To the question, how much housing does California need, there's a range of anwers. Only a couple make sense.

February, 2021

1. **Why do some state legislators refuse to trust the demographic analysis of their own Dept. of Finance?**
2. **Freddie Mac's analysis of California's housing needs aligns closely with the Dept. of Housing and Community Development's Pre SB-828 estimates.**
3. **SB-828 introduced changes to the methodology used by Dept. of Housing and Community Development (HCD) that resulted in a doubling of the estimated housing need. Most of the new increase falls under the heading of existing, not future, housing need.**
4. **But when the question that is posed in government code "do the estimates achieve a feasible balance between jobs and housing?" is asked, the answer is that estimates from only two models – the Pre SB-828 HCD and Freddie Mac – are feasible.**

There's a range of answers to the question of how much housing California needs, but only a couple of answers survive scrutiny when other state objectives, like jobs-housing balance, are taken into account. It raises questions about the politicization of housing in California.

The housing needs assessments became political when state elected officials, including legislators and the Governor of California, embraced McKinsey & Co.' estimate of California's housing need (3.5 million by 2025 - based on a simple housing per capita model), over their own Dept. of Finance's multifactorial estimate (1.2 million by 2022)*. The state legislators dismissed the work of the Dept. of Finance (DOF) again when they passed Senator Wiener's Senate Bill 828, a bill that assumed that the DOF had gotten their household projections wrong. Senator Wiener, without evidence, claimed the DOF had underestimated the housing needs and had failed to account for existing housing needs (not true). Senator Wiener in his bill, SB-828, authorized another state department, HCD, to make a second round of adjustments to the DOF estimates. By creating uncertainty and doubt about the DOF's work, Senator Wiener paved the way for others, like Christopher Elmendorf, a law professor at UC Davis, to challenge the work of the DOF and HCD with his proprietary housing model.

Why has this happened? In part, it's driven by money. Tech millions financing the YIMBY movement and real-estate millions flowing into political donations have a vested interest in creating uncertainty and doubt about the state's housing needs. Inflating the number perpetuates a misdirection away from the real need, affordable housing, towards market-rate housing. The solution to an affordable housing crisis requires serious government funding. The solution to a market-rate housing crisis doesn't. It only requires changing the existing rules so it is more profitable for developers to build e.g. by eliminating parking requirements, allowing more density, reducing set-backs etc. The housing meme (underwritten by tech and real estate millions) would have us believe that more market rate-housing produces affordable housing. But that hasn't happened, nor do the economics of that story play out. Quite the opposite.

What's wrong with this picture? Big Tech and real estate interest groups are rational players in this drama, acting in their own best interests. But the state, by aligning with these corporate interests, has completely abrogated its responsibility to its most disadvantaged residents. Taxpayers are entitled to an explanation as to why state legislators continue to undermine the work of their own Dept. of Finance and refuse to direct the necessary funding to affordable housing efforts. State legislators, like Senator Wiener, should have to clearly articulate where they find fault in the DOF's methodology before creating new work with new standards for other state departments.

*Based on the 5th cycle Regional Housing Needs Assessments.

Estimates of the housing needed in the four major planning regions in California vary widely. Two models show close agreement — "HCD Pre-SB828" and "Freddie Mac".

Our last report showed how language in Senate Bill 828 introduced double-counting errors and resulted in a doubling of the housing needs estimated by the Dept. of Housing and Community Development (HCD) in the latest housing assessments. Freddie Mac's February 2020 assessment of California's housing deficit closely aligns with estimates produced using HCD's pre SB-828 methodology.

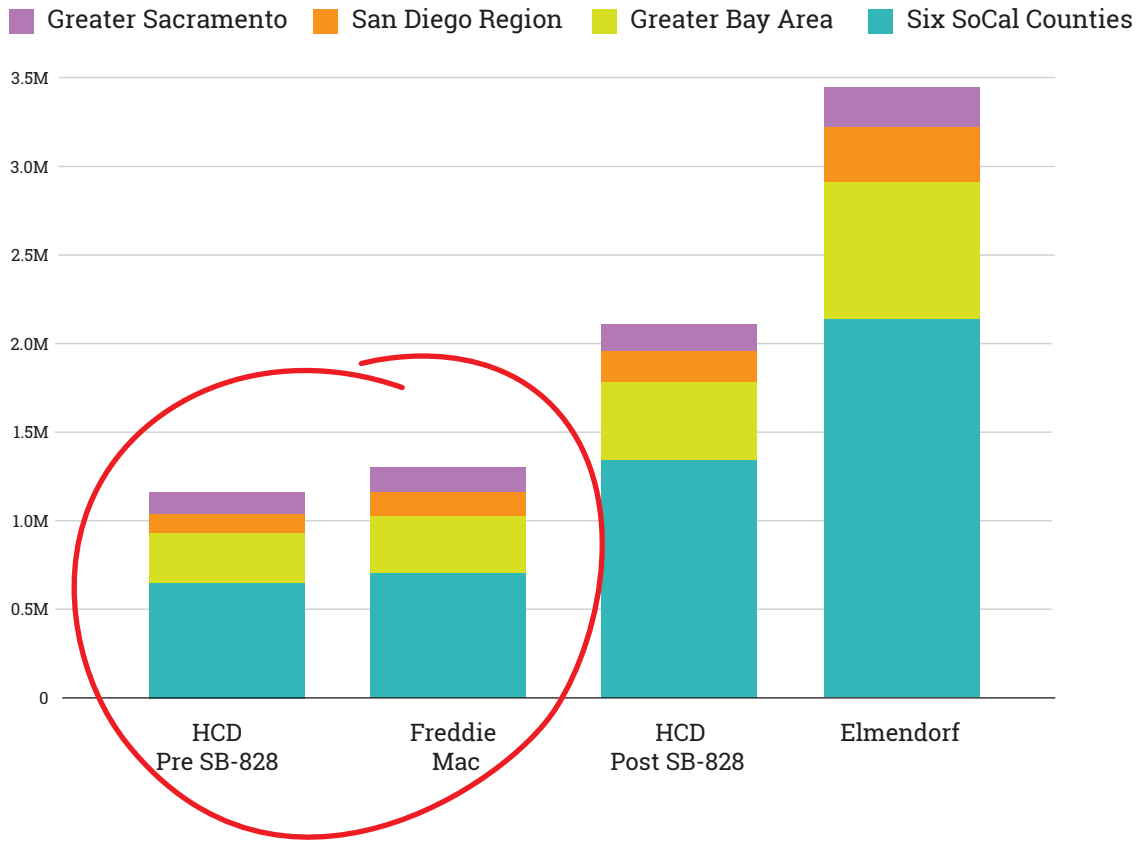
HCD Pre SB-828 The need for housing based on the approach used for the past three decades by HCD, prior to SB-828 (2018) becoming law. Overcrowding and cost-burdening adjustments are from Dept. of Finance (DOF).

Freddie Mac* The need for housing according to the model outlined in Freddie Mac's *The Housing Supply Shortage State of the States.* Model based on target households and target gross vacancies.

HCD Post SB-828 The need for housing based on changes initiated by SB-828 and used by the HCD in the latest assessments. Overcrowding and cost-burdening includes DOF and HCD adjustments.

Elmendorf The need for housing based on the approach outlined in *Regional Housing Need in California: The San Francisco Bay Area.* The model was developed for the Greater Bay Area but the same methodology is applied here to remaining three regions. The approach extends the HCD's post SB-828 model to include an additional jobs/housing adjustment.

