Regional Growth Forecast for Kern Council of Governments

Methodology and Forecasts 2020 to 2050

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Executive Summary

This report presents the 2019 update of the Kern COG Regional Growth Forecast, used principally to update the Kern County Regional Transportation Plan.

The report provides forecasts for a number of demographic and economic indicators, but the principal elements are:

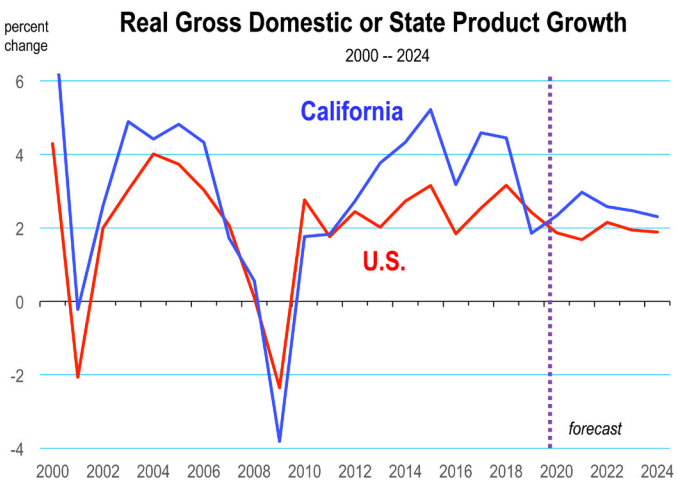
- Population
- Number of Housing Units
- Number of Households, and
- Employment

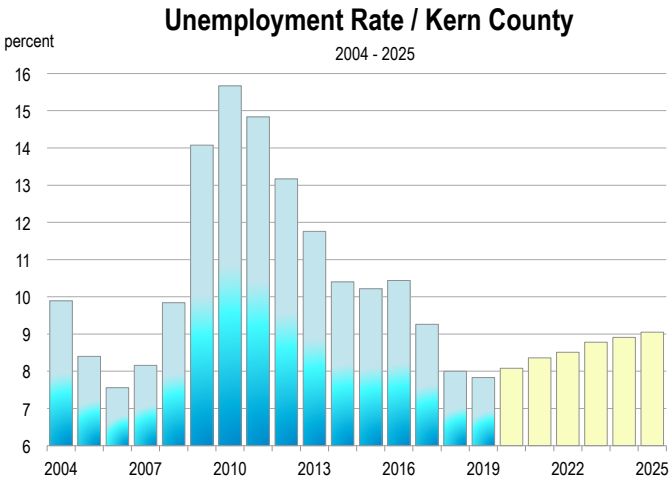
The forecast of these indicators is largely influenced by economic conditions prevailing in the state and county. Economies which are vibrant and creating jobs will encourage new in-migrants that augment the population. Higher population growth influences the demand for housing, infrastructure, and transportation.

Summary of Economic Conditions Today Underlying the Forecast Update

The growth forecast for Kern County indicates that relatively healthy conditions will continue to prevail in the County over the longer term.

Clearly, however, the short term forecast is more beneficial to business and public policy makers because there is a higher degree of accuracy in the forecast over the next few years than over the next 30.





Consider the short term forecast of 5 years (to 2024). During this time, a recession in the U.S. economy is anticipated and growth of employment and population in Kern County would be impacted by such an event, just as it has in past recessions afflicting the national stage.

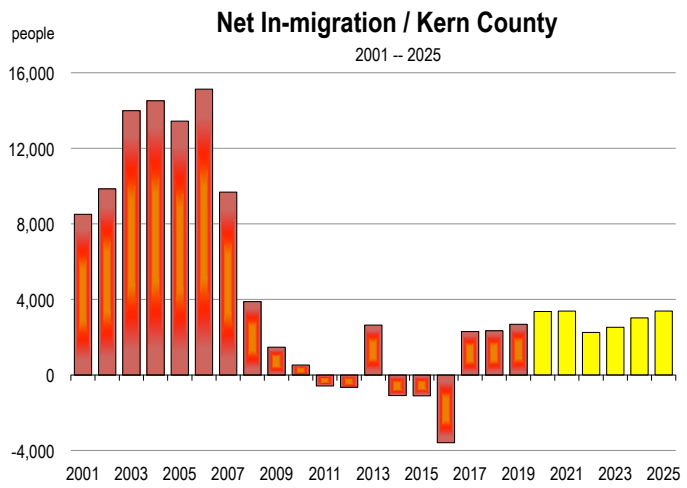
The outlook for the U.S. economy has growth slowing from 2.1 percent in 2019 to 1.6 percent in 2020, rising to 2.0 percent in 2021. While a bona fide recession is not forecast, the conditions that might lead to one will be present next year, such as GDP growth hovering around 1.0 percent. At this level, the economy becomes vulnerable to an unanticipated shock, even a mild one, which could push the business cycle into contraction.

The state's economy, while not always the case, has moved in tandem with the National economy over the last 10 years. Furthermore, it is likely that any softening or contraction in growth will also impact California in a similar fashion. Moreover, recession in California is also presumed to impact Kern County.

Consequently, the forecast for employment growth is muted over the next few years relative to the last 5 years in Kern County. Nevertheless, the growth rate is positive and the unemployment rate remains relatively low over this time period.

A slowdown in the California and Kern County economies would typically reduce job opportunities and consequently, the attraction of new in-migrants. Population growth is forecast to slow in California as a result. But in Kern County, because job creation will remain

Executive Summary



positive and home prices extraordinarily competitive, the forecast for net migration remains consistent with actual levels between 2017 and 2019.

This differs from the Department of Finance population forecast which assumes that in-migration will suddenly accelerate in 2020, pushing the overall population growth rate higher.

Real estate assets are forecast to increase to accommodate population and job growth over the longer term. New housing units augment the existing housing stock, the number of households, and school enrollments: K through 12 and in the county's community colleges, trade schools, and at Cal State Bakersfield.

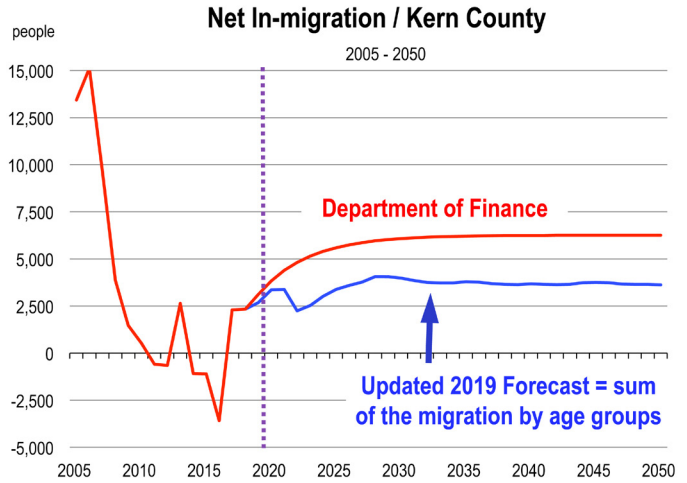
All of these influences drive the forecast of employment. Employment drives net migration. Together with the demographics of the current population, net migration impacts population growth, which ultimately influences the demand for housing. Housing then results in new households require improved transportation infrastructure to move between the workplace, schools, and home.

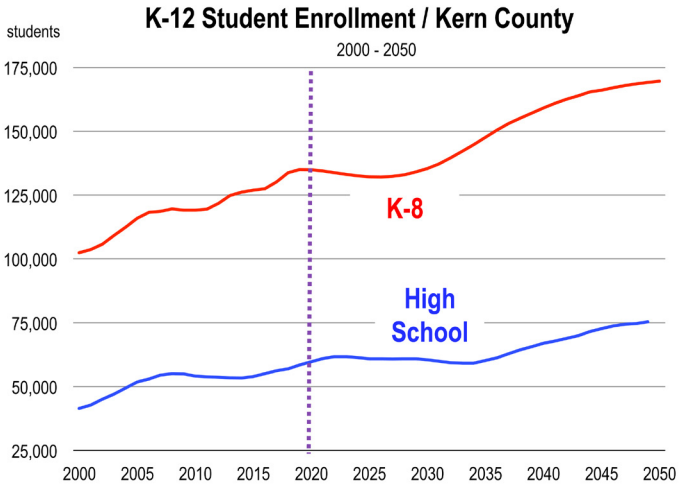
Growth Inducing Influences

Clearly, California's High Speed Rail will increase the likelihood for an acceleration in population growth in Kern County. This is especially true when the Bakersfield to Palmdale to Burbank line is completed, sometime between 2028 and 2032. Until then however, the forecast makes no presumption that this line will be completed by 2030, or how it exactly impact net in-migrating populations. Consequently, the incorporation of the High Speed Rail project on the growth prospects for Kern County is deferred to a later forecast update.

Energy projects have been especially important to the County's economy over the last 5 years. New solar and wind farms are increasing energy outputs for thousands of California homes. Not many jobs however are being created by these projects. However, these farms represent an increase in real estate asset values which increase property tax assessments, generating more school and general fund revenues.

Housing prices are forecast to remain competitive, meaning that more households will be able to become homeowners in Kern County compared to substantially higher housing cost areas in the coastal areas of California. While technology jobs are not as prolific





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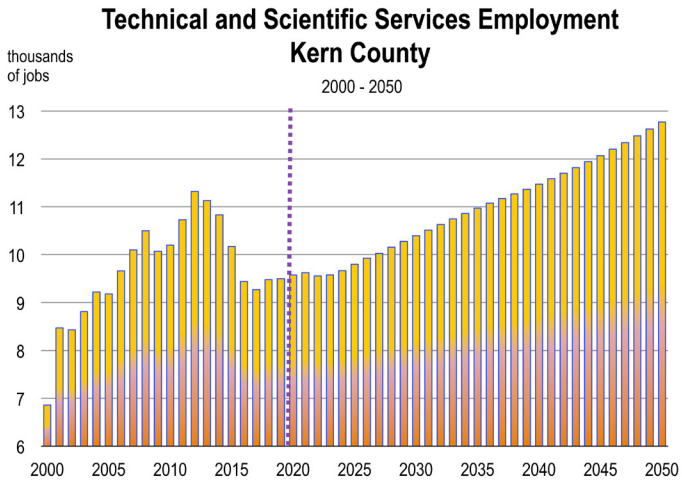
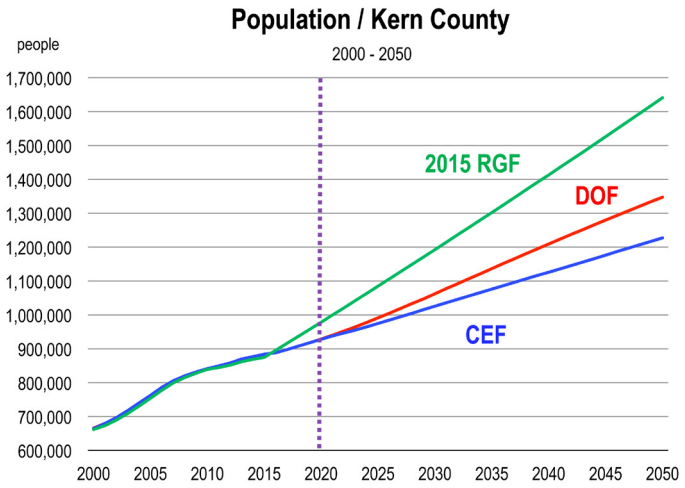




in the County today compared to the Bay Area and Los Angeles metro regions, professional and scientific service jobs are forecast to increase slowly over time. Currently, there are very high level tech jobs in the East County areas of Ridgecrest, California City, and Mojave. And these jobs will expand to support the missions at Mojave Airport, and military and NASA operations at China Lake Naval Air Station and Edwards Air Force Base.

Kern County Regional Growth Forecasts to 2050

Actual information through 2019 was used to produce a 31 year forecast to 2050.

Unlike previous forecast updates, most of the indicators were forecast from mathematical models based on local, state, and national economic factors. A macro model of the Kern County economy was used to produce many of the projections. The forecasts of the state and national indicators were taken from the UCLA Anderson Forecast which updates their projections four times per year.

The Kern Council of Governments will use these updated forecasts to support the next updates of the Regional Transportation Plan (RTP).

Population, Households and Employment

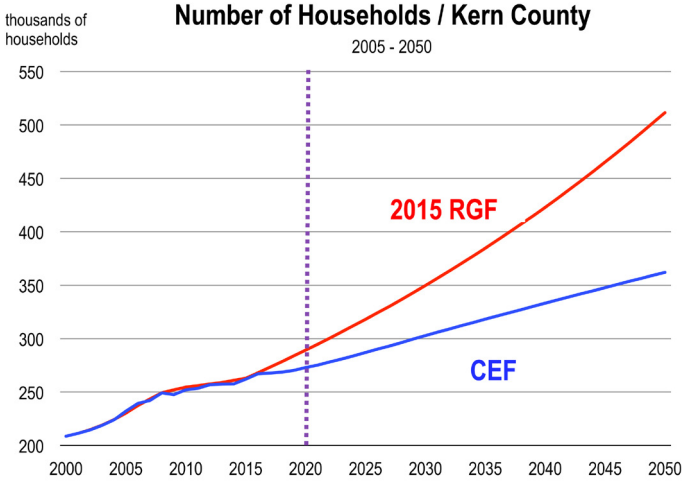
The new population forecast has been derived from the simple accounting identity:

Population this year = Population at the beginning of last year + Births during last year – Deaths during last year + net in-migration population during last year. We estimate the last three components of the identity using the Kern County econometric model. The resulting forecast is compared with two other forecasts for context.

