

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 1/12/21**

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 1/12/21 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.**

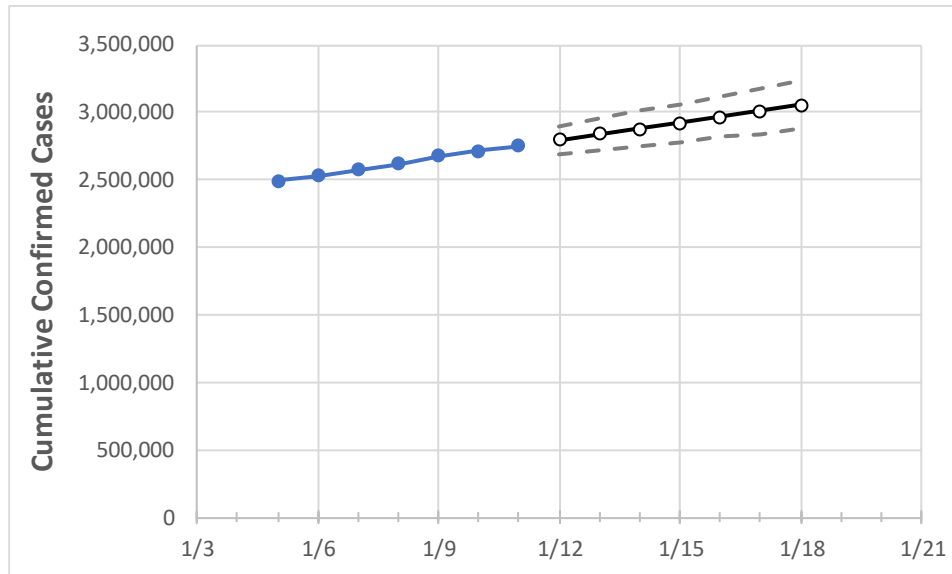
**IEM's Modeling Lead**

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:							
	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	
California	2,619,829	2,675,262	2,717,862	2,753,739	2,796,064	2,838,620	2,880,943	2,923,440	2,966,621	3,010,100	3,054,269	

*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:						
	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18
Alameda	57,921	59,172	60,125	61,111	61,935	62,769	63,596	64,436	65,268	66,138	66,979
Contra Costa	45,793	46,618	47,315	47,315	48,115	48,945	49,826	50,702	51,579	52,496	53,414
Fresno	72,557	73,689	74,816	75,621	76,528	77,439	78,363	79,276	80,222	81,167	82,128
Kern	76,304	77,875	78,832	78,832	79,971	81,100	82,291	83,445	84,595	85,810	86,972
Lake	2,088	2,120	2,144	2,174	2,203	2,231	2,260	2,289	2,318	2,347	2,374
Los Angeles	889,405	907,077	920,324	932,697	947,991	963,146	978,802	994,167	1,010,252	1,026,455	1,042,438
Marin	10,582	10,696	10,811	10,811	10,917	11,029	11,141	11,255	11,374	11,498	11,624
Monterey	30,903	32,394	32,483	32,571	33,028	33,487	33,939	34,384	34,838	35,295	35,748
Orange	181,922	186,608	191,004	193,766	197,171	200,561	203,968	207,399	210,862	214,330	217,920
Placer	15,454	15,532	15,609	15,978	16,179	16,373	16,562	16,755	16,946	17,135	17,324
Riverside	208,177	212,122	216,076	219,486	222,493	225,503	228,394	231,377	234,433	237,340	240,342
Sacramento	72,342	73,245	74,482	75,394	76,183	76,975	77,757	78,513	79,299	80,076	80,839
San Bernardino	219,691	224,350	228,857	232,171	235,243	238,312	241,383	244,462	247,547	250,615	253,770
San Diego	185,062	188,600	191,888	194,795	198,605	202,524	206,564	210,667	214,650	218,754	222,945
San Francisco	25,885	26,378	26,708	27,054	27,417	27,789	28,168	28,556	28,951	29,347	29,753
San Joaquin	50,156	51,523	51,927	52,535	53,092	53,618	54,158	54,682	55,244	55,780	56,312
San Luis Obispo	12,810	13,286	13,647	13,968	14,339	14,739	15,170	15,608	16,067	16,544	17,027
San Mateo	27,494	28,072	28,512	28,972	29,431	29,889	30,355	30,838	31,327	31,821	32,328
Santa Barbara	20,252	20,550	21,323	21,323	21,765	22,232	22,707	23,209	23,731	24,292	24,855
Santa Clara	80,466	82,170	83,655	84,726	85,984	87,213	88,488	89,756	91,019	92,345	93,689
Santa Cruz	10,228	10,486	10,717	10,951	11,167	11,388	11,618	11,844	12,086	12,333	12,575
Solano	22,232	22,593	22,953	23,314	23,711	24,114	24,523	24,942	25,376	25,809	26,261
Sonoma	20,857	21,264	21,463	21,925	22,185	22,462	22,737	23,026	23,317	23,609	23,904
Ventura	49,083	50,553	51,988	53,095	54,593	56,141	57,721	59,355	61,041	62,797	64,569