Housing Units Needed in California's 4 major planning regions (2021–2030)



* Note: Freddie Mac study looked at the housing supply shortage by state. Since the four regions above represent 82% of California's housing supply we have assumed 82% of the housing deficit in the Freddie Mac Model is in the four major regions. Healthy benchmarks for target households and target vacancy that Freddie Mac used to determine the existing housing deficit were applied to Dept of Finance population projections (2020 to 2030) to develop estimates for future housing needs so the models could be compared. The Freddie Mac study as published only looked at *existing* housing need.

It's important to understand that there are two parts to the estimates of housing need: a) the existing housing need and b) the future demand for housing. SB-828 affected both estimates.

Existing Need

Existing need is determined by comparing current conditions in the housing market to healthy benchmarks.

Pre SB-828

- **Target Households**: The Dept. of Finance (DOF) looks at how many households have formed and compares that to how many households should have formed if high housing cost and overcrowding weren't an issue.
- **Target Vacancies**: The Dept. of Housing and Community Development (HCD) looks at the vacancy rates in rental and owner-occupied housing and compares them to healthy norms (typically 1.5% for owner-occupied and 5% for rental housing). If the vacancy rates are lower than those thresholds, that's a signal that the housing market is too tight. So additional housing units are added to the housing need to bring the vacancy rate back to a healthy level. If the vacancy rate is too high, then the housing market is thought to be distressed and housing units would be subtracted from the housing need.

Post SB-828

- **Second overcrowding adjustment:** HCD compares the percentage of homes in the region that are overcrowded (more than one person per room) with the percentage of homes that are overcrowded in regions outside California that have been identified as benchmark regions. The difference between the percentages is multiplied by the number of existing households to ascertain the number of housing units that should be added to the total housing need. Elmendorf applied a similar adjustment but used a different regional benchmark.
- **Second cost-burdening adjustment**: HCD compared the percentage of households that were cost-burdened in the region (spending more than 30% of their income on housing costs) with the percentage of households that were cost-burdened in regions outside California that had been identified as benchmarks. However, HCD did not make an adjustment for cost-burdening to existing households. Elmendorf, however, applied an adjustment to existing housing using their benchmark.
- **Additional jobs/housing adjustment:** Elmendorf took the number of supercommuters (commutes of 90 mins or more) for the region and added an additional housing unit for every supercommuter to the housing need.

Future Demand 2020-2030

Future demand is determined by projecting population growth and anticipating healthy rates of household formation and vacancies.

Pre SB-828

- The Dept. of Finance (DOF) produces population growth estimates for the region and breaks down the estimates by age cohort. They then estimate the amount of housing needed to comfortably accommodate this population growth. They base their assumptions on healthy household formation rates for each age cohort.
- HCD makes an adjustment to this DOF base by adding a healthy number of vacancies - 5% for rental housing, 1.5% for owner-occupied housing. The vacancies ensure there's enough housing for the housing market to function efficiently.
- The DOF also supplies the HCD with an estimate of how many housing units will be demolished (based on a 10-year average) and will need to be replaced during the housing cycle. This added to the estimate of housing need.

Post SB-828

- **2nd overcrowding adjustment**: HCD and Elmendorf applied the percentage difference they found in existing conditions to future households.
- **2nd cost-burdening adjustment**: HCD and Elmendorf applied the percentage difference they found in existing conditions to future households.

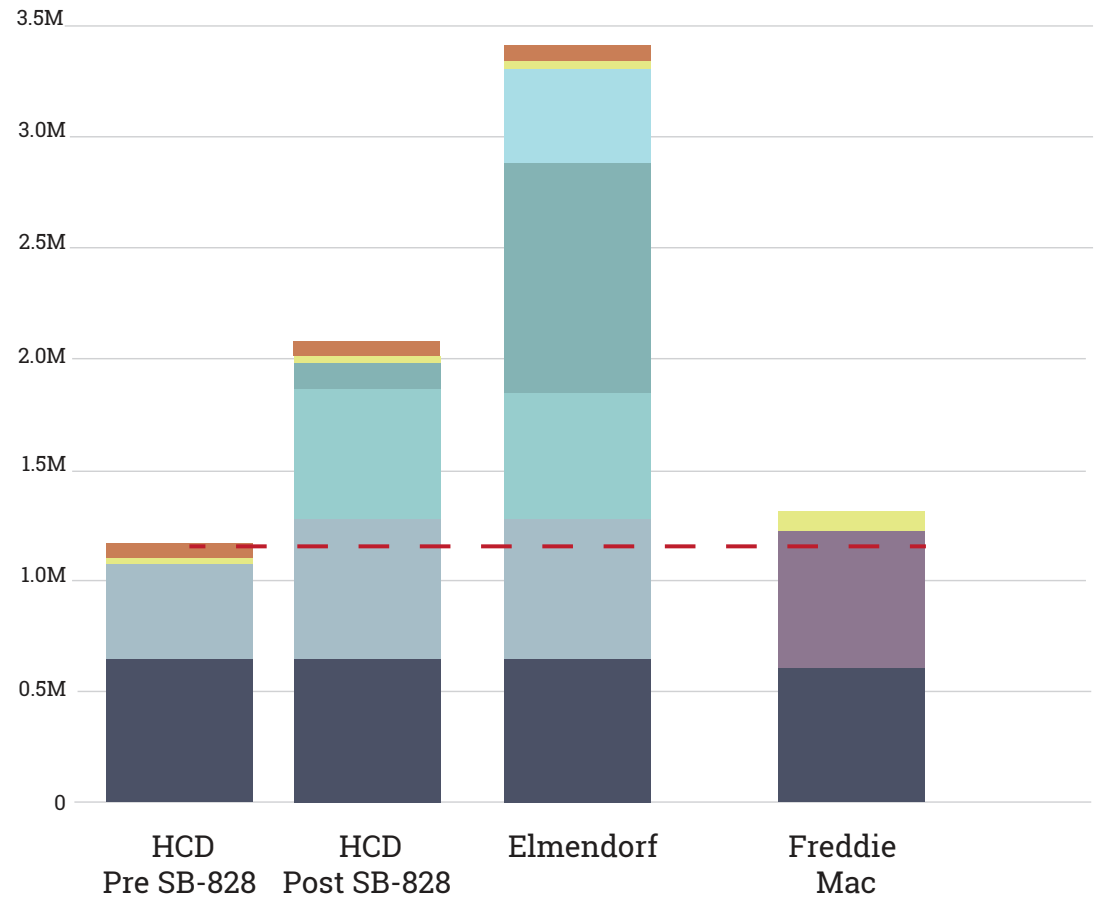
SB-828 resulted in a doubling, or in the case of the Elmendorf model, a tripling of the housing need estimates.

	Demand Sources		SB-828 Impacts			Pre-SB-828 Adjustments		
	"Population growth" assuming "healthy" households per capita	"Pent-up" demand as signalled by lower household formation and fewer vacancies	2nd Adjustment for Overcrowding	2nd Adjustment for Cost-Burdening	2nd Adjustment for Jobs-Housing	Vacancy adjustment on future housing	Replacement units for any teardowns	**Total** Rounded to nearest ten thousand
HCD Pre SB-828	650,000	426,000	**0**	**0**	**0**	30,000	60,000	**1,170,000**
HCD Post SB-828	650,000	636,000	**599,000**	**134,000**	**0**	27,000	60,000	**2,100,000**
Elmendorf	650,000	636,000	**573,000**	**1,057,000**	**427,000**	27,000	60,000	**3,430,000**
Freddie Mac	612,000	637,000	**0**	**0**	**0**	73,000	0	**1,320,000**

SB-828's greatest impact was felt in estimates of existing need, i.e., how much housing is needed today to comfortably house the existing population. Even though they take slightly different approaches, once again, the "HCD Pre SB-828"and "Freddie Mac" are in close agreement on existing need.