The three plotted population curves above include the updated 2019 forecast (CEF) in blue, the most recent Department of Finance (DOF) forecast in red, and the last population forecast from the 2015 Regional Growth Forecast update (by Placeworks).

The development of the household forecast requires a forecast of new housing units. New housing development is therefore forecast along with vacancy rates for the single, multiple, and mobile home housing stock.[1] The new household forecast is compared with the previous RGF estimate from 2015.

Because population is significantly lower in the new 2019 forecast, the projection of the number of households is also correspondingly lower.



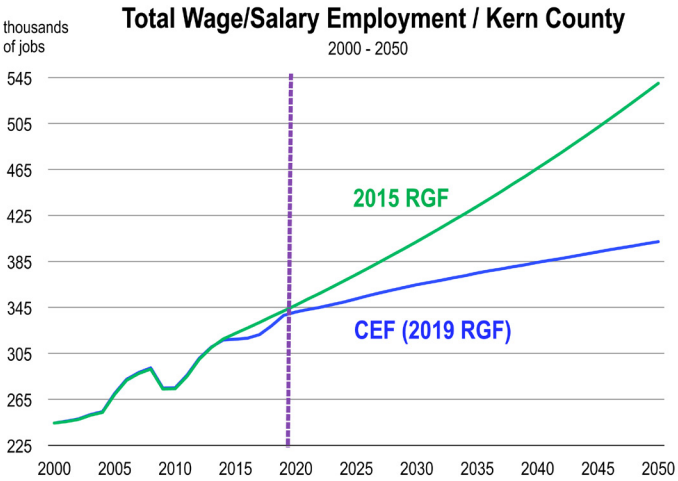
[1] All of these components are part of the long term econometric forecasting model for Kern County.

Executive Summary

The households forecast is based in large part on the forecast for housing stock in Kern County over the next 30 years (and to what extent the housing stock is occupied).

Housing stock is the sum of three principal housing types: single family units, multi-family units, and mobile homes. Total housing stock in the County is equal to the housing stock last year plus new homes permitted last year, and subsequently built, and completed this year. Units permitted are influenced by demand for housing, both purchase and rental, which is largely driven by population growth.

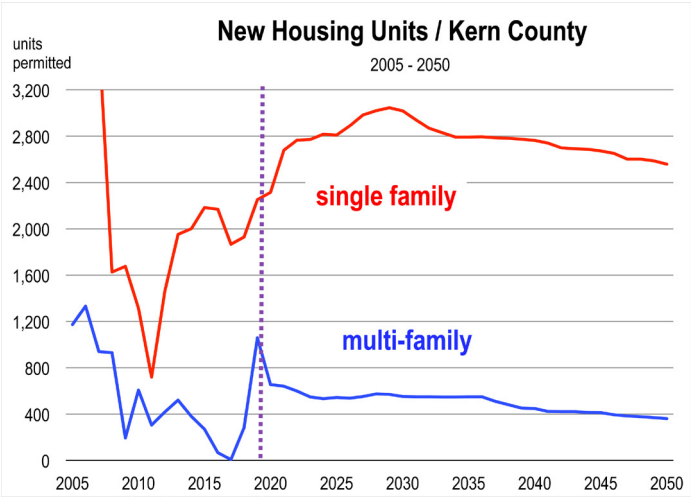
The updated forecast for total employment is the sum of the employment forecasts for each of the individual industries that describe the Kern County labor market. There are 20 sectors, and each is forecast using national, state, and local indicators that influence employment demand by sector in Kern County.



Summary

The 2019 update presents a more modest long term forecast of demographic and economic indicators for Kern County, compared to the 2015 forecast. The implication for this is not a downgrade of the potential for a vibrant and growing economy. Rather, it is an adjustment in the forecast.

The adjustment accounts for how the actual economic and demographic indicators moved during the 2015 to 2019 period, i.e., they were decidedly lower than the previous forecast levels for those years. This in turn lowered the forecast going forward. Furthermore, for the 2019 forecast, economic factors were taken into consideration for the development of net migration, housing units, and employment. The principal drivers of these indicators have also been revised lower at both the state and national levels as the economy matures and long term growth moderates.



Regional Growth Forecast
Kern County
2010 - 2050

Year	Population	Household Population	Number of Households	Employment
	---------- *people* ----------		---- *homes* ----	---- *jobs* ----
2010	841,189	800,300	252,200	275,000
2020	927,500	894,900	272,900	341,000
2030	1,025,700	994,000	302,800	364,700
2040	1,126,000	1,095,100	333,200	384,100
2050	1,227,200	1,199,800	362,100	402,200

Table of Contents

Regional Growth Forecast

Introduction

This report is an update of the 2015 Regional Growth Forecast for long-range socio-economic indicators pertaining to Kern County.

The forecast model draws principally from the stochastically derived forecasts of economic and demographic indicators comprising the California Economic Forecast macroeconomic model of Kern County. That model is used routinely to forecast the Kern County economy for the Department of Transportation.

The model was expanded to include the specific indicators needed by Kern COG for their Regional Transportation Plan update. The principal indicators for which forecasts were generated include the following:

- Population
- Household Population
- Group Quarters Population
- Population by ethnicity
- Population by age
- Number of Households
- Housing Stock by Housing type
- Households by Income category
- Average Household Size
- Vacancy rates by Housing Stock type
- Public School Enrollment
- Community College and Cal State Bakersfield enrollment
- Employment by Industry

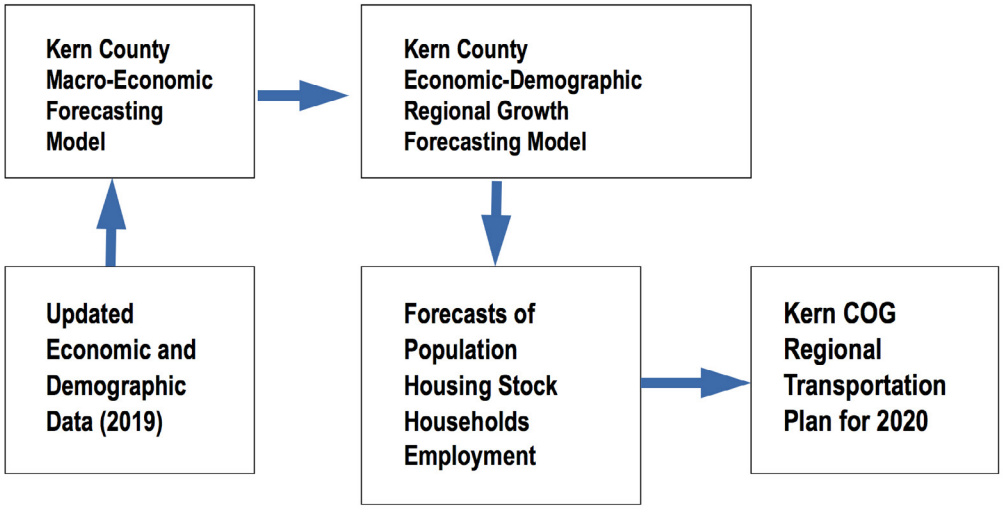
Forecasts to 2050

Actual information through 2019 was used to produce a 31 year forecast to 2050. Because the forecast was made in October 2019, complete data for the calendar year was not yet available; consequently, much of the data for 2019 was estimated based on monthly data to date, including employment and new housing units. Births, deaths and net migration were estimated based on trend. From The Department of Finance, their 2019 estimates of population, group quarters, housing stock, and number of households were used. Other information from the American Communities Survey was extrapolated to 2019.

Time series data for the demographic indicators and the Employment by 2 digit NAICS sectors was added to the macroeconomic forecasting model to produce many of the indicators necessary to construct the principal forecasts, including:

- Population
- Population by age and ethnicity
- Number of Households
- Housing Stock
- Households by Income Category
- School Enrollments
- Employment by Industry

The Kern Council of Governments will use these updated forecasts to support the next updates of the Regional Transportation Plan (RTP).



Regional Growth Forecast

The Forecast Model

Most of the Regional Growth Forecast series' were stochastically forecast in the Kern County Macro-Economic Model that has been used annually since 2001 to forecast economic (and demographic) indicators for the California Department of Transportation.[2]

The model was updated and expanded to include additional employment and demographic indicators requested by Kern COG.

The source for the exogenous forecasts of the state and nation is the UCLA Anderson Forecast for California and the U.S., September 2019.

The principal forecasts produced in the Kern County macro model were added to the Regional Growth Model in Excel. The population by age forecast and most of the summation operations are performed in the excel model where the complete 2000 to 2050 forecast of all indicators is presented.

Summary Evaluation of the 2019 Forecast Update

The 2019 forecast update presents a more modest long term forecast of demographic and economic indicators for Kern County, relative to the 2015 forecast. The implication for this is not necessarily a downgrade of the potential for a vibrant and growing economy. Rather, it is an adjustment in the forecast to seamlessly extend recent growing conditions the regional economy has demonstrated since 2015. It also incorporates longer run U.S. and California conditions as they would influence the Kern County economy.

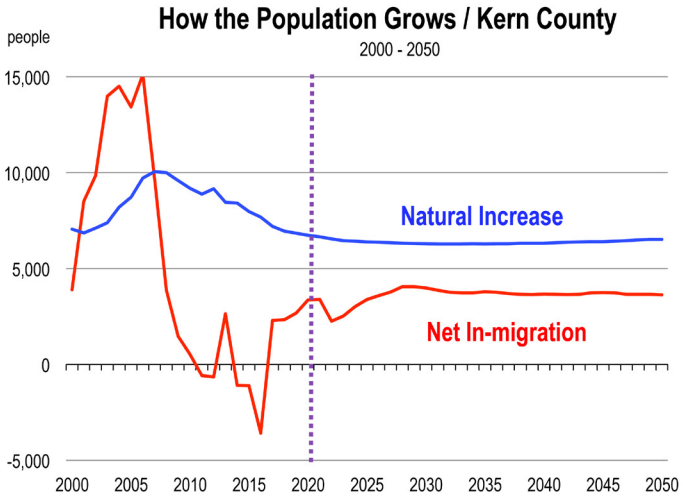
The Population Forecast

The determination of population is basically an accounting identity of the form:

$$Population(t) = Population(t-1)+Births(t)-Deaths(t)+NIP(t)$$

where NIP = net in-migration populations or Gross in-migrants less gross out-migrants.

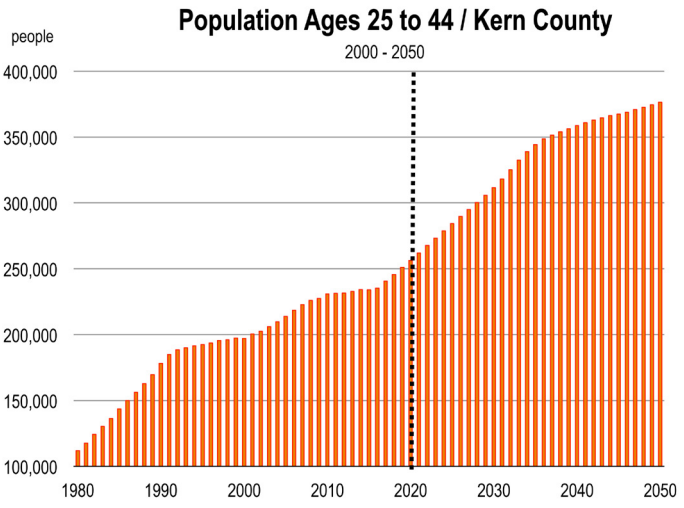
And where t = annual time



Net In-migration, a principal component of population growth, is not as important in Kern County as elsewhere in the Central Valley region to the north. The natural rate of population growth (births less deaths) dominates population change in the County, and the forecast maintains this relationship going forward, even over the longer term.

Births

The critical component in the economic model for forecasting births is the size of the fertile age population cohort. Ninety-five percent of all births occur to women between 20 and 45.[3]

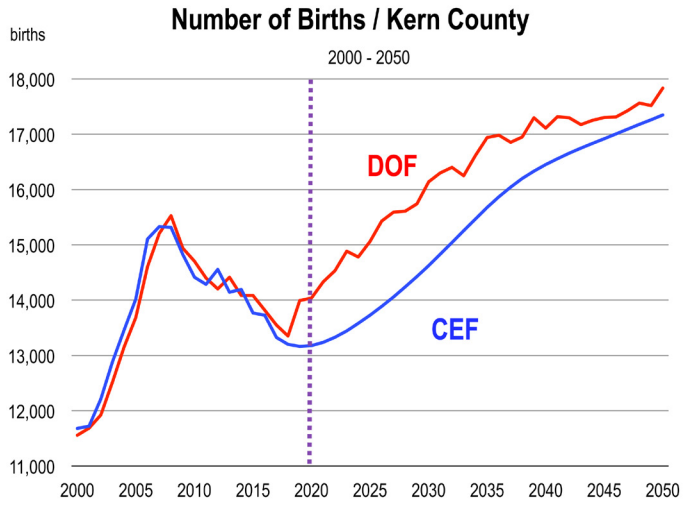


Source: Department of Finance 2019 estimates

[2] The last five years of annual forecasts can be viewed or downloaded from this site: https://dot.ca.gov/programs/transportation-planning/economics-data-management/transportation-economics/long-term-socio-economic-forecasts-by-county

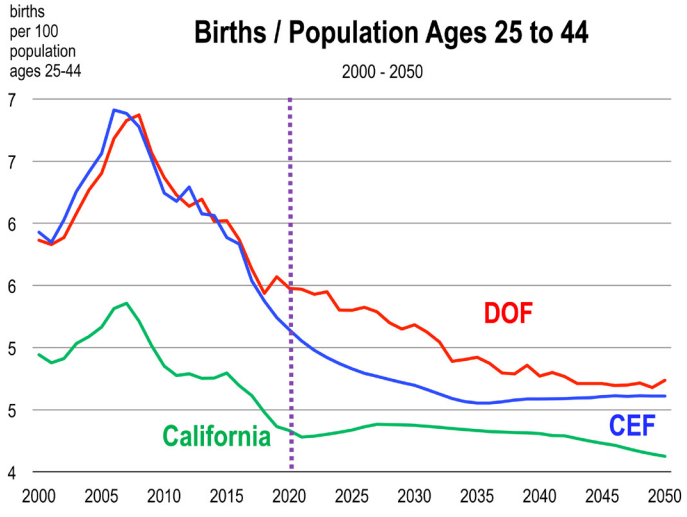
[3] See: https://kernpublichealth.com/wp-content/uploads/2015/08/Births-by-Mothers-Age_-2000-2013.pdf and https://data.chhs.ca.gov/dataset/births-by-age-of-mother

Regional Growth Forecast



Consequently, the convenient age cohorts in the forecasting model: 22 to 24 and 25 to 44 years old, represent the best predictors of births for the region.