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:											
	1/8	1/9	1/10	1/11	1/13				1/15				1/17			
Alameda	57,921	59,172	60,125	61,111	62,769	(12,554)	[3,013]	{1,506}	64,436	(12,887)	[3,093]	{1,546}	66,138	(13,228)	[3,175]	{1,587}
Contra Costa	45,793	46,618	47,315	47,315	48,945	(9,789)	[2,349]	{1,175}	50,702	(10,140)	[2,434]	{1,217}	52,496	(10,499)	[2,520]	{1,260}
Fresno	72,557	73,689	74,816	75,621	77,439	(15,488)	[3,717]	{1,859}	79,276	(15,855)	[3,805]	{1,903}	81,167	(16,233)	[3,896]	{1,948}
Kern	76,304	77,875	78,832	78,832	81,100	(16,220)	[3,893]	{1,946}	83,445	(16,689)	[4,005]	{2,003}	85,810	(17,162)	[4,119]	{2,059}
Lake	2,088	2,120	2,144	2,174	2,231	(446)	[107]	{54}	2,289	(458)	[110]	{55}	2,347	(469)	[113]	{56}
Los Angeles	889,405	907,077	920,324	932,697	963,146	(192,629)	[46,231]	{23,116}	994,167	(198,833)	[47,720]	{23,860}	1,026,455	(205,291)	[49,270]	{24,635}
Marin	10,582	10,696	10,811	10,811	11,029	(2,206)	[529]	{265}	11,255	(2,251)	[540]	{270}	11,498	(2,300)	[552]	{276}
Monterey	30,903	32,394	32,483	32,571	33,487	(6,697)	[1,607]	{804}	34,384	(6,877)	[1,650]	{825}	35,295	(7,059)	[1,694]	{847}
Orange	181,922	186,608	191,004	193,766	200,561	(40,112)	[9,627]	{4,813}	207,399	(41,480)	[9,955]	{4,978}	214,330	(42,866)	[10,288]	{5,144}
Placer	15,454	15,532	15,609	15,978	16,373	(3,275)	[786]	{393}	16,755	(3,351)	[804]	{402}	17,135	(3,427)	[822]	{411}
Riverside	208,177	212,122	216,076	219,486	225,503	(45,101)	[10,824]	{5,412}	231,377	(46,275)	[11,106]	{5,553}	237,340	(47,468)	[11,392]	{5,696}
Sacramento	72,342	73,245	74,482	75,394	76,975	(15,395)	[3,695]	{1,847}	78,513	(15,703)	[3,769]	{1,884}	80,076	(16,015)	[3,844]	{1,922}
San Bernardino	219,691	224,350	228,857	232,171	238,312	(47,662)	[11,439]	{5,719}	244,462	(48,892)	[11,734]	{5,867}	250,615	(50,123)	[12,030]	{6,015}
San Diego	185,062	188,600	191,888	194,795	202,524	(40,505)	[9,721]	{4,861}	210,667	(42,133)	[10,112]	{5,056}	218,754	(43,751)	[10,500]	{5,250}
San Francisco	25,885	26,378	26,708	27,054	27,789	(5,558)	[1,334]	{667}	28,556	(5,711)	[1,371]	{685}	29,347	(5,869)	[1,409]	{704}
San Joaquin	50,156	51,523	51,927	52,535	53,618	(10,724)	[2,574]	{1,287}	54,682	(10,936)	[2,625]	{1,312}	55,780	(11,156)	[2,677]	{1,339}
San Luis Obispo	12,810	13,286	13,647	13,968	14,739	(2,948)	[707]	{354}	15,608	(3,122)	[749]	{375}	16,544	(3,309)	[794]	{397}
San Mateo	27,494	28,072	28,512	28,972	29,889	(5,978)	[1,435]	{717}	30,838	(6,168)	[1,480]	{740}	31,821	(6,364)	[1,527]	{764}
Santa Barbara	20,252	20,550	21,323	21,323	22,232	(4,446)	[1,067]	{534}	23,209	(4,642)	[1,114]	{557}	24,292	(4,858)	[1,166]	{583}
Santa Clara	80,466	82,170	83,655	84,726	87,213	(17,443)	[4,186]	{2,093}	89,756	(17,951)	[4,308]	{2,154}	92,345	(18,469)	[4,433]	{2,216}
Santa Cruz	10,228	10,486	10,717	10,951	11,388	(2,278)	[547]	{273}	11,844	(2,369)	[569]	{284}	12,333	(2,467)	[592]	{296}
Solano	22,232	22,593	22,953	23,314	24,114	(4,823)	[1,157]	{579}	24,942	(4,988)	[1,197]	{599}	25,809	(5,162)	[1,239]	{619}
Sonoma	20,857	21,264	21,463	21,925	22,462	(4,492)	[1,078]	{539}	23,026	(4,605)	[1,105]	{553}	23,609	(4,722)	[1,133]	{567}
Ventura	49,083	50,553	51,988	53,095	56,141	(11,228)	[2,695]	{1,347}	59,355	(11,871)	[2,849]	{1,425}	62,797	(12,559)	[3,014]	{1,507}

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.