Existing Deficit

- Replacement Adjustment
- Vacancy Adjustment on future housing
- Jobs-Housing Adjustment
- 2nd Cost-Burdening Adjustment
- 2nd Overcrowding Adjustment
- "Missing" households—based on Dept of Finance estimates of impacts of overcrowding/cost burdening + sub-optimal vacancy rates *
- "Missing" households as determined by Freddie Mac based on difference from target households and target vacancies
- Base Increase in households 2020-2030 assumes healthy household formation rate in future housing



Pre SB-828 HCD:
Existing Need 0.4M

Freddie Mac:
Existing Need 0.6M

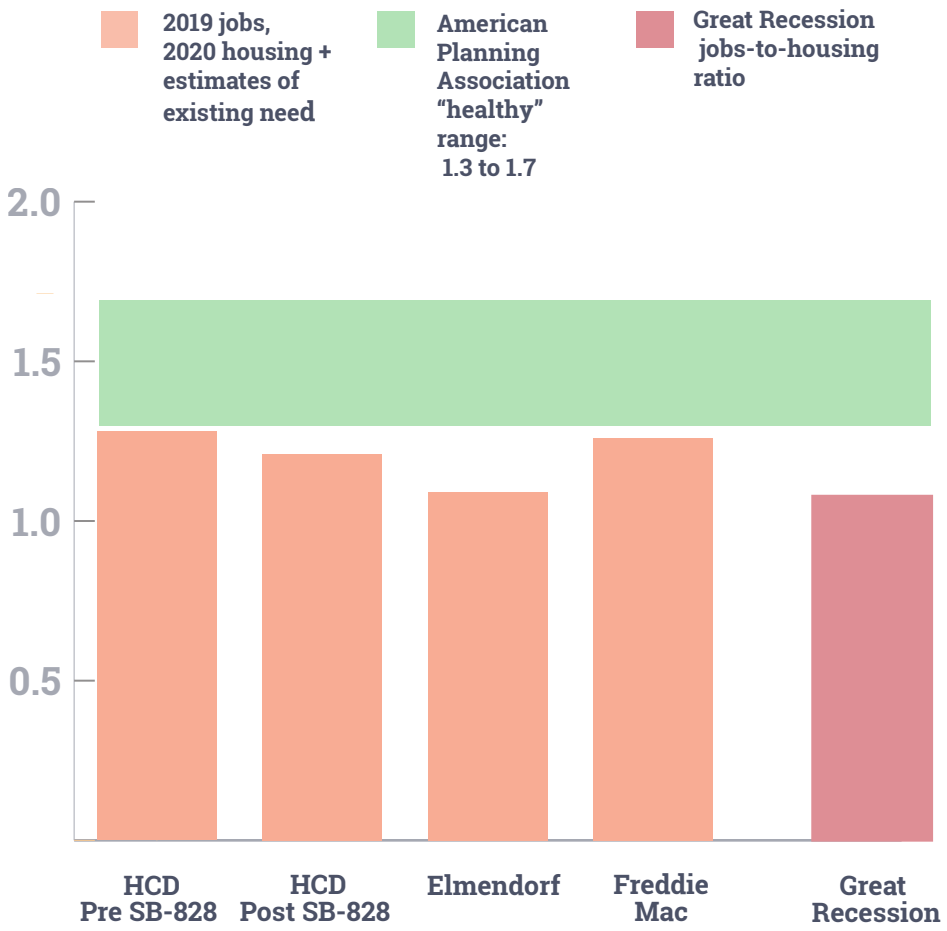
Post SB-828 HCD:
Existing Need 1.4M

Elmendorf
Existing Need: 2.7M

*The adjustment needed to ensure a healthy vacancy level in existing housing comes under "missing" households so only the vacancies required for future housing is shown in yellow

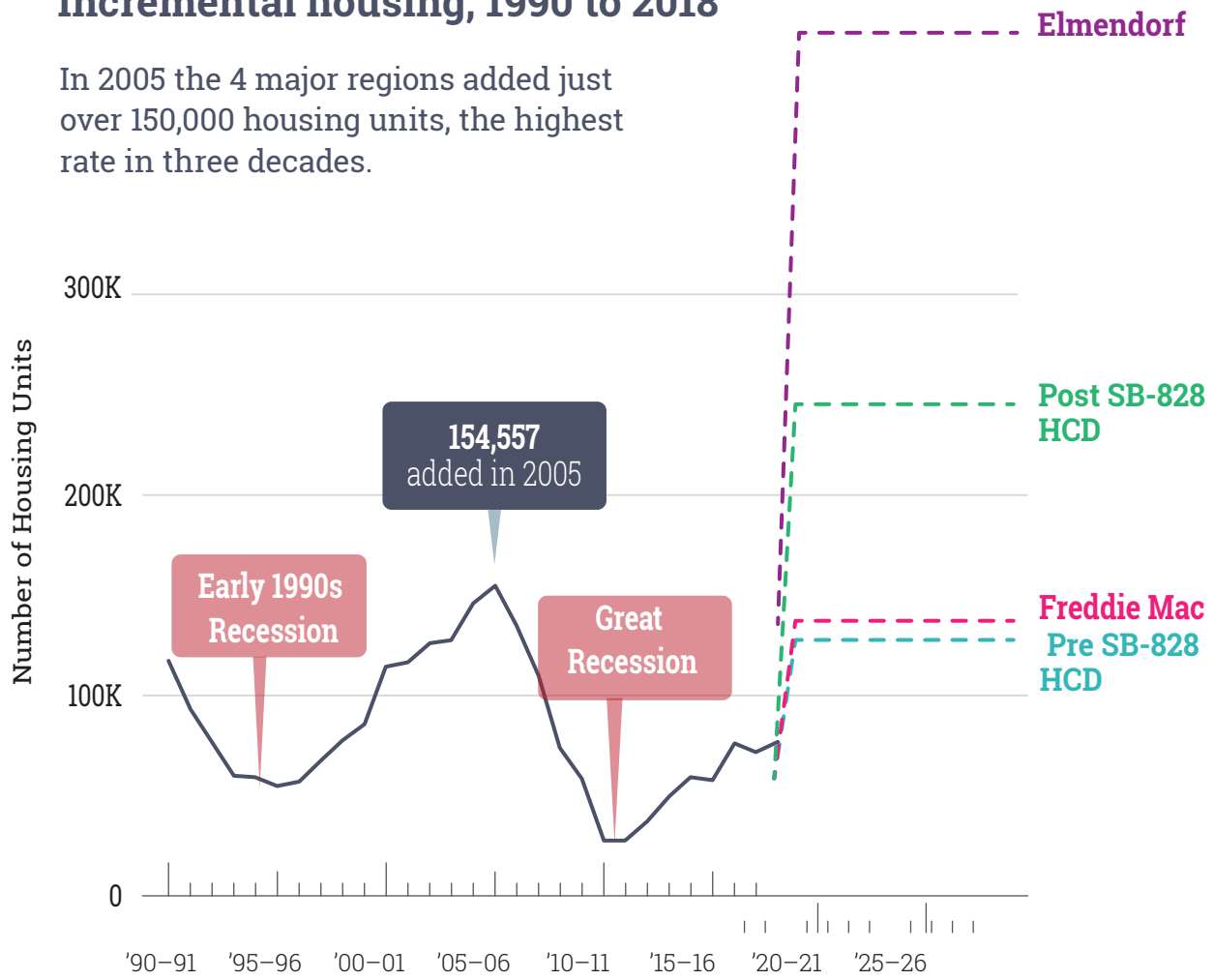
When estimates of existing housing need are checked for feasibility against the state's benchmark - a balance between jobs and housing - only "Pre SB-828 HCD" and the "Freddie Mac" estimates seem reasonable*. Based on the last 30 years of housing production, they also generate the only estimates that seem reasonable from a production perspective.