The births forecast is generated from the regression equation that includes these population cohorts.[4] The blue line (CEF) is the 2019 updated forecast. The red line is the Department of Finance forecast of births for Kern County. The CEF forecast is lower and more consistent with the birth rate forecast for the entire state.



[4] The regression results are presented in Appendix A

Birth rate: Births per Population aged 25 to 44

year	Kern County CEF	California	Kern County DOF
2020	0.048	0.044	0.051
2021	0.047	0.044	0.051
2022	0.046	0.044	0.050
2023	0.045	0.044	0.050
2024	0.045	0.044	0.049
2025	0.045	0.044	0.049
2026	0.044	0.044	0.049
2027	0.044	0.044	0.049
2028	0.044	0.044	0.048
2029	0.043	0.044	0.048
2030	0.043	0.044	0.048

To see this, construct the ratio of the births forecast to the 25 to 44 year old (fertile age) population forecast. The resulting ratio in blue more closely aligns with the statewide forecast (black) than does the DOF forecast for Kern County (red).

Deaths

The forecast for deaths is generated from a log-liner regression equation that, interpreted, has the change in deaths driven by the change in the oldest age population cohort in Kern County. Seventy-five year olds and the adjustment factor explain 98 percent of the variation in the number of deaths. The resulting forecast is slightly higher than the DOF forecast.

$$Log(deaths) = c + b*log(age75+) + d*dum18on$$

where c, b, and d are the estimated coefficients or "weights."

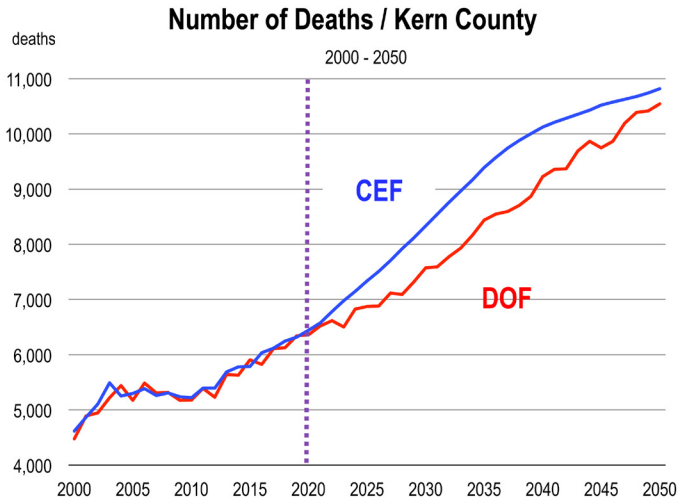
deaths = Kern county deaths,

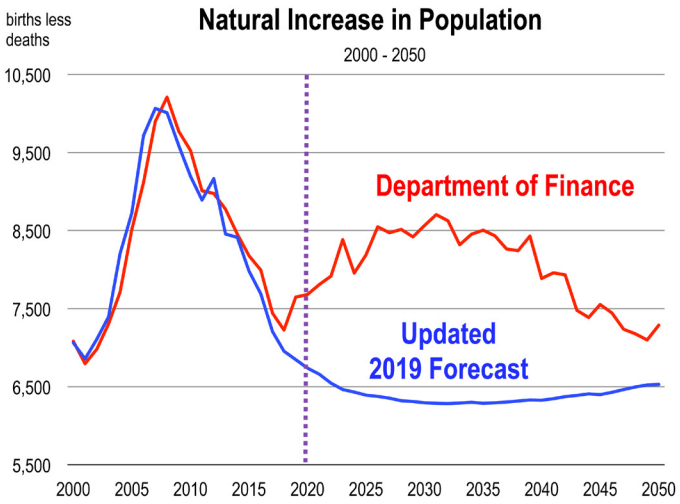
age75+ = Kern County aged population 75 and over

dum18on = add factor that adjusts the predicted values to match the actual in 2018 and 2019.[5]

[5] Ibid. See Appendix A.

Regional Growth Forecast





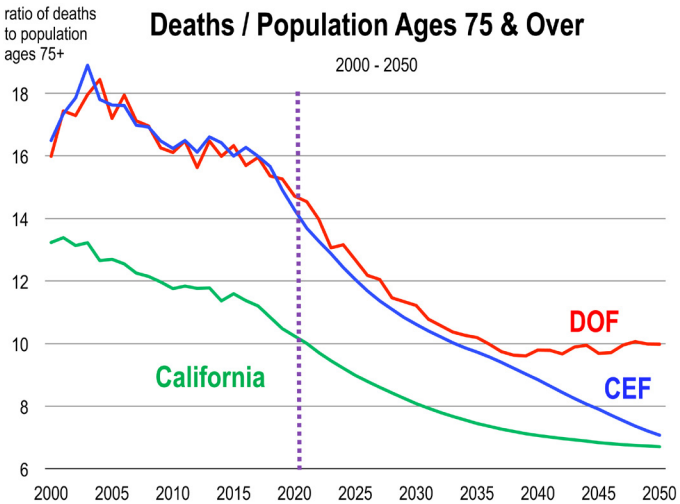
The forecast is more consistent with the forecast of the ratio of deaths to the 75 and over aged population for all of California. While both the CEF forecast and the statewide forecast (from UCLA) is the result of declining death rates for the 75+ population over time, the DOF forecast has a higher mortality rate for the 75 and over aged population in the outer years.

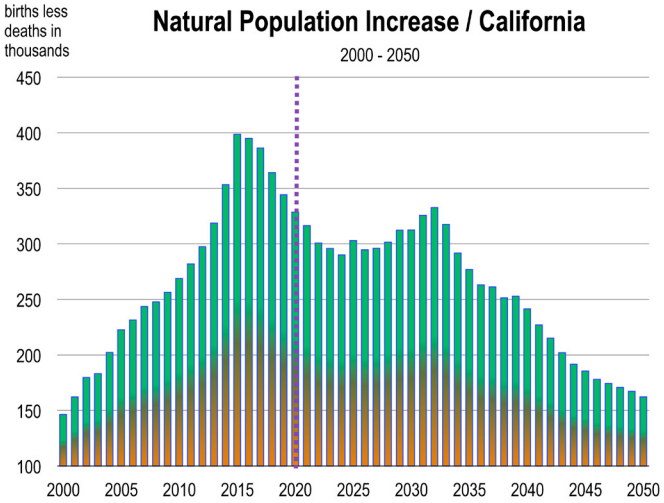
Natural Rate of Population Increase (births less deaths)

The DOF forecast has a lower rate of births and a lower rate of deaths. Our forecast has a higher rate of births and a higher rate of deaths. Based on these forecasts, the forecast for the natural increase in population is quite different.

The implied DOF forecast of the natural increase rises suddenly over time, peaking in 2032 and then declining. The CEF forecast continues the smooth trend that has been in place since 2008 reaching a minimum in 2035 and then rising due to a higher rate of deaths because of the rising elderly population. The CEF forecast is more consistent with the UCLA statewide forecast of the natural increase in population.

The principal explanation for the increase in the natural increase in Kern County from 2040 to 2050 is the faster growth of the 25 to 44 year old population, relative to the rest of California.





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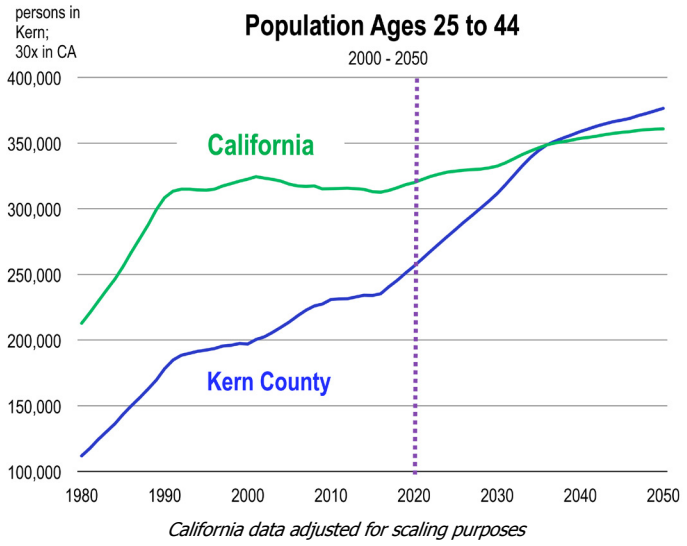
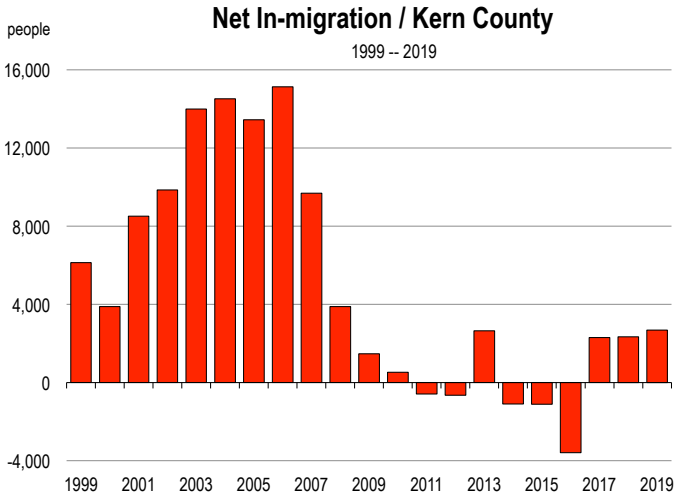
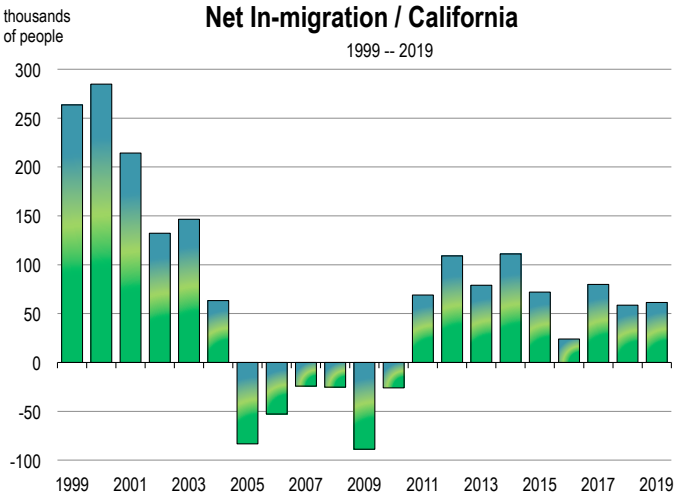


California data adjusted for scaling purposes





Net Migration

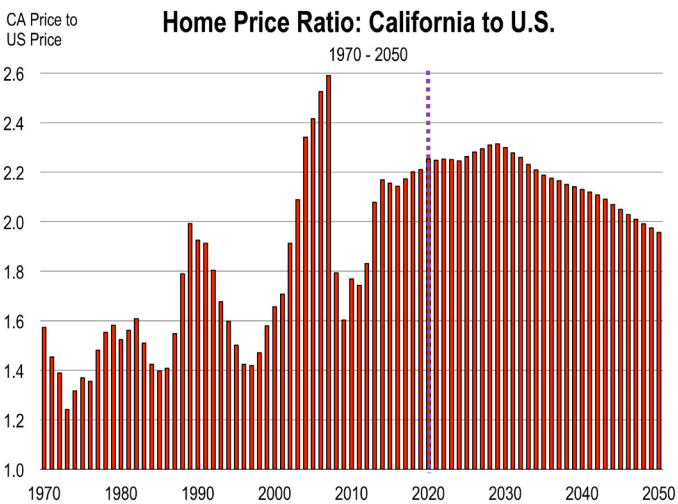
The DOF historical (actual) series of estimated net in-migration for Kern County has demonstrated diminishing numbers during the last 11 or 12 years.

Factors for Declining Net In-Migration

Even amidst an economic expansion that has created 3+ million jobs in California over the last 8 years, net in-migration in California has been relatively austere, and inconsistent with previous economic expansions that have attracted hundreds of thousands of net migrants to the state. Here are the principal factors that are responsible for the muted response of migration into the state.

<u>High home prices in California and rents for rental units</u>

This is not necessarily the case for Kern County but for the entire state. Median home selling prices in California are now 2.2 times the median home selling price for homes nationwide. Rents are twice as high in California versus the rest of the U.S. The lack of housing due to a lack of new construction is the principal reason for higher home prices in the state. This combined with non-trivial impact fees on housing by municipalities have created an environment where only 30 percent of households in California can afford the median priced home.[6]



[6] See https://www.car.org/en/aboutus/mediacenter/newsreleases/2019releases/2qtr2019affordability

Regional Growth Forecast

Oil prices

They declined sharply in 2014 which negatively impacted the crude oil extraction sector which is highly concentrated in Kern County. Job loss (more than 4,000 between 2013 and 2015) and out-migration accelerated as a result.

