	41,941	41,976	42,012	42,049	42,085	42,122
Santa Barbara	34,261	34,291	34,306	34,317	34,331	34,345	34,358	34,371	34,384	34,395	34,408
Santa Clara	118,698	118,792	118,851	118,901	118,959	119,016	119,073	119,125	119,176	119,226	119,275
Santa Cruz	16,062	16,188	16,188	16,188	16,218	16,248	16,279	16,310	16,341	16,370	16,400
Solano	32,698	32,752	32,752	32,752	32,792	32,831	32,870	32,908	32,946	32,984	33,023
Sonoma	29,951	29,966	29,975	29,984	29,998	30,011	30,025	30,038	30,051	30,064	30,077
Ventura	80,812	80,842	80,842	80,842	80,871	80,899	80,928	80,957	80,984	81,011	81,039

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:							
	5/6	5/7	5/8	5/9	5/11				5/13			
Alameda	87,407	87,485	87,585	87,633	87,773	(17,555)	[4,213]	{2,107}	87,908	(17,582)	[4,220]	{2,110}
Contra Costa	68,279	68,437	68,503	68,582	68,711	(13,742)	[3,298]	{1,649}	68,839	(13,768)	[3,304]	{1,652}
Fresno	101,491	101,536	101,625	101,676	101,770	(20,354)	[4,885]	{2,442}	101,863	(20,373)	[4,889]	{2,445}
Kern	108,887	108,968	108,993	109,031	109,134	(21,827)	[5,238]	{2,619}	109,232	(21,846)	[5,243]	{2,622}
Lake	3,458	3,465	3,467	3,470	3,477	(695)	[167]	{83}	3,484	(697)	[167]	{84}
Los Angeles	1,234,746	1,235,150	1,235,422	1,235,651	1,236,148	(247,230)	[59,335]	{29,668}	1,236,630	(247,326)	[59,358]	{29,679}
Marin	14,009	14,030	14,034	14,037	14,054	(2,811)	[675]	{337}	14,072	(2,814)	[675]	{338}
Monterey	43,506	43,563	43,563	43,563	43,596	(8,719)	[2,093]	{1,046}	43,631	(8,726)	[2,094]	{1,047}
Orange	270,569	270,625	270,705	270,744	270,871	(54,174)	[13,002]	{6,501}	270,993	(54,199)	[13,008]	{6,504}
Placer	22,532	22,550	22,550	22,550	22,628	(4,526)	[1,086]	{543}	22,706	(4,541)	[1,090]	{545}
Riverside	298,968	299,064	299,064	299,064	299,215	(59,843)	[14,362]	{7,181}	299,365	(59,873)	[14,369]	{7,185}
Sacramento	104,058	104,176	104,192	104,208	104,446	(20,889)	[5,013]	{2,507}	104,681	(20,936)	[5,025]	{2,512}
San Bernardino	296,324	296,425	296,514	296,596	296,732	(59,346)	[14,243]	{7,122}	296,862	(59,372)	[14,249]	{7,125}
San Diego	277,323	277,533	277,759	277,949	278,420	(55,684)	[13,364]	{6,682}	278,927	(55,785)	[13,388]	{6,694}
San Francisco	36,577	36,599	36,616	36,642	36,684	(7,337)	[1,761]	{880}	36,724	(7,345)	[1,763]	{881}
San Joaquin	72,784	73,009	73,009	73,009	73,163	(14,633)	[3,512]	{1,756}	73,315	(14,663)	[3,519]	{1,760}
San Luis Obispo	21,243	21,282	21,282	21,282	21,303	(4,261)	[1,023]	{511}	21,323	(4,265)	[1,024]	{512}
San Mateo	41,755	41,802	41,844	41,871	41,941	(8,388)	[2,013]	{1,007}	42,012	(8,402)	[2,017]	{1,008}
Santa Barbara	34,261	34,291	34,306	34,317	34,345	(6,869)	[1,649]	{824}	34,371	(6,874)	[1,650]	{825}
Santa Clara	118,698	118,792	118,851	118,901	119,016	(23,803)	[5,713]	{2,856}	119,125	(23,825)	[5,718]	{2,859}
Santa Cruz	16,062	16,188	16,188	16,188	16,248	(3,250)	[780]	{390}	16,310	(3,262)	[783]	{391}
Solano	32,698	32,752	32,752	32,752	32,831	(6,566)	[1,576]	{788}	32,908	(6,582)	[1,580]	{790}
Sonoma	29,951	29,966	29,975	29,984	30,011	(6,002)	[1,441]	{720}	30,038	(6,008)	[1,442]	{721}
Ventura	80,812	80,842	80,842	80,842	80,899	(16,180)	[3,883]	{1,942}	80,957	(16,191)	[3,886]	{1,943}

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.