Existing Jobs-to-Housing Ratio: Four Regions



Incremental housing, 1990 to 2018

In 2005 the 4 major regions added just over 150,000 housing units, the highest rate in three decades.



*Per Govt. Code 65584.01 (c)(1) that requires "that the existing and projected housing need, as established, must achieve a feasible balance between jobs and housing using regional employment projections from the regional transportation plan"

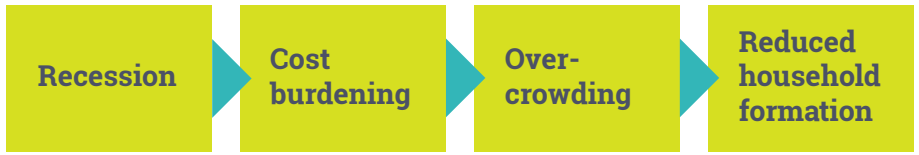
Appendix

1. Explanation of benchmarks
2. Explanation of household formation rates
3. Models: HCD Pre SB-828
4. Models: HCD Post SB-828
5. Models: Elmendorf
6. Models: Freddie Mac

The largest difference between the five models lies in estimates of the existing housing deficit. Different "healthy" benchmarks as well as double counts drive the difference in estimates.

Future demand is projected based on population growth and estimations of how many households will be formed. Then a cushion for "transactional" vacancies is added to ensure adequate housing supply.

Existing shortfall or "missing" households are estimated by comparing conditions today with healthy benchmarks. "Post SB-828 HCD" and "Emendorf" apply second adjustments using benchmarks that appear to be interdependent.



Benchmarks that Determine Existing Housing Shortfall

Vacancy Rate

Four out of five models use vacancy benchmarks. The "Pre SB-828 HCD" model differentiates between owner-occupied and rental housing and uses standard "healthy" rates as benchmarks. The "Post SB-828 HCD" and "Elmendorf" models adopt a similar approach but use the healthy rental vacancy rate across all housing. "Freddie Mac" uses historical gross vacancy rates as the benchmark.

Household Formation

The rate at which households form is referred to as the headship or household formation rate. It varies by age cohort e.g. fewer 20-year-olds head households than 40-year-olds. Since the 1980s household formation rates across all ages has decreased. However, a more significant drop-off was seen after the Great Recession and has been attributed, in part, to economic hardship. These rates, according to experts, are an aberration. The state's Dept. of Finance chose to benchmark household formation to conditions in the early 2000s to ensure estimates were not pegged to current unfavorable conditions of overcrowding and cost-burdening. "Freddie Mac" chose the 30-year average (1970 to 2000) household formation rates.

Overcrowding/ Cost-burdening

Only two of the models -- "Post SB-828 HCD" and " Elmendorf"--- made a second adjustment for overcrowding and cost-burdening (in addition to the adjustment described above). However, they chose different benchmarks.

"Post SB-828 HCD": The Bay Area was benchmarked against seven large Combined Statistical Areas (CSAs) outside California*. The Sacramento region was benchmarked against seven mid-size Metropolitan Areas (MSAs) outside California, while Southern California and San Diego were benchmarked against national averages*. San Diego's numbers were not adjusted for cost-burdening, only overcrowding.

"Elmendorf": Benchmarked against Metropolitans Areas (MSAs) that had grown more than 30% between 2000 and 2013. However, to be consistent with HCD they used the Combined Statistical Areas that corresponded to those fast-growing MSAs. Two of the eleven MSAs that met the criteria did not have a corresponding CSA and were excluded.*

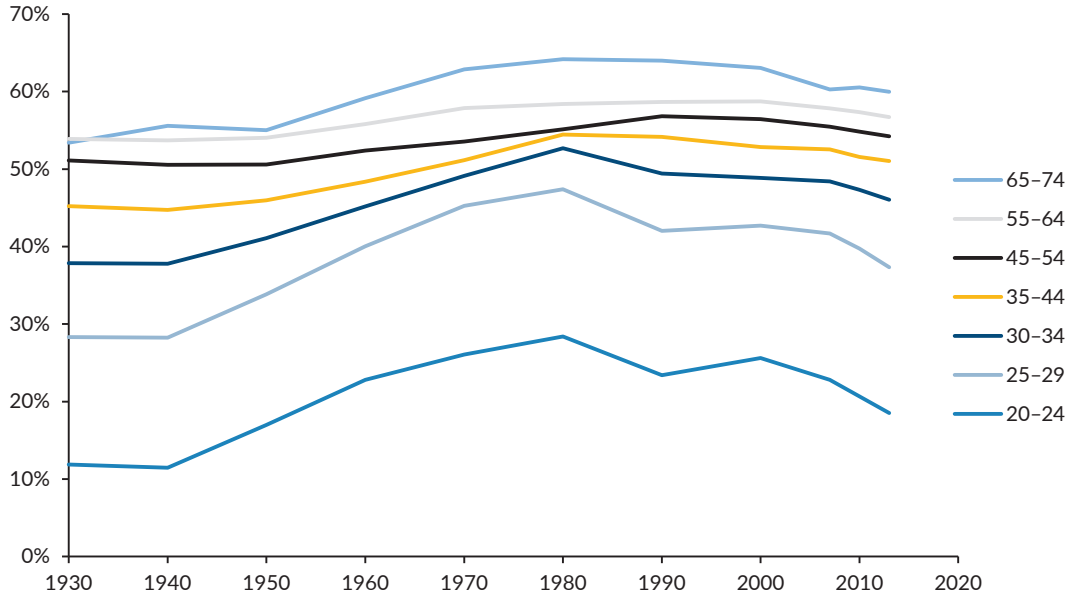
Jobs-to Housing

This benchmark was only used by the "Elmendorf" model. The benchmark was the zero commutes greater than 90 minutes for workers in the region.

* Seven largest CSAs are Denver-Aurora, Minneapolis-St. Paul, Boston-Worcester-Providence, Washington-Baltimore-Arlington, Chicago-Naperville, New York-Newark, Seattle-Tacoma.
Seven mid-size MSAs are Austin-Round Rock, Denver-Aurora-Lakewood, Miami-Fort Lauderdale-West Palm Beach, Phoenix-Mesa-Scottsdale, Portland-Vancouver-Hillsboro, Salt Lake City, San-Antonio-New Braunfels
"Elmendorf" CSAs that correspond to MSAs that grew faster than 30% between 2000 and 2013 represent growth greater than Dallas-Fort Worth, Houston-The Woodlands, Atlanta--Athens-Clarke County--Sandy Springs, Orlando-Deltona-Daytona Beach, Las Vegas-Henderson, Jacksonville-St. Marys-Palatka, Raleigh-Durham-Chapel Hill, Nashville-Davidson--Murfreesboro, Phoenix-Mesa. Note that Austin-Round Rock and Charleston-North Charleston did not have a corresponding CSA.

Household formation rates have been in decline since the 1980's but it is the decline since 2010 that the Dept. of Finance and Freddie Mac determined to be an aberration. To avoid underestimating the housing need they benchmarked household formation to earlier "healthier" norms.

Headship rate among US adults ages 20–74, 1930–2013



Sources: Decennial Censuses 1930–2000 and American Community Survey 2007 through 2013, extracted from Steven Ruggles, J. Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek 2010. Integrated Public Use Microdata Series: Version 5.0 [Machine-readable database]. Minneapolis: University of Minnesota.