Higher costs and taxes

Over the last ten years, California voter referendums have resulted in higher state income taxes, higher gasoline taxes, and higher vehicle registration fees. Furthermore, there are higher electricity costs, worker's compensation costs and more rigorous compliance standards for air and water quality. And due to the 2012 to 2017 drought, there are substantially higher water costs now in place, for both residents and businesses.

With more regulations threatened on businesses in California by the state legislature, it is unlikely that net migration will materially increase as part of the forecast.

An aging population

Older populations don't move as much as younger populations.[7] Older populations are no longer motivated or compelled to relocate due to work opportunities or schools for their children relative to 18 to 45 year old populations. These later age cohorts are more often moving for job relocations or to afford housing or to raise their families.

The move to urban locations

Millennials (the largest population age cohort in the country) are principally showing preference for urban locations in California, due to the abundance of job opportunities that have been created during the strong economic expansion indicative of the 2014 to 2019 period in California and the nation.[8] Also, more rental housing is being built in urban centers like Los Angeles, San Francisco, San Jose, San Diego, Anaheim and Irvine, and Sacramento, and this has also been a principal attraction for Millennials.

Net migration by age

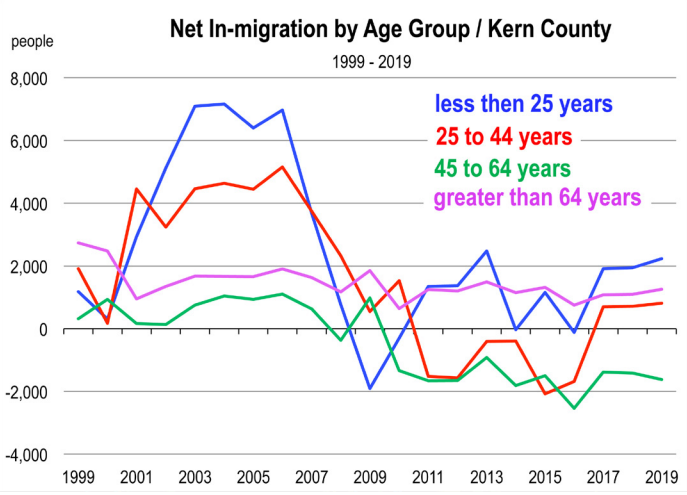
Net migration is categorized into 4 age cohorts with the intent of forecasting each series in the Kern County macro-econometric model.

The 4 age categories are:

- 0 to 24
- 25 to 44
- 45 to 64, and
- 65 and over[9]

The only positive in-migrant age groups are the under 24 and 65 and over. The 25 to 44 age group did produce positive in-migration for the 2017 to 2019 period, due principally to the growing job opportunities that increased in Kern County during those years.

Each age cohort series was modeled stochastically using causal factors from the regional economy.[10] The forecasts by age cohort show no departure from the recent trends in migration. There is a slight shift in the 65 and over age cohort. This population



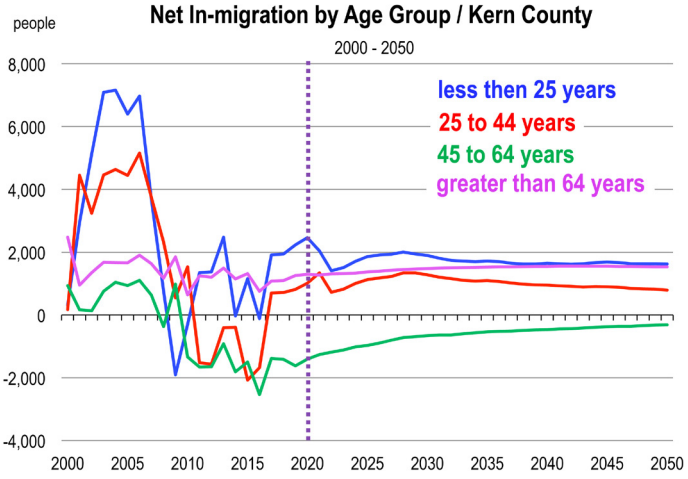
[7] See https://medium.com/migration-issues/who-migrates-part-i-young-educated-professionals-5f46cf2840d6

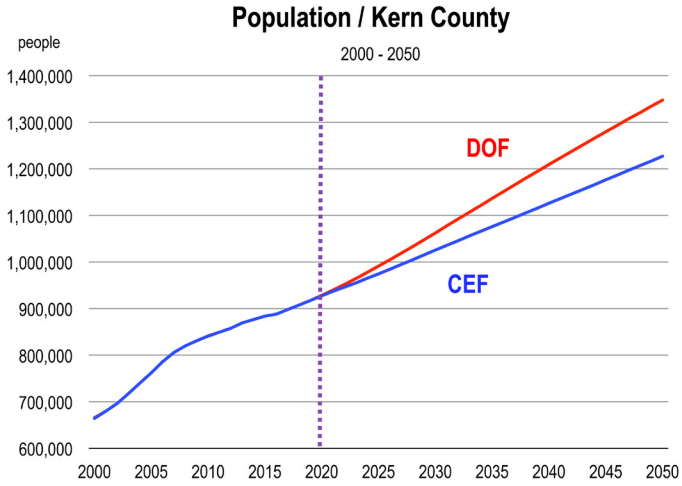
[8] See Lee, Lee and Shubho, "Urban revival by Millennials? Intrurban net migration patterns of young adults, 1980-2010, Journal of Regional Science, Volume 59, issue 3, June 2019 (https://onlinelibrary.wiley.com/doi/abs/10.1111/jors.12445)

[9] The derivation of the age cohorts for net in-migration is presented in Appendix B.

[10] The regression results are presented and explained in Appendix C

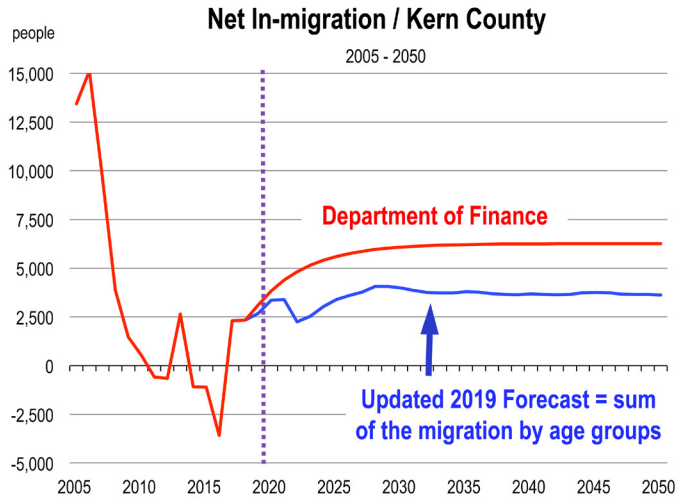
Regional Growth Forecast





is attracted to Kern County over the longer term forecast by the development of more housing and for the recreational opportunities that exist in the County. Anecdotally, with the advent of the high speed rail, the older age and all age cohorts will become more connected to larger population centers like Los Angeles for more diverse cultural activities.

Forecasts for the four categories were summed to produce a total net migration forecast for Kern County. It is presented below (in blue) along with the most recent Kern County forecast for net migration by the Department of Finance (in red).



The forecast shows that after rising in 2019 and 2020, the level of net in-migration in the following year or two declines, which is consistent with the economic cycle because the economy is expected to slow.

Net in-migration then picks up with the recovery and reaches the highest levels since the early 2000s. The DOF forecast is made irrespective of the business cycle and appears to be wildly optimistic.

Total Population

With all components of the population now forecast, the identity equation first presented on page 8 of this report can be solved.

The sum of births, net in-migration and the subtraction of deaths each year yields the following population forecast for the 2020 to 2050 time period.

Total Population 2015 - 2050							
2015	2020	2025	2030	2035	2040	2045	2050
883,799	927,500	974,600	1,025,700	1,076,000	1,126,000	1,176,400	1,227,200

Regional Growth Forecast

Dependent Variable: LOG(POPHISPANIC)
Method: Least Squares
Date: 10/26/19 Time: 17:10
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-16.84568	1.598826	-10.53628	0.0000
LOG(POPCAHISPANIC)	1.808049	0.097100	18.62043	0.0000
DUM18ON	-0.008971	0.019634	-0.456886	0.6559

R-squared	0.974501	Mean dependent var	12.94871
Adjusted R-squared	0.970251	S.D. dependent var	0.128706
S.E. of regression	0.022199	Akaike info criterion	-4.600670
Sum squared resid	0.005914	Schwarz criterion	-4.459060
Log likelihood	37.50503	F-statistic	229.3008
Durbin-Watson stat	2.170644	Prob(F-statistic)	0.000000

Population by Race

The components of race are Hispanic (mixed with any other race), and non-Hispanic White, Black, Asian, Pacific Islander, Native American and Other. The sum of seven categories equals the total population.

Hispanic Population

The Hispanic Population includes all Hispanics of origin, regardless of ethnicity.

The forecast of the Hispanic population was modeled from the Hispanic population in California, under the assumption that the growth of the Kern County Hispanic Population tracks the greater statewide growth in the Hispanic population. The actual data for the 1990 to 2019 period confirmed this assumption, as well as the statistical evidence.

The regression results indicate that the percentage change in the Hispanic population at the County level, LOG(POPHISPANIC) is strongly correlated with the percentage change in the Statewide Hispanic population, LOG(POPCAHISPANIC). The statewide Hispanic population growth explains 97.5 percent of the variation in Kern County Hispanic population growth.

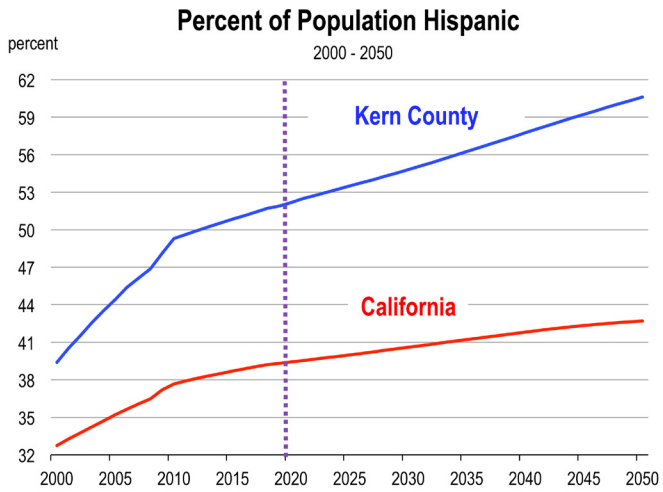
Consequently, the forecast for the Hispanic population mirrors the corresponding growth forecast of Hispanics for the entire State. Hispanic populations are forecast to continue rising but with diminishing growth in the concentration of the California population that is Hispanic.

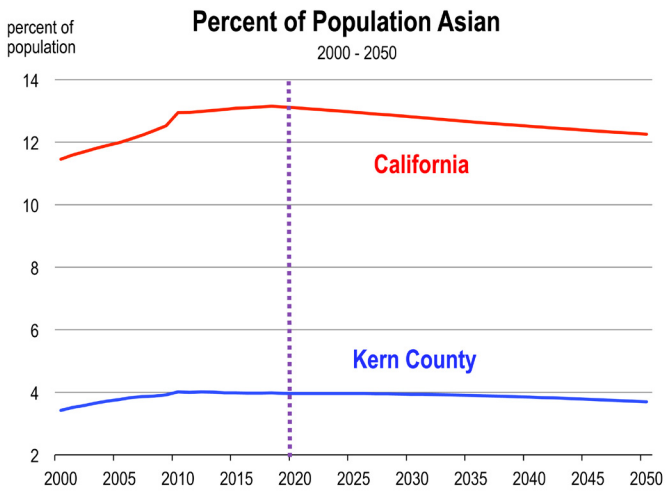
Regression analysis was used to model and forecast all other ethnicities: White, Black, Asian, Pacific Islander. Statistical tests confirmed that in all cases, Kern County ethnicity moves in tandem with Statewide ethnicity growth, except for White Non-Hispanic.

"Other ethnicity" was determined as a residual of the other 6 races. Forecasts were generated from the model for all races.

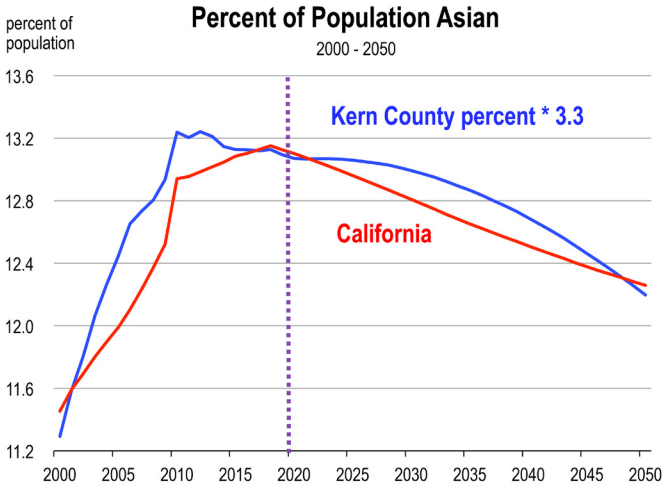
Pacific Islander and Asian

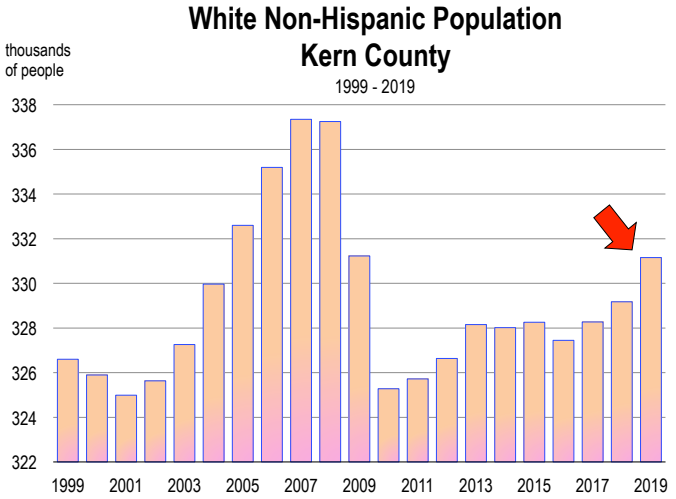
The Pacific Islander and Asian populations in Kern County move in lockstep with the broader statewide Pacific Islander and Asian population, respectively.





Regional Growth Forecast

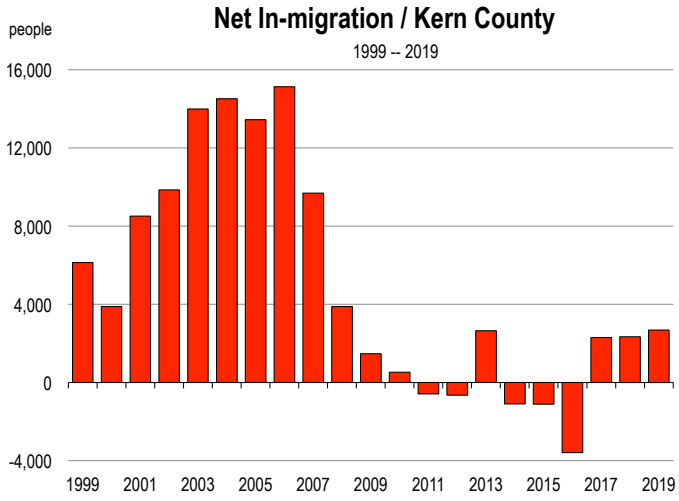


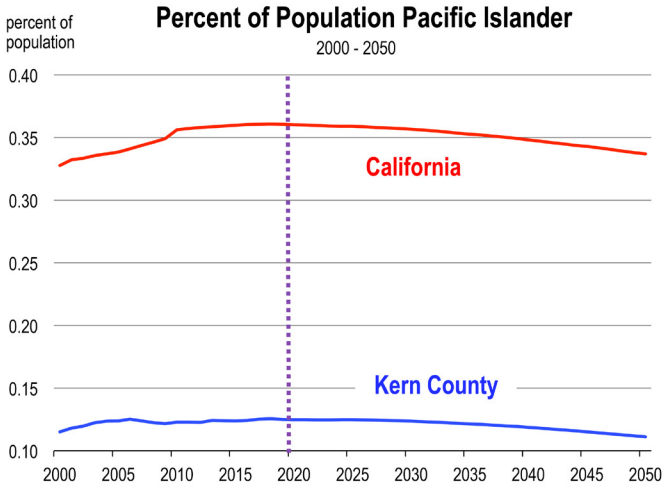


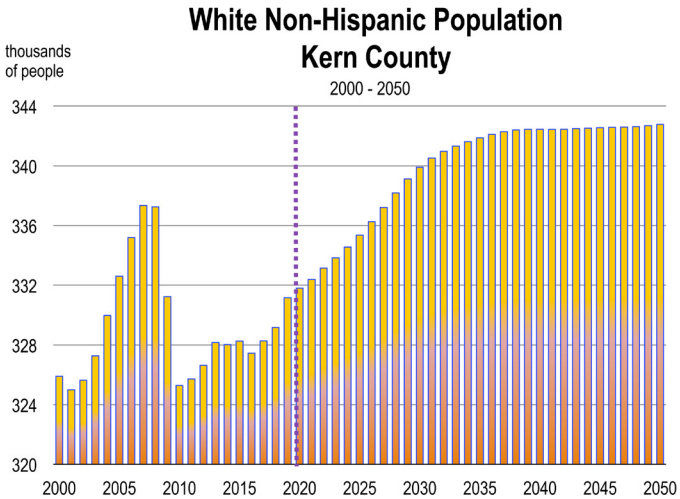
To see this with even greater clarity, multiply the Kern County Asian population data series by 3.3 and overlay the result with the California Asian population series (both expressed as a percent of total population). The result shows a very strong temporal correlation over the 19 year history and then, over the forecast.

White and Black (Non-Hispanic)

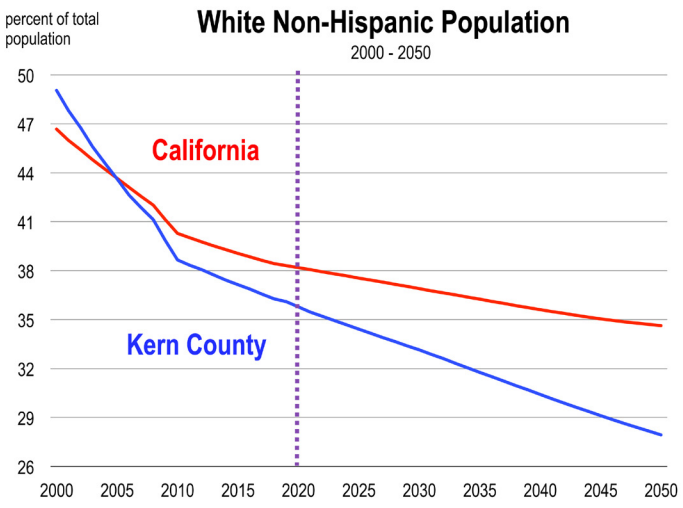
A surge in white population growth occurred in the early part of the century followed by an abrupt collapse and reversal of the population, seemingly due to the great recession of 2008-2009. During the recovery, the white population began to grow again and the 2019 estimate is the highest level of white non-Hispanic population in 10 years.







Regional Growth Forecast



Dependent Variable: POPINDIAN
Method: Least Squares
Date: 10/29/19 Time: 14:45
Sample (adjusted): 2000 2019
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-505.5110	561.1310	-0.900879	0.3819
POPWHITE	0.016799	0.001779	9.444109	0.0000
POPBLACK	0.022292	0.002689	8.290701	0.0000
DUM14ON	-53.20408	20.56429	-2.587208	0.0206
DUM18ON	-23.58926	24.19079	-0.975134	0.3450

R-squared	0.940830	Mean dependent var	6003.950
Adjusted R-squared	0.925051	S.D. dependent var	100.5137
S.E. of regression	27.51748	Akaike info criterion	9.679838
Sum squared resid	11358.18	Schwarz criterion	9.928771
Log likelihood	-91.79838	F-statistic	59.62623
Durbin-Watson stat	1.798065	Prob(F-statistic)	0.000000

White population moves closely with overall net in-migrating population, implying that much of the out-migration during the economic slump was principally white. Other factors were tested that would explain the further variation in the white population which declined sharply in 2009. Statistically important factors which validate known white flight during the recession included the unemployment rate to capture the slack in jobs, and the run-up in home prices (inflation adjusted) in California.[11]

American Indian and Other Non-Hispanic Population

It was found that the Native American or "American Indian" population moved with both the white and black non-Hispanic populations in Kern County. The correlation with white and black population over time was surprisingly strong.[12]

The variance in multi-race non-Hispanic population or "Other Ethnicity" over time was explained by the broader statewide "Other Ethnicity" series. The functional form of the equation was in natural logs to create a semi-log specification that enabled the seven ethnicities to sum to the total Population forecast which was derived previously as an accounting identity from Births, Deaths, and Net In-migration.

Population by Race
Kern County 2010 - 2050

Year	White	Black	Asian	Islander	Indian	Hispanic	Other
2010	325,279	45,867	33,745	1,020	5,967	414,650	15,048
2011	325,719	46,077	33,995	1,033	5,988	421,549	15,256
2012	326,635	46,011	34,425	1,041	6,005	428,297	15,527
2013	328,154	46,658	34,804	1,065	6,031	436,778	15,869
2014	328,017	47,461	34,928	1,077	6,025	443,128	16,090
2015	328,258	47,595	35,156	1,085	6,020	449,316	16,369
2016	327,447	47,691	35,327	1,098	6,005	454,085	16,555
2017	328,271	48,393	35,700	1,111	6,016	461,618	16,840
2018	329,175	48,619	36,101	1,127	6,028	469,258	17,210
2019	331,156	49,300	36,404	1,134	6,083	476,000	17,558
2020	331,808	49,850	36,739	1,145	6,103	483,981	17,902
2021	332,391	50,383	37,128	1,157	6,125	492,176	18,211
2022	333,153	50,901	37,480	1,169	6,149	499,000	18,519
2023	333,839	51,466	37,833	1,180	6,173	506,084	18,786
2024	334,553	52,048	38,199	1,191	6,198	513,587	19,037
2025	335,353	52,614	38,568	1,203	6,224	521,342	19,285
2026	336,257	53,196	38,934	1,214	6,252	529,173	19,536
2027	337,214	53,746	39,308	1,224	6,281	537,137	19,778
2028	338,186	54,279	39,681	1,235	6,309	545,367	20,012
2029	339,117	54,796	40,039	1,245	6,336	553,670	20,236
2030	339,908	55,314	40,386	1,255	6,361	562,050	20,448
2031	340,521	55,815	40,719	1,264	6,382	570,524	20,649
2032	340,972	56,316	41,042	1,272	6,401	579,073	20,838
2033	341,325	56,818	41,350	1,280	6,418	587,735	21,016
2034	341,619	57,303	41,654	1,287	6,434	596,489	21,185
2035	341,874	57,788	41,955	1,294	6,449	605,336	21,352
2036	342,109	58,257	42,244	1,302	6,463	614,224	21,512
2037	342,289	58,709	42,521	1,308	6,477	623,139	21,663
2038	342,407	59,162	42,792	1,314	6,489	632,101	21,809
2039	342,453	59,599	43,054	1,320	6,499	641,160	21,953
2040	342,457	60,019	43,303	1,324	6,509	650,334	22,095
2041	342,443	60,424	43,543	1,328	6,517	659,557	22,228
2042	342,458	60,828	43,777	1,332	6,527	668,768	22,363
2043	342,493	61,249	44,005	1,336	6,537	677,991	22,493
2044	342,527	61,653	44,218	1,339	6,546	687,342	22,625
2045	342,555	62,057	44,426	1,343	6,556	696,710	22,758
2046	342,584	62,445	44,631	1,345	6,565	706,106	22,892
2047	342,603	62,817	44,830	1,347	6,573	715,496	23,027
2048	342,630	63,189	45,014	1,348	6,582	724,921	23,164
2049	342,695	63,545	45,190	1,349	6,591	734,353	23,303
2050	342,777	63,885	45,357	1,352	6,600	743,777	23,440

[11] The great recession created massive job loss and out-migration from California as a result. The decline in the white population in Kern County is indicative of the decline observed elsewhere in California. The return of white populations to California also mirrors this ethnicity's same return to Kern County. See Appendix D for further discussion.

[12] The overall fit of the regression was 94 percent. The Durbin Watson statistic did not suggest the existence of specification error. Consequently we are confident of this relationship over the 2000 to 2019 actual period and recommend that it be used for future forecast updates.

Regional Growth Forecast

Population by Age

Forecasts of population by age were developed as identities in the following form, with the 0-4 age group used as an example:

Age04(t) = Age04(t-1) – Age4(t-1) + Births(t) – Deaths04(t) + NP04(t)

where:

Age04 = Population aged 0 to 4

Age4 = Population age 4

Deaths04 = deaths of residents aged 0 to 4

NP04 = Net In-migrating population aged 0 to 4

t = annual time

Births, total countywide deaths, and net migration by age were determined in the Kern County Econometric Model (and explained previously).

To estimate population by single age year during the 2020-2050 period (e.g. the number of residents age 4), it was assumed that there was an equal distribution of residents across all age years. For example, it was assumed that residents age 4 represented 1/5 of all residents aged 0-4, and that residents age 64 represented 1/10 of all residents aged 55 to 64.

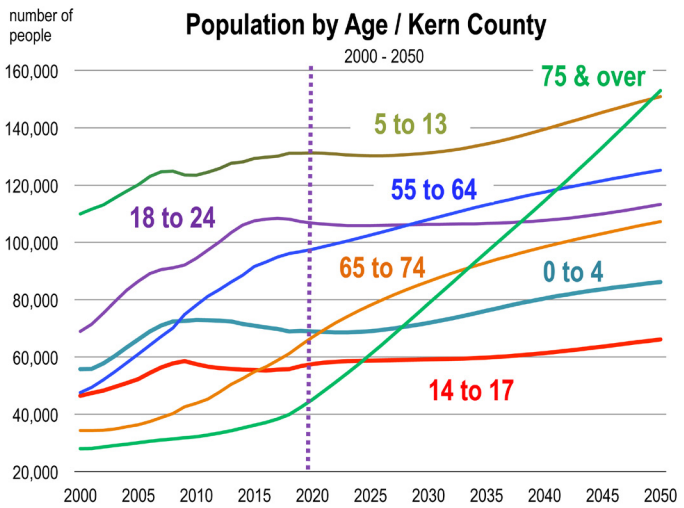
The same assumptions were used to allocate net migration by age. The Kern County Econometric Model produced forecasts of net migration by age for the following categories:

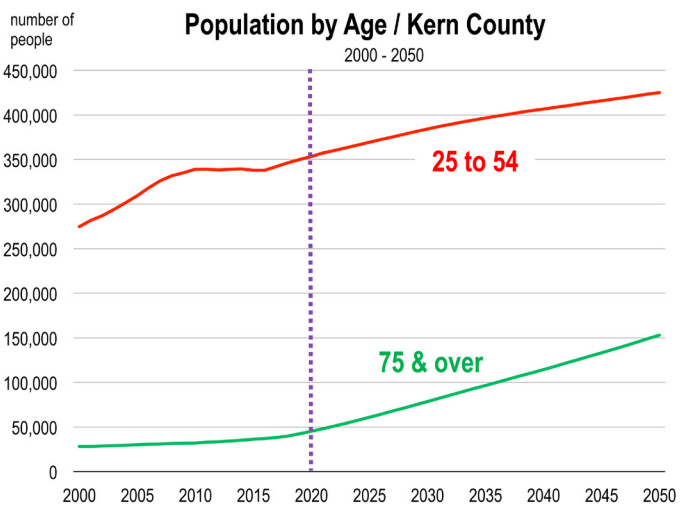
- Age 0 to 24
- Age 25 to 44
- Age 45 to 64
- Age 65 and over

It was then assumed that net migration of residents aged 0 to 4 accounted for 1/5 of all net migration in the 0–24 age group, and that net migration of residents age 55 to 64 accounted for 1/2 of all net migration in the 45-64 age group.