Harvard's Joint Center for Housing Studies discussion of recent trends

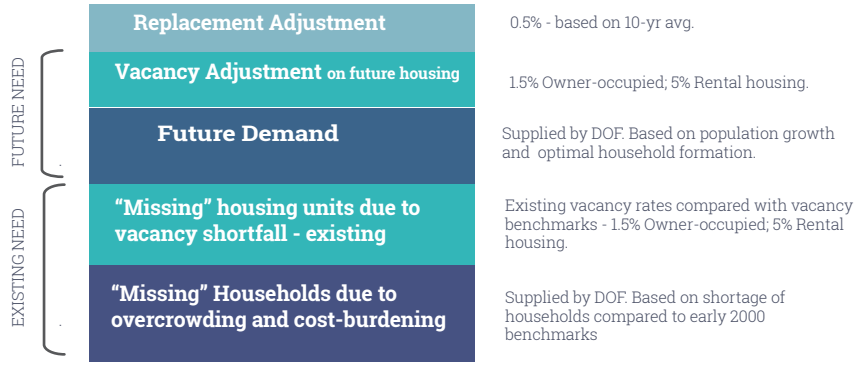
"Indeed, over this period a trend of delayed household formation has pushed down headship rates of young adults. At the same time a trend of lower mortality rates has helped older couples remain living together longer as a couple rather than alone, which has also reduced headship rates for this age group over time. Meanwhile, in the most advanced age groups, people have grown increasingly likely and able to live alone in households rather than moving to nursing facilities or group quarters, which has worked to raise headship rates as a trend for this group over the long term."

“Pre SB-828 HCD”: The numbers broken down

Models:
Pre SB-828 HCD

	Bay Area	Six SoCal Counties	Greater San Diego	Greater Sacramento
Vacancy (includes shortfall on existing and adjustment on future housing)	2018 Former HCD	2017 Former HCD	2016 Former HCD	2017 Former HCD
	Vacancy: Owner **1.5%** Rental **5%** — **44,000**	Vacancy: Owner **1.5%** Rental **5%** — **66,000**	Vacancy: Owner **1.5%** Rental **5%** — **11,000**	Vacancy: Owner **1.5%** Rental **5%** — **4,500**
+ **Replacement**	Replacement **0.5%** — **15,120**	Replacement **0.5%** — **34,010**	Replacement **0.5%** — **6,256**	Replacement **0.5%** — **5,105**
+ **2nd Overcrowding**	Not Applicable			
+ **2nd Cost-Burdening**	Not Applicable			
+ **Jobs/Housing**	Not Applicable			
+ **DOF “missing” households + future demand needed**	223,550	551,499	95,232	112,609
TOTAL NEED (rounded)	**283,000**	**652,000**	**112,000**	**122,000**

Additional Housing Needed by 2030



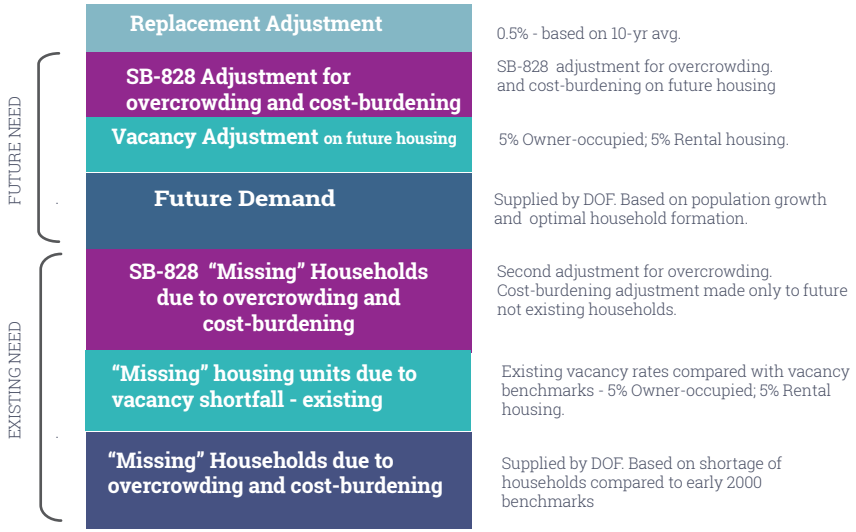
Source: Dept. of Housing and Community Development, 6th cycle Final Regional Housing Needs Determination letters, American Community Survey 5-yr 2014-2018, 2013-2017 & 2012-2016;

"Post SB-828 HCD": The numbers broken down

Models: Post SB-828 HCD

	Bay Area		Six SoCal Counties		Greater San Diego		Greater Sacramento	
Vacancy (includes shortfall on existing and adjustment on future housing)	2018	New HCD	2017	New HCD	2016	New HCD	2017	New HCD
	Vacancy: Owner **5%** Rental **5%**	98,799	Vacancy: Owner **5%** Rental **5%**	178,896	Vacancy: Owner **5%** Rental **5%**	31,500	Vacancy: Owner **5%** Rental **5%**	22,730
+ **Replacement**	Replacement **0.5%**	15,120	Replacement **0.5%**	34,010	Replacement **0.5%**	6,256	Replacement **0.5%**	5,105
	2018	New HCD	2017	New HCD	2016	New HCD	2017	New HCD
+ **2nd Overcrowding** (includes shortfall on existing and adjustment on future housing)	Bay Area	6.74%	Six SoCal Counties	10.11%	Greater San Diego	6.43%	Greater Sacramento	4.39%
	7 Metros Benchmark	3.6%	National Benchmark	3.35%	National Benchmark	3.34%	Mid-Metros Benchmark	3.79%
	Additional Housing Needed	**94,605**	**Additional Housing Needed**	**459,917**	**Additional Housing Needed**	**38,700**	**Additional Housing Needed**	**6,111**
	2018	New HCD	2017	New HCD			2017	New HCD
+ **2nd Cost-Burdening ONY ON FUTURE HOUSING**	Bay Area Lower Income Household	66.64%	SoCal Lower Income Household	69.88%			Sacramento Lower Income Household	68.76%
	Bay Area Higher Income Household	16.25%	SoCal Higher Income Household	18.65%			Sacramento Higher Income Household	16.37%
	7 Metros Lower Income Households	66%	National Lower Income Households	59.01%			7 Mid-Metros Lower Income Households	64.23%
	7 Metros Higher Income Households	13.13%	National Higher Income Households	9.94%			7 Mid-Metros Higher Income Households	11.48%
	Lower Income Housing Adjustment	1,130	Lower Income Housing Adjustment	55,383			Lower Income Housing Adjustment	2,744
	Higher Income Housing Adjustment	7,972	Higher Income Housing Adjustment	62,121			Higher Income Housing Adjustment	4,214
	Additional Housing Needed	**9,102**	**Additional Housing Needed**	**117,505**			**Additional Housing Needed**	**6,957**
+ **Jobs/Housing**	N/A							
+ **DOF "missing" households + future demand**	**223,550**		**551,499**		**95,232**		**112,609**	
TOTAL NEED (rounded)	**441,000**		**1,342,000**		**172,000**		**154,000**	

Additional Housing Needed by 2030



Source: Dept. of Housing and Community Development, 6th cycle Final Regional Housing Needs Determination letters, American Community Survey 5-yr 2014-2018, 2013-2017 & 2012-2016; CHAS (Comprehensive Housing Affordability Strategy) 2012- 2016 and 2013-2017 by county.

Elmendorf Model

The "Elmendorf" model builds off the "Post SB-828 HCD" model but with some important differences

1. Choice of Comparator regions

Elmendorf argued that the use of large slow growing metros as benchmarks locks in slow growth patterns. A national benchmark was also ruled out because " it includes declining regions, such as the Rust Belt, which are inapt comparators because a lot of their housing stock consists of stranded assets". Instead Elmendorf chose the Metropolitan Statistical Areas that had grown more than 30% between 2000 and 2013* and used *"the corresponding Combined Statistical Area (CSA), because CSAs are the geographic units employed by ABAG and HCD for making their cost-burden, vacancy, and overcrowding adjustments"*

It's important to note that

1) Two of the MSAs that grew 30% or more between 2000 and 2013 did not tie back to a CSA*.