Deaths by age group were determined by allocating the forecast of total deaths to various age groups. This allocation followed the U.S. share of deaths for each age category in 2017, as reported by the Centers for Disease Control and Prevention.

The resulting forecasts are shown in the accompanying two charts. All age groups except the largest, the 25 to 54 year old population are presented in the first chart. The 2nd chart shows the 25 to 54 population along with a repeat of the 75 and above age group for reference.





Regional Growth Forecast

Population by Age
Kern County 2010 - 2050

Year	Age 0 to 4	Age 5 to 13	Age 14 to 17	Age 18 to 24	Age 25 to 54	Age 55 to 64	Age 65 to 74	Age 75 and over
2010	72,941	123,480	57,483	94,459	339,201	78,071	43,793	32,148
2011	72,846	124,454	56,589	97,341	339,150	81,209	45,303	32,725
2012	72,628	125,811	56,099	100,215	338,431	83,540	47,765	33,452
2013	72,428	127,668	55,858	103,423	339,160	86,123	50,448	34,251
2014	71,505	128,093	55,559	106,019	339,426	88,499	52,418	35,207
2015	70,919	129,303	55,508	107,525	338,090	91,518	54,748	36,188
2016	70,255	129,678	55,203	108,121	338,152	93,136	56,553	37,110
2017	69,754	130,051	55,568	108,373	342,290	94,865	58,766	38,282
2018	68,884	131,080	55,784	108,126	346,524	96,112	61,129	39,879
2019	69,057	131,089	56,752	107,216	350,014	96,776	64,140	42,386
2020	68,874	131,213	57,515	106,741	353,554	97,587	66,910	45,134
2021	68,700	131,137	58,034	106,406	357,297	98,496	69,458	48,042
2022	68,523	130,805	58,314	106,071	360,277	99,466	71,827	51,089
2023	68,518	130,512	58,502	105,881	363,230	100,455	74,030	54,233
2024	68,687	130,321	58,642	105,820	366,274	101,480	76,095	57,492
2025	69,001	130,240	58,751	105,844	369,349	102,515	78,041	60,850
2026	69,423	130,250	58,831	105,906	372,404	103,574	79,880	64,295
2027	69,933	130,351	58,896	105,984	375,439	104,660	81,622	67,802
2028	70,533	130,567	58,966	106,085	378,528	105,764	83,276	71,348
2029	71,191	130,858	59,034	106,173	381,532	106,864	84,854	74,933
2030	71,904	131,230	59,108	106,249	384,388	107,952	86,360	78,532
2031	72,660	131,671	59,191	106,307	387,083	109,022	87,799	82,141
2032	73,459	132,188	59,291	106,356	389,637	110,060	89,176	85,748
2033	74,307	132,801	59,420	106,417	392,066	111,084	90,493	89,351
2034	75,194	133,509	59,581	106,495	394,403	112,085	91,756	92,947
2035	76,113	134,320	59,783	106,605	396,683	113,065	92,965	96,515
2036	77,037	135,218	60,022	106,745	398,870	114,015	94,128	100,076
2037	77,941	136,185	60,292	106,909	400,958	114,935	95,248	103,637
2038	78,811	137,216	60,599	107,111	402,956	115,834	96,331	107,216
2039	79,640	138,304	60,943	107,358	404,890	116,706	97,380	110,817
2040	80,426	139,446	61,325	107,662	406,790	117,553	98,397	114,441
2041	81,159	140,613	61,736	108,013	408,647	118,380	99,386	118,107
2042	81,839	141,791	62,172	108,413	410,479	119,188	100,350	121,821
2043	82,478	142,981	62,632	108,869	412,291	119,981	101,289	125,581
2044	83,086	144,181	63,116	109,386	414,133	120,763	102,203	129,382
2045	83,657	145,372	63,613	109,951	415,983	121,528	103,091	133,208
2046	84,195	146,541	64,117	110,557	417,838	122,280	103,959	137,081
2047	84,705	147,674	64,619	111,192	419,678	123,018	104,807	141,002
2048	85,198	148,782	65,120	111,860	421,539	123,749	105,635	144,966
2049	85,678	149,865	65,619	112,557	423,426	124,472	106,444	148,967
2050	86,147	150,922	66,113	113,278	425,324	125,185	107,233	152,987

Group Quarters and Household Population

Group Quarters (GQ) population data is extracted from the Department of Finance estimates of Population in their annual E-5 Series. Group Quarters population refers to persons who, under care or custody, stay in a group living arrangement that is managed by or owned by an organization. Group quarter arrangements include correctional facilities (e.g., prisons, detention centers, halfway houses), care facilities (e.g., nursing homes, hospice, residential schools for people with disabilities), student housing, military quarters, and other non-institutional facilities (e.g., homeless shelters, group homes, residential treatment facilities). Note: The GQ population is not projected for each jurisdiction rather a proportion of the statewide GQ projection is distributed across jurisdictions.

Group Quarters in Kern County

In 2019, a total of 32,414 people were in group quarters, representing a scant 3.5 percent of the total Kern County population.[13]

There are 565 students residing in the dormitories at Cal State Bakersfield.[14]

There is unaccompanied military housing at China Lake NAS and though the extent of it is unknown, discussions with military personnel at China Lake indicated a total barracks population of less than 500.

The permanent party UH campus at Edwards AFB consists of 136 one-plus-one-configured rooms in eight dormitories and 185 rooms in three dormitories. Total military in group quarters barracks is also about 500 military personnel.

Prison Populations **October 2019**

Facility	Capacity	Actual population
California Correctional Institute	2,783	3,779
Wasco State Prison	3,190	4,825
North Kern State Prison Delano	2,694	4,317
Kern Valley State Prison Delano	2,448	3,554
Taft Modified Community Correctional Facility	600	600
Delano Modified Community Correctional Facility	640	640
Shaft Modified Community Correctional Facility	578	578
Kern County Detentions Bureau (Sherrif's Office)	2,500	2,500
Lerdo Justice Facility	824	824
Lerdo Maximum-Medium Facility	408	408
Kern County Crossroads Juvenile Hall	120	120
Kern County Juvenile Hall	108	108
Total	**16,893**	**22,253**

Source: Bureau of Prisons, Facility websites

[13] Report E-5, 2019, Department of Finance, Population Research Unit

[14] CSUB has eight dormitory buildings. Student Housing East has 500 beds. Student Housing West has 80 beds. The latter is currently not in use, pending needed maintenance. See https://www.bakersfield.com/news/csub-is-reducing-on-campus-housing-rates-next-year-but/article_47c5d5c8-613f-11e9-a277-d7538aa05db1.htm

Regional Growth Forecast

And that is the extent of the non-institutionalized group quarters for which there is actual and anecdotal evidence. The ACS information provides us with one data point, estimating that institutionalized group quarters populations account for over 99 percent of the total group quarters population in Kern County.

Prisons in Kern County comprise the majority of the Group Quarters (institutionalized) population.[15]

Consequently, a forecast of the group quarters population for Kern County should rely on the forecast for the incarcerated population in the County. Statistical testing revealed that the County's inmate population was strongly correlated with the nation's total incarcerated population. The balance of the group quarters population would include convalescent homes for the elderly, half-way houses, homeless shelters, and residential care facilities.

The equation used to forecast group quarters population is:

popgq = a + b*log(age1821) + c*log(age2029) + d*log(age75) + e*zprisoners

where:

popgq = group quarters population

age1821=age cohort 18 to 21, Kern County

age2029 = age cohort 20 to 29, Kern County

age75 = age cohort 75 and over, Kern County

zprisoners = total incarcerated population, U.S.[16]

a = estimated constant parameter value (intercept of the line), and

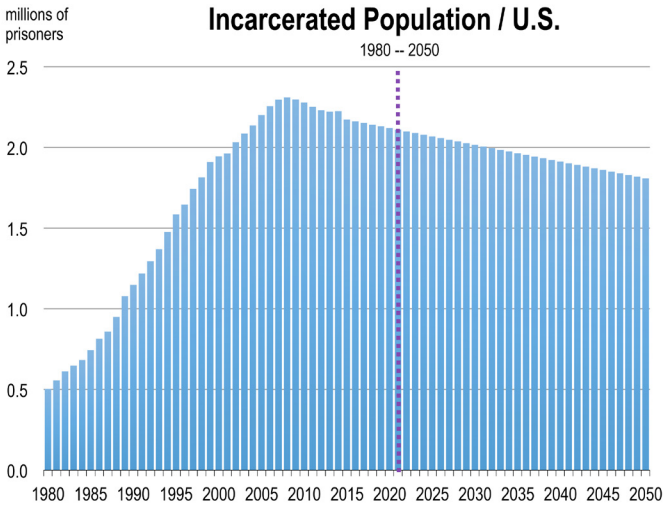
b, c, d, e are the estimated slope parameter values in the regression equation

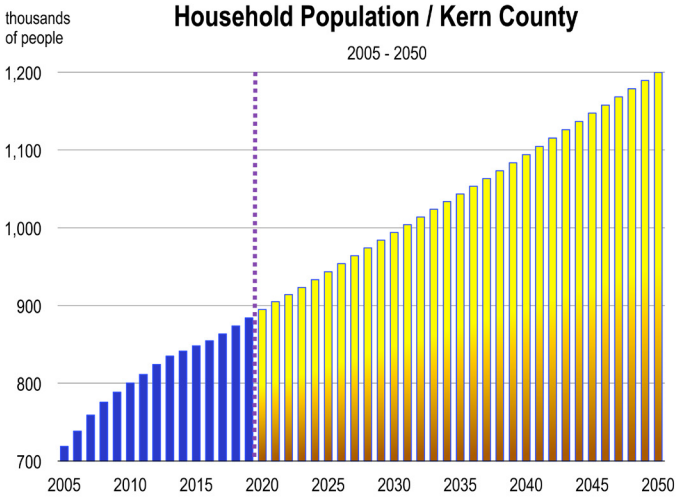
Household Population

Total Population = Household population + Group quarters population

Therefore:

Household population = Total population – Group quarters population



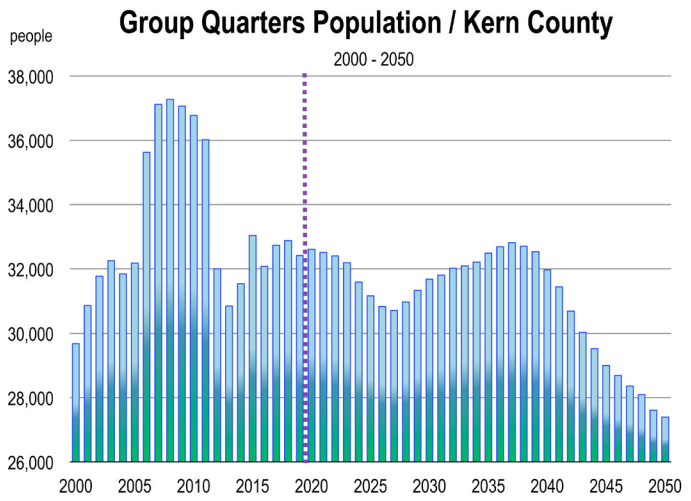


Household Population 2015 - 2050							
2015	2020	2025	2030	2035	2040	2045	2050
848,126	894,900	943,400	994,000	1,043,500	1,094,000	1,147,400	1,199,800

[15] Prison report on population by facility in California: https://www.cdcr.ca.gov/research/wp-content/uploads/sites/174/2019/10/Tpop1d191016.pdf?label=View%20Weekly%20Report%20(Wednesday%20Reporting%20Date)&from=https://www.cdcr.ca.gov/research/population-reports-2/

[16] See Department of Justice population statistics. Also see: https://apps.urban.org/features/prison-population-forecaster/

Regional Growth Forecast



The surge in group quarters population after 2006 occurred in tandem with increased incarceration rates throughout the United States. However, following the Great Recession, both incarcerations and group quarters population in Kern County have generally moved lower. The forecast reflects the lower DOJ forecast of nation-wide incarcerations over time, and the rise in the 20 to 29 age population cohort (now with a much lower incarceration rate than other age groups) in Kern County.