2) The density of the "high-growth" metros are approximately a third of the density of the "large metros" comparators used by HCD. Not surprisingly, average land prices in the large dense metros are approximately three times that of the "high-growth" metros. Given this disparity it raises the question of whether these regions are relevant comparators.

3) HCD does not use metro benchmarks for vacancy adjustments as Elmendorf suggesst in the quote

Elmendorf/Monkkonen	**HCD** **Bay Area**	**HCD** **Sacramento**	**HCD** **SoCal, San Diego**
Combined Statistical Areas* 1. Dallas—Fort Worth 2. Houston—The Woodlands 3. Atlanta—Athens-Clarke County—Sandy Springs 4. Orlando—Deltona—Daytona Beach 5. Las Vegas—Henderson 6. Jacksonville—St. Marys—Palatka 7. Raleigh—Durham—Chapel Hill 8. Nashville—Davidson—Murfreesboro 9. Phoenix—Mesa	Combined Statistical Areas 1. Denver—Aurora 2. Minneapolis—St. Paul 3. Boston—Worcester—Providence 4. Washington—Baltimore—Arlington 5. Chicago—Naperville 6. New York—Newark 7. Seattle—Tacoma	Combined Statistical Areas 1. Denver—Aurora 2. Minneapolis—St. Paul 3. Boston—Worcester—Providence 4. Washington—Baltimore—Arlington 5. Chicago—Naperville 6. New York—Newark 7. Seattle—Tacoma	United States National norm

2. Cost-burdening

Elmendorf extended the cost-burdening adjustment. Where HCD had applied the adjustment only to future housing, Elmendorf applied the adjustment to both existing and future housing. Separately, Elmendorf could not reproduce the benchmarks used by ABAG/HCD for cost-burdening. Embarcadero Institute was able to reproduce HCD benchmarks for all regions. It is unclear why Elmendorf was unable to reproduce work done by HCD. It seems he may have only taken into account owner-occupied data from CHAS data and failed to account for renter-occupied cost-burdening. We cannot say this with certainty, but it was the only way we could reproduce Elmendorf's numbers. His own numbers produced the unxpected result: the Bay Area had no cost-burdening in low-income households (relative to HCD benchmarks), but had significant cost-burdening in higher-income households. In recreating the Elmendorf model we used the combined owner-occupied and rental cost-burdening as reported by CHAS per HCD's methodology.

3. Jobs-to-Housing

Elmendorf argued that an additional adjustment should be made to reflect the jobs/housing imbalance. He recommended making the adjustment based on the absolute number of supercommuters who work in the region. Note: this includes people living in the region who work in the region as well as workers commuting from outside into the region. Elmendorf multiplied the number of supercommuters (defined as commutes longer than 90 mins) and divided it by ABAG's optimal jobs per housing factor (1.41) to determine the number of additional housing units needed to house supercommuters.

Note: Embarcadero Institute could not reproduce Elmendorf's housing units needed for supercommuters in the Bay Area (137,524). From ACS (2014-2018) data, for the nine Bay Area counties that make up ABAG, we determined there were approximately 212,000 super commuters which translated to **150K** housing units, not Elmendorf's **138K**. We were only able to back into their 138K if we only took into account five of the nine Bay Area counties - Alameda, Contra Costa, San Francisco, San Mateo, and Santa Clara. ABAG however covers all nine counties so we have used our number to better reflect the region supercommuter imbalance as described by Elmendorf.

4. Overcrowding

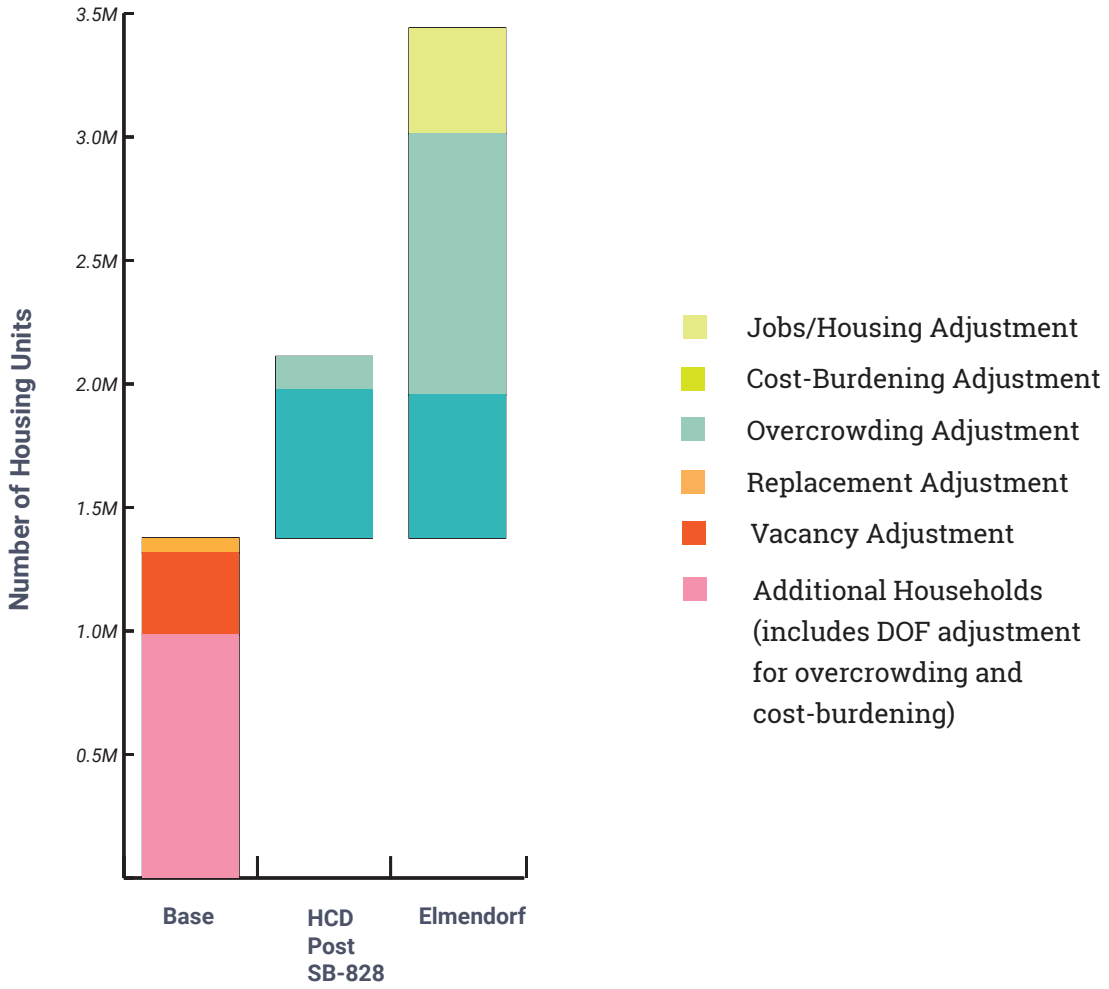
Once again Elmendorf was unable to reproduce HCD data. The issue seems to be that Elmendorf used simple averages whereas HCD used weighted averages. Separately, where HCD used national benchmarks (for Southern California) it used the data reported at the national level by the American Community Survey. Elmendorf appears to have used the 175 Combined Statistical Areas as their "whole nation" comparator, again with simple rather than weighted averages. Weighted averages are commonly used in population statistics. Both approaches have their merits, but since overcrowding is reported as a percentage, it is already an average. It is important therefore in this case to use a weighted average approach - especially given the CSAs range so greatly in size. As such, the Embarcadero institute followed the HCD weighted average approach.

*Austin-Round Rock, TX and Charleston-North Charleston, SC did not translate to a Combined Statistical Area and so do not appear on this list and were not included in the comps.
Source: Regional Housing Need in California: The Bay Area published by UCLA Lewis Center for Regional Housing Studies; Authors: Elmendorf, Elkind, Lens, Manville, Marantz, Monkkonen, O';Neill, Trounstine.

The "Elmendorf" model extends cost-burdening to existing as well as future households. It also adds a 'jobs-to-housing balance' adjustment and uses 'fast-growth' comparators rather than the HCD comparator regions. The net result is 3.4 million housing units needed in the 4 regions by 2030.

Models: Elmendorf

Housing Needs Estimates thru 2030 : Totals for Four Regions



1. 2nd Overcrowding Adjustment

Elmendorf recommended using the fast growing metropolitan areas as benchmarks, but in the final analysis, this did not result in a marked difference for overcrowding. In the original Elmendorf analysis the overcrowding benchmark was said to be 2.9%, but it is 3.66% which turns out to be a little higher than the large metro benchmark used by HCD. The discrepancy between Elmendorf's 2.9% and the actual 3.66% comes about because Elmendorf used a simple rather than weighted average as HCD had done.

Benchmark Comparisons

	Actual Fast-Growth	Elmendorf Fast-Growth	Actual Bay Area	Elmendorf Bay Area
Overcrowding	3.66%	2.9%	6.74%	6.7%
Cost-burdening Lower income	61.4%	56.2%	66.64%	58.5%
Cost-burdening Higher income	8.99%	8.6%	16.3%/	15.9%

2. 2nd Cost-Burdening Adjustment

Elmendorf followed the HCD approach, creating two cost-burdening groups - lower income (extremely low, very low and low) and higher income (moderate and above moderate). Once again though, Elmendorf underreported cost-burdening for the "fast-growth" metros, 56.2% where it should have been 61.4%. This error was somewhat offset by also underreporting Bay Area cost-burdening (58.5%, when it should have been 66.64%). Elmendorf's under-reporting did however, produce some unusual results - for example, Elmendorf reported that low-income Bay Area households were less cost-burdened than HCD's chosen benchmark.

HCD only applied the second cost-burdening adjustments to future households, while Elmendorf applied the adjustment to existing and future households.

3. Jobs/Housing Adjustment

The "Elmendorf" model makes an adjustment based on the number of commutes greater than 90 mins. He divides the number of 'supercommuters' by the jobs per housing ratio used by ABAG, 1.41, to determine the additional housing units needed.

4. Existing Demand

Existing demand in the "Elmendorf" model includes the DOF original adjustment for overcrowding and cost-burdening which is embedded in its projected number of households needed, a second cost-burdening & overcrowding adjustment on existing households, the jobs/housing adjustment, the vacancy differential from healthy benchmark in existing households.

5. Future Demand

Includes DOF projected new households plus healthy vacancy, SB-828 overcrowding and cost-burdening adjustment on future housing.

A summary of the mistakes introduced in the Elmendorf model.

Models: Elmendorf

Overcrowding

	HCD	Emb. Institute reproducing HCD model	E/M reproducing HCD model
Bay Area	6.7%	6.7%	6.7%
7 Metro Benchmark	3.6%	3.6%	3.0%
Additional Housing Needed	**94,605**	**94,605**	**113,363**
Fast Growth Benchmark		3.66%	2.9%
Additional Housing Needed		**93,074**	**116,235**

HCD used weighted averages while Elmendorf appears to have used simple averages, and may have excluded some metros from the dataset The metros range in size. In the case of the "Largest Metros" the largest is more than six times the smallest, and in the case of the "Fast Growth" metros, the largest is four times the smallest.

On account of the range and because overcrowding is reported as a percentage, a weighted average approach is appropriate. Later, when we recreated the Elmendorf model we adopt the HCD weighted average approach.

Cost-Burdening

	HCD	Emb. Institute reproducing HCD model	E/M reproducing HCD model
Bay Area Lower-Income Household	66.64%	66.64%	58.5%
Bay Area Higher-Income Household	16.25%	16.25%	15.9%
7 Metro Lower-Income Household	66.00%	66.00%	60.1%
7 Metro Higher-Income Household	13.1%	13.1%	11.4%
Lower-Income Housing Adjustment	1,061	1,061	-2,807
Higher-Income Housing Adjustment	8,041	8,041	11,305
Additional Housing Needed	**9,102**	**9,102**	**8,498**

Embarcadero Institute (EI) recreated HCD's cost-burdening statistics using data from HUD's CHAS 2012–2016. Elmendorf reported not being able to reproduce the HCD work. We've identified a couple of possible errors in in Elmendorf's analysis:

- Only included owner-occupied—not renter data (CHAS)
- Only included 5 of the 9 Bay Area counties

Jobs-to-Housing Balance

	Emb. Institute reproducing HCD model	E/M reproducing HCD model
Number of Super Commuters	211,883	not reported
Workers per Housing	1.41	1.41
Housing Adjustment	**150,272**	**137,524**

Elmendorf's Jobs-to Housing statistic could not be reproduced for the 9 Bay Area Counties. However, we found that it matched to the number of supercommuters if we looked only at 5 out of the 9 Bay Area counties. To be consistent with HCD's regional definition we have used the 9 Bay Area number in our recreation of the Elmendorf model.

In attempting to recreate work done by the HCD, Elmendorf seems to have introduced several sources of error:

1) In some cases only data from five out of the nine Bay Area counties represented by ABAG have been used.

2) A simple rather than weighted average approach was used even though the HCD used weighted average and given the nature of the data it seems the more appropriate approach.

3) In some cases, owner-occupied not owner-occupied *and* renter-occupied cost burdening data may have used.

4) It is unclear whether all the regions that satisfied Elmendorf's criteria - CSAs that correspondeded to MSAs that grew 30% or more between 2000 and 2013 were included in his dataset.

Embarcadero Institute was able to reproduce all the HCD analysis and followed the same weighted average methodology to later determine benchmarks for Elmendorf's preffered 'fast-growth" benchmarks.

Source: Dept. of Housing and Community Development, 6th cycle Final Regional Housing Needs Determination letters, American Community Survey 5-yr 2014-2018, 2013-2017 & 2012-2016; CHAS (Comprehensive Housing Affordability Strategy) 2012- 2016 and 2013-2017 by county.

Elmendorf's "fast-growth" benchmarks corrected.