Housing Stock and Households by Type (Single Family, Multiple Family, and Mobile Homes)

The housing stock forecast is an identity of the form:

$$HS(t) = HS(t-1)+SFU(t-1)+ MFU(t-1) +MHU(t) – D(t)$$

Where:

HS = total housing stock in year t

SFU = single family units permitted

MFU = multi-family units permitted

MHU = new mobile home units parked

D = demolitions

t = annual time

Single Family Units

Single family units are new detached homes. They are monitored by data from permits issued for their construction by the municipality in which they are located. Usually the building time between permit issuance and completion of the unit is one year. Consequently, we approximate total housing stock over time with the addition of permits issued for single (and multiple) family homes one year prior. While there may be error on an annual basis with the precise number of homes representing the housing stock, over a 5 year period, much of the year to year variation will be offset.

Multi-Family Units

Multiple family units are group homes or apartment units, typically of 4 units or more. In California, MFUs today are typically apartments. They are recorded from permits issued for their construction and add directly to housing stock.

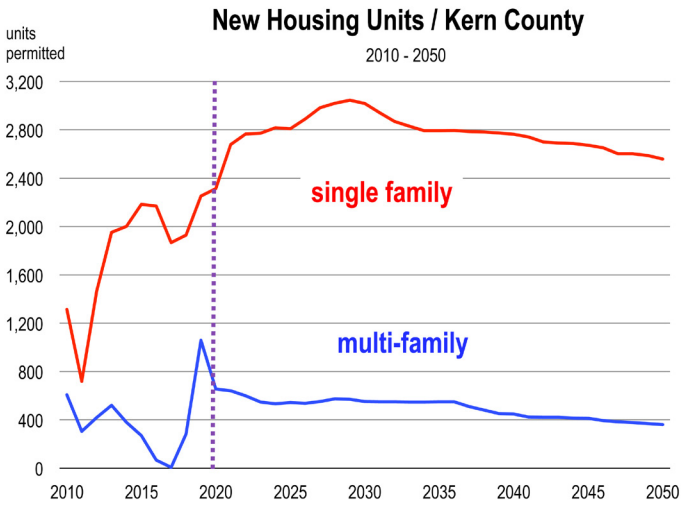
Housing Stock

The housing stock is the total of all housing units in the County, not including group quarters.

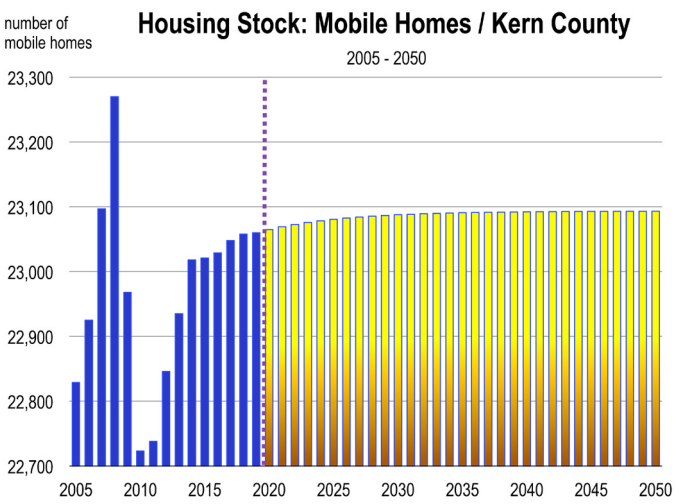
Housing consists of single family homes, multi-family homes (apartments), and mobile or manufactured homes.

The sum of these three types of housing units is equal to the total housing stock.

Data on demolitions is absent the county level database. Demolitions are generally negligible relative to the size of the existing and new housing stock.



Regional Growth Forecast



Housing Stock by Type of Household

Total Housing Stock, HS = HSSF + HSMF + HSMH

Total housing stock (HS) is the sum of singe family, multi-family and mobile home housing stock in Kern County:

HSSF = HSSF(t-1) + SFU(t-1)

HSMF = HSMF(t-1_+ MFU(t-1)

HSMH = f(HSMH(t-1))

The first two equations are identities. Housing stock this year is equal to the housing stock last year plus new units permitted last year (and presumably completed this year and added to the stock of available housing for rent or sale). This is the case for both single family and multi-family units.

SFU = single family units authorized through the entitlement process

MFU = multi-family units authorized through the entitlement process

Both of these series are forecast in the Kern County econometric model. Their forecasts are presented here.

The variation in mobile homes is more uncertain. The stock of mobile homes rose to a peak in the mid-1990s but declined sharply through 2003. A surge in mobile homes occurred during the rush to build housing in mid-2000 to meet housing demand induced largely by an easy financing environment that ultimately led to the bursting of the housing bubble.

The stock of mobile homes declined sharply in tandem with the ensuing recession and home foreclosures. It then recovered starting in 2012. The inventory of mobile homes has now leveled off. An autoregressive model was specified for the mobile home series to extrapolate the minimal growth in mobile homes observed from 2014 to 2019, over the forecast.

Households

A household consists of one (or more) people who live in the same dwelling and share meals. It may also consist of a single family or another group of people. A household therefore represents an occupied housing unit. The sum of all occupied housing units is therefore the total number of households. Unoccupied housing stock is vacant and can be calculated as:

Housing stock * vacancy rate

Households are therefore equal to:

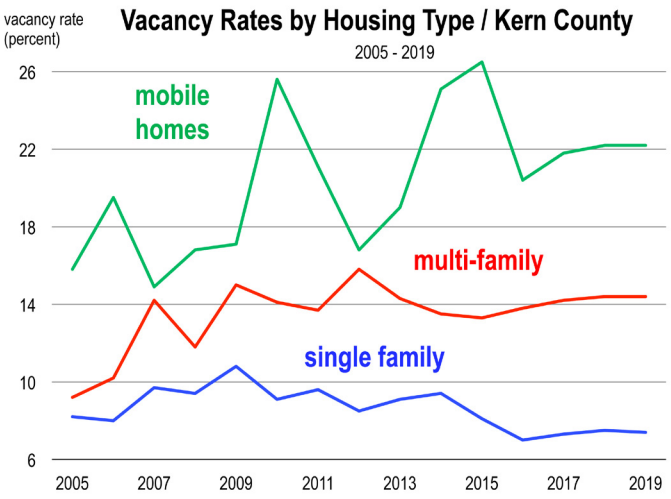
Housing stock * (1-vacancy rate)

If the housing stock and the vacancy rate are known, the total number of households can be derived.

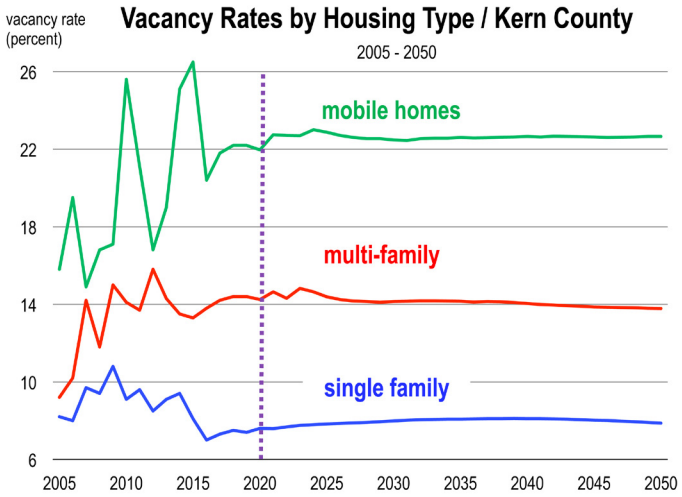
The number of households would be equal to the housing stock if all of the stock was occupied. Clearly however, there are vacancies in the housing stock.

Vacancy rates for the housing stock in Kern County are calculated from the 2019 updates of the American Communities Survey, and are applied to the single family, multi-family, and mobile home housing stock separately.

To derive households by each category of housing stock, a vacancy factor for the particular type of housing stock is applied.



Regional Growth Forecast



One minus the vacancy rate multiplied by housing stock yields occupied housing. And occupied housing in the single, multi, and mobile home categories has a head of household.

Vacancy rate factors were obtained from the American Communities Survey. The following are the vacancy rates for the three categories of housing stock.

Vacancy rates were forecast using the broader countywide forecast of vacancy associated with all housing. That series, from the Department of Finance, was forecast based on new housing units permitted, job growth, and the extent of population growth through net migration.

Total Households 2015 - 2050							
2015	2020	2025	2030	2035	2040	2045	2050
262,008	272,900	287,000	302,800	318,200	333,200	347,800	362,100

Households by type of housing can be determined from the following accounting equations:

HHSF = HSSF*(1-VRSF)

HHMF = HSMF*(1-VRMF)

HHMH = HSMH*(1-VRMH)

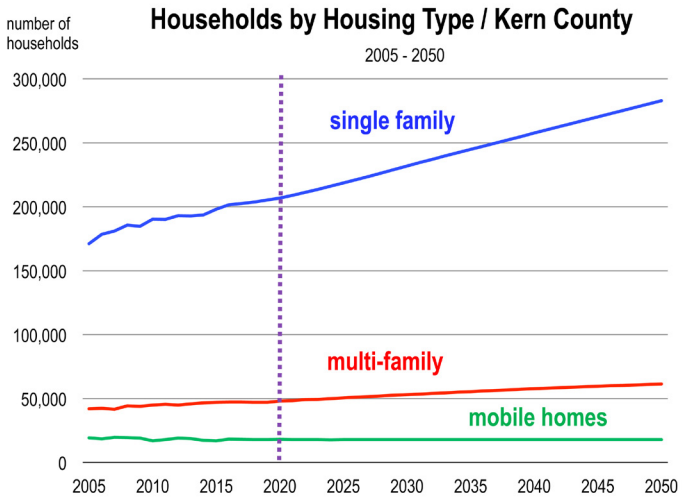
Where VRSF, VRMF, VRMH are the vacancy rate factors for single family housing stock, multi-family housing stock, and mobile homes, respectively

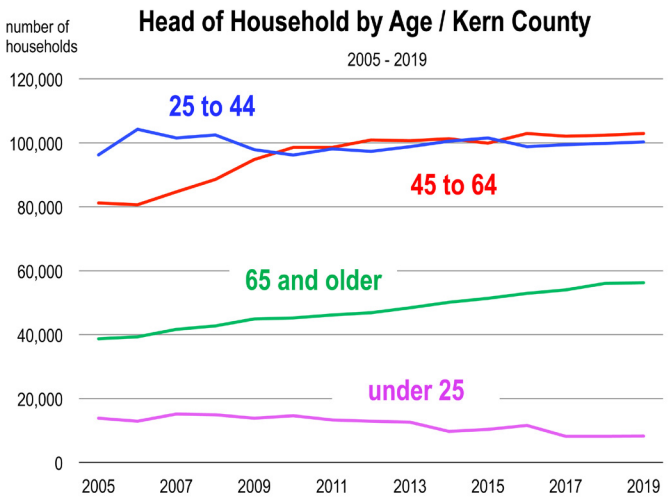
Total Households (HH) is simply the sum of the three household types:

HH = HHSF + HHMF + HHMH

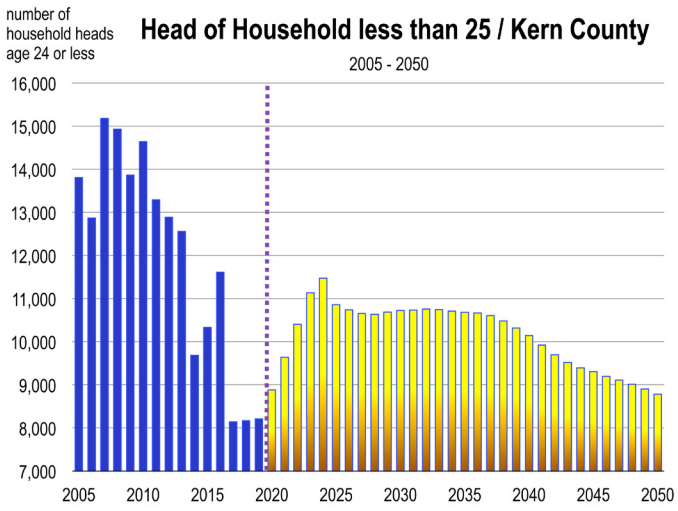
Head of Householder by Age

The principal heads of households in Kern County are aged 25 to 64. This broad age cohort accounted for 76 percent of all households in 2019. The smallest age cohort heading households is the under 25 group. Furthermore, headship in this age group has been declining gradually over time.



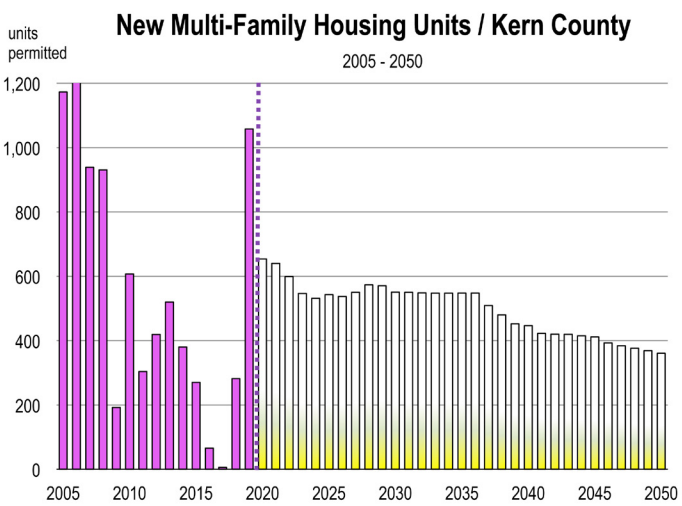


Regional Growth Forecast



Households age 24 and under

The number of households with a head of household aged 24 or less have generally been in decline in Kern County since continuous data records have been kept. This is consistent with the rate at which apartment building has occurred over time in the County. This statistical relationship proved effective in the regression of households age 24 and under, and the average number of apartment units permitted in the County over the last 5 years.