Vacancy (includes shortfall on existing and adjustment on future housing)

+

Replacement

+

2nd Overcrowding (includes shortfall on existing and adjustment on future housing)

+

2nd Cost-Burdening (includes shortfall on existing and adjustment on future housing)

+

Jobs/Housing

+

DOF "missing" households + future demand needed

TOTAL NEED (rounded)

Bay Area	E/M model = New HCD
Vacancy: Owner Occ/ Rental 5%	98,799
Replacement 0.5%	15,120
	Emb. Institute reproducing E/M model
Bay Area	6.74%
Fast Growth Benchmark	3.66%
Additional Housing Needed	**93,074**
	Emb. Institute reproducing HCD model
Bay Area Lower Income Household	66.64%
Bay Area Higher Income Household	16.25%
Fast Growth Lower Income Households	61.4%
Fast Growth Higher Income Households	8.99%
Lower Income Housing Adjustment	64,587
Higher Income Housing Adjustment	129,695
Total Adjustment	**194,282**
	Emb. Institute reproducing E/M model
Number of Super-commuters	211,883
Workers per Housing	1.41
Additional Housing Needed	**150,272**
	223,550
	775,000

Six SoCal Counties	E/M model = New HCD
Vacancy: Owner Occ/ Rental 5%	178,896
Replacement 0.5%	34,010
	Emb. Institute reproducing E/M model
Six SoCal Counties	10.11%
Fast Growth Benchmark	3.66%
Additional Housing Needed	**438,694**
	Emb. Institute reproducing HCD model
SoCal Lower Income Household	69.88%
SoCal Higher Income Household	18.65%
Fast Growth Lower Income Households	61.4%
Fast Growth Higher Income Households	8.99%
Lower Income Housing Adjustment	307,840
Higher Income Housing Adjustment	383,408
Total Adjustment	**691,248**
	Emb. Institute reproducing E/M model
Number of Super-commuters	335,360
Workers per Housing	1.41
Additional Housing Needed	**237,844**
	551,499
	2,132,000

Greater San Diego	E/M model = New HCD
Vacancy: Owner Occ/ Rental 5%	31,500
Replacement 0.5%	6,256
	Emb. Institute reproducing E/M model
Greater San Diego	6.43%
Fast Growth Benchmark	3.66%
Additional Housing Needed	**34,652**
	Emb. Institute reproducing HCD model
San Diego Lower Income Household	68.57%
San Diego Higher Income Household	19.66%
Fast Growth Lower Income Households	61.4%
Fast Growth Higher Income Households	8.99%
Lower Income Housing Adjustment	36,051
Higher Income Housing Adjustment	79,806
Total Adjustment	**115,857**
	Emb. Institute reproducing E/M model
Number of Super-commuters	31,583
Workers per Housing	1.41
Additional Housing Needed	**22,399**
	95,232
	306,000

Greater Sacramento	E/M model = New HCD
Vacancy: Owner Occ/ Rental 5%	22,730
Replacement 0.5%	5,105
	Emb. Institute reproducing E/M model
Greater Sacramento	4.34%
Fast Growth Benchmark	3.66%
Additional Housing Needed	**6,961**
	Emb. Institute reproducing HCD model
Sacramento Lower Income Household	68.76%
Sacramento Higher Income Household	16.37%
Fast Growth Lower Income Households	61.4%
Fast Growth Higher Income Households	8.99%
Lower Income Housing Adjustment	24,746
Higher Income Housing Adjustment	31,669
Total Adjustment	**56,416**
	Emb. Institute reproducing E/M model
Number of Super-commuters	23,632
Workers per Housing	1.41
Additional Housing Needed	**16,760**
	112,609
	221,000

Models: Elmendorf

Additional Housing Needed by 2030

FUTURE NEED

- **Replacement Adjustment** — 0.5% - based on 10-yr avg.
- **SB-828 Adjustment for overcrowding and cost-burdening** — SB-828 adjustment for overcrowding. and cost-burdening on future housing
- **Vacancy Adjustment** on future housing — 5% Owner-occupied; 5% Rental housing.
- **Future Demand** — Supplied by DOF. Based on population growth and optimal household formation.

EXISTING NEED

- **SB-828 "Missing" Households due to jobs-housing balance** — Additional Elmendorf adjustment based on number of 90-minute long and greater commutes
- **SB-828 "Missing" Households due to overcrowding and cost-burdening** — Second adjustment for overcrowding. Cost-burdening adjustment made only to future not existing households.
- **"Missing" housing units due to vacancy shortfall - existing** — Existing vacancy rates compared with vacancy benchmarks - 5% Owner-occupied; 5% Rental housing.
- **"Missing" Households due to overcrowding and cost-burdening** — Supplied by DOF. Based on shortage of households compared to early 2000 benchmarks

Source: Dept. of Housing and Community Development, 6th cycle Final Regional Housing Needs Determination letters, American Community Survey 5-yr 2014-2018, 2013-2017 & 2012-2016; CHAS (Comprehensive Housing Affordability Strategy) 2012- 2016 and 2013-2017 by county.

Freddie Mac Model

Models:
Freddie Mac

The model was produced by the Federal Home Loan Mortgage Program, known as Freddie Mac. It is a pubic government–sponsored enterprise.

Freddie Mac's estimate of housing demand relies on two components.
a) An estimate of long-term vacancy rates v^*
b) An estimate of the target number of households h^*

The estimates of v^* and h^* give an estimate of housing demand k^* using the formula:

$k^* = h^*/(1- v^*)$

1. Choice of Benchmark

Vacancy Rates
Freddie Mac: "For the housing market to function smoothly, year-round vacant units are needed. Vacancy rates are often used to track the vitality of the housing market. Too high of a vacancy rate reflects a moribund market, while too low of a rate means demand is outstripping supply. Freddi Mac model uses gross vacancy rates = (total housing units - occupied housing units)/total housing units.

The benchmark for v^* was a state's gross vacancy average from 1970 to 2000 because this was the period before the boom and the bust in the housing market began. FM reports that difference between California's historical Long term vacancy rate **v^* and recent vacancy v is -4.02%**

Target Households
Previous FM research has shown that high housing costs have constrained household formation. High housing costs have caused some young adults to turn to shared living arrangements. Others have moved back home with parents. High housing costs have affected all age groups. If housing costs were lower, more households would form.

Freddie Mac uses the average of household formation rates from 1970 until 2000 as a benchmark for healthy household formation as this corresponds to the period before the boom and bust in the housing market began. FM's model reports that the number of "missing" households due to unusually high housing costs in **California is 160,000.**

2. Housing Deficit

Existing housing deficit = (existing households + "missing "households)/ (1 - historical vacancy rate) - existing housing units.

Freddie Mac estimates that **California's existing housing deficit is 5.74% of California's housing stock or 820,000**. According to FM This is a static housing defict and does not account for interstate migration flow. High housing costs have driven many U.S. citizens and households out of California, driving housing demand higher in their destination states while reducing California's. FM estimates **California's dynamic housing deficit is closer to 5.42% or 780,000 housing units.** Eightty-two % of the housing stock in California is in the 4 major urban planning regions. In our analysis we assumed therefore that 82% of 770,000 (approx 640,000) is the existing housing deficit for those regions.

3. Future Demand

The Freddie Mac model does not estimate future demand, however to create an apples-to-apples comparision with other models we projected future demand using the Freddie Mac assumptions of a health gross vacancy rate and healthy household formation rates and the Dept of Finance projections for population growth by 2030. Based on these assumptions the future demand for housing for the four regions would be around 600,000 to 610,000 housing units. We apportioned that growth based on the existing relative share of the housing stock.

The total housing need by 2030 = Existing housing deficit + Future housing need = approx 1.3 Million housing units.

Additional Housing Needed by 2030

Embarcadero Institute added Freddie Mac target gross vacancy rates (historical average 1970 to 2000) to future housing units

Embarcadero Institute used population projections from DOF and Freddie Mac target household formation rates - historical avg 1970 to 2000.

Freddie Mac estimated based on target gross vacancy rate historical averages 1970 to 2000 using Moody's analytics.

Freddie Mac estimated based on target target household formation rates - historical averages 1970 to 2000. Data source: Current Population Survey–Annual Social and Economic Supplement (CPS-ASEC) using the Integrated Public Use Microdata Series (IPUMS) 2019 Version 9.

Source: "The Housing Supply Shortage: State of the States", Economic and Housing Research Insight, February 27,2020, Freddie Mac.
Data source: Current Population Survey–Annual Social and Economic Supplement (CPS-ASEC) using the Integrated Public Use Microdata Series (IPUMS) (Steven Ruggles, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas and Matthew Sobek. IPUMS USA: Version 9.0 [dataset]. Minneapolis, MN: IPUMS, 2019.)