With a surge in apartment unit building in Kern County in 2019 and forecast over the next few years, the number of younger heads of household are expected to rise, from just over 8,000 to 11,000 by 2023. This would be the high point in view of the longer term forecast for apartment units.

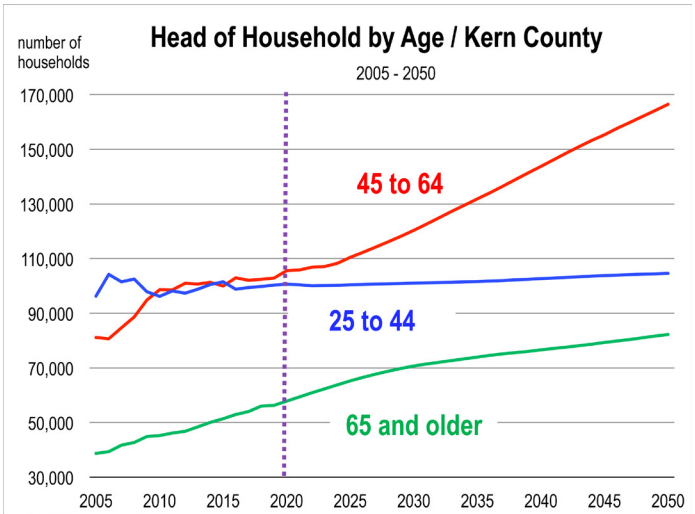
Householder ages 25-44, 45-64, and 65+

Variation of the principal heads of households in Kern County can be explained largely by economic factors, and the age of the population. However, the older the population, the greater likelihood that there is a close correlation with heading a household.

Regression equations that included economic factors were used to forecast the two age cohorts: 25 to 44 and 45 to 64. The unemployment rate was a factor influencing headship rates for these two cohorts. For the 25 to 44 age group, job creation over the last 3 years was an important factor.

Age of the population was the only relevant factor that accounted for nearly all of the variation in households headed by the age group 65 and older.

These results are fairly intuitive. Economic factors will support the creation of a household. As people reach mid-life ages and older, many have acquired homes and remain heads of them, even as



Regional Growth Forecast

they retire after age 65. Furthermore, economic factors are less variable on home ownership or household headship once careers are established and rising or falling unemployment impacts older age workers (with more skills and knowledge) less than younger age workers.

Average Household Size

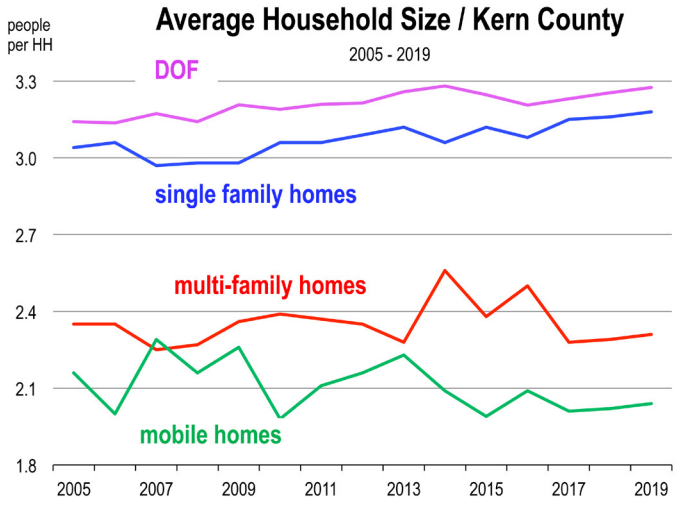
Average household sizes for single family, multi-family and mobile homes were obtained from the American Communities Survey (ACS) and indirectly using the official population and household estimates from the Department of Finance. The average household size for the household population can be derived from the following accounting identity:

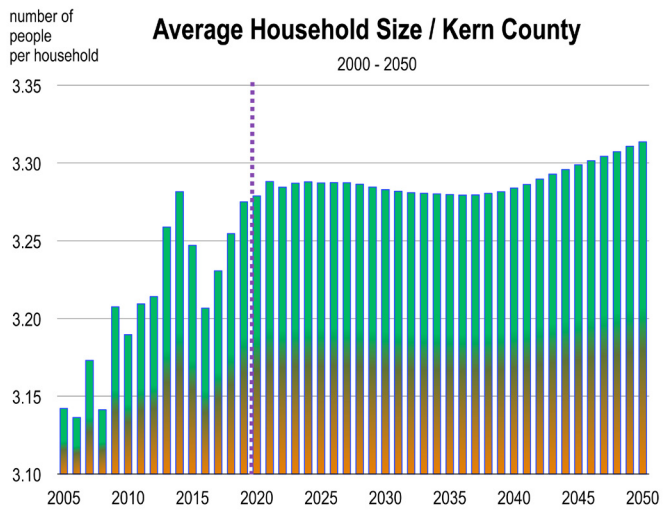
> Average Household Size = (Population – Group quarters population) / Households

This series (for all households) was not entirely compatible with the three series' from the ACS. Consequently, the ACS data were adjusted so that each of the three series would correspond to the derived DOF data series for which a forecast exists.[17]

Average household sizes for single family, multi-family and mobile homes were regressed against the derived (DOF) series.

> AHS(i) = f(derived series, other factors),

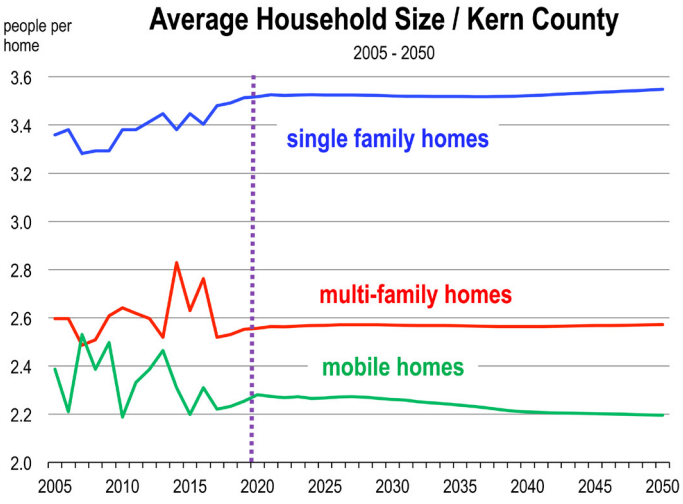




where i= single family, multi-family and mobile home series'

> The derived series = (population – group quarters population) / households

The results of the estimated equations are presented in Appendix B. The forecast for the derived series is presented above.



[17] The factor of adjustment was 1.105. With this adjustment, the weighted average of the three housing type series' would equal to the DOF all housing types series. The forecast of the average housing size for all households exists because there is a forecast of (1) population, (2) group quarters population and (3) total households. Therefore the identity in the equation above can be solved.

Regional Growth Forecast

Average Household Size
Kern County 2010 - 2050

Year	Single Family Households	Multi Family Households	Mobile Homes Households	Total Households
2010	3.38	2.64	2.19	3.19
2011	3.38	2.62	2.33	3.21
2012	3.41	2.60	2.39	3.21
2013	3.45	2.52	2.46	3.26
2014	3.38	2.83	2.31	3.28
2015	3.45	2.63	2.20	3.25
2016	3.40	2.76	2.31	3.21
2017	3.48	2.52	2.22	3.23
2018	3.49	2.53	2.23	3.25
2019	3.51	2.55	2.25	3.27
2020	3.52	2.56	2.28	3.28
2021	3.53	2.56	2.27	3.29
2022	3.52	2.56	2.27	3.28
2023	3.52	2.57	2.27	3.29
2024	3.53	2.57	2.26	3.29
2025	3.52	2.57	2.27	3.29
2026	3.52	2.57	2.27	3.29
2027	3.52	2.57	2.27	3.29
2028	3.52	2.57	2.27	3.29
2029	3.52	2.57	2.27	3.28
2030	3.52	2.57	2.26	3.28
2031	3.52	2.57	2.26	3.28
2032	3.52	2.57	2.25	3.28
2033	3.52	2.57	2.25	3.28
2034	3.52	2.57	2.24	3.28
2035	3.52	2.57	2.24	3.28
2036	3.52	2.57	2.23	3.28
2037	3.52	2.56	2.23	3.28
2038	3.52	2.56	2.22	3.28
2039	3.52	2.56	2.21	3.28
2040	3.52	2.56	2.21	3.28
2041	3.52	2.56	2.21	3.29
2042	3.53	2.56	2.21	3.29
2043	3.53	2.57	2.20	3.29
2044	3.53	2.57	2.20	3.30
2045	3.54	2.57	2.20	3.30
2046	3.54	2.57	2.20	3.30
2047	3.54	2.57	2.20	3.30
2048	3.54	2.57	2.20	3.31
2049	3.55	2.57	2.20	3.31
2050	3.55	2.57	2.20	3.31

Average household size for all households remains high though stable for most of the forecast, rising slightly in last 5 years in tandem with an increase in the 18 to 29 year old population.

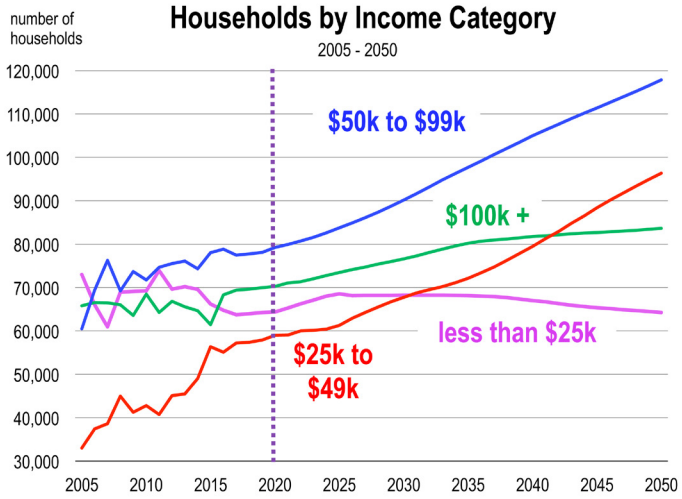
Households by Income Category

The updated household categories from the American Communities Survey are now:

- Less then $25,000
- $ 25,000 to $49,999
- $ 50,000 to $99,999
- $1 00,000 and over

All four categories of households were modeled stochastically and forecast using economic indicators as the principal causal drivers. Age of the population was also used in the equations because household income typically rises with age through 55 years of age, and then diminishes over time.

The number of households earning $100,000 and over was found to be highly corrected with the age group 45 to 64. Households earning $50K to $99,999 were the most correlated with the broader age group: 25 to 64 years. Job growth, net in-migration, and the 25 to 44 year old age group were the principal



Regional Growth Forecast

determinants of the variation in the $25,000 to $49,999 income category households. Variation in the lowest household income group was negatively correlated with job growth, and positively correlated with the unemployment rate and the percentage of the total workforce employed in Farming. See Appendix C for details of these regression estimates that generated the forecasts in households by income category.

Percentage of Total Households by Income Category
Kern County **2010 - 2050**

Year	Less than $25,000	$25,000 to $49,999	$50,000 to $99,999	$100,000 and Up
2010	27.4%	27.1%	28.4%	17.0%
2011	29.2%	25.3%	29.5%	16.1%
2012	27.1%	26.0%	29.4%	17.5%
2013	27.3%	25.5%	29.6%	17.7%
2014	27.0%	25.1%	28.8%	19.0%
2015	25.3%	23.5%	29.8%	21.5%
2016	24.3%	25.6%	29.5%	20.6%
2017	23.8%	25.9%	28.9%	21.4%
2018	23.8%	25.9%	28.9%	21.4%
2019	23.8%	25.9%	28.9%	21.4%
2020	23.6%	25.8%	29.0%	21.6%
2021	23.7%	25.8%	29.0%	21.4%
2022	23.8%	25.6%	29.0%	21.6%
2023	23.9%	25.6%	29.1%	21.4%
2024	24.0%	25.6%	29.1%	21.3%
2025	23.9%	25.6%	29.2%	21.3%
2026	23.5%	25.6%	29.3%	21.7%
2027	23.3%	25.5%	29.4%	21.9%
2028	23.0%	25.4%	29.5%	22.1%
2029	22.8%	25.4%	29.6%	22.3%
2030	22.5%	25.3%	29.8%	22.4%
2031	22.3%	25.3%	30.0%	22.5%
2032	22.1%	25.3%	30.2%	22.5%
2033	21.9%	25.3%	30.4%	22.5%
2034	21.6%	25.2%	30.6%	22.6%
2035	21.4%	25.2%	30.7%	22.7%
2036	21.2%	25.1%	30.9%	22.8%
2037	20.9%	25.0%	31.0%	23.0%
2038	20.7%	24.8%	31.2%	23.3%
2039	20.4%	24.7%	31.4%	23.6%
2040	20.1%	24.5%	31.5%	23.8%
2041	19.8%	24.4%	31.6%	24.2%
2042	19.6%	24.2%	31.7%	24.5%
2043	19.3%	24.1%	31.9%	24.8%
2044	19.0%	23.9%	32.0%	25.1%
2045	18.8%	23.8%	32.0%	25.4%
2046	18.6%	23.6%	32.1%	25.7%
2047	18.4%	23.5%	32.2%	25.9%
2048	18.2%	23.3%	32.3%	26.2%
2049	17.9%	23.2%	32.4%	26.4%
2050	17.7%	23.1%	32.5%	26.6%

Dependent Variable: ENROLLK8
Method: Least Squares
Date: 10/25/19 Time: 11:08
Sample (adjusted): 1990 2019
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-14060.25	3134.082	-4.486241	0.0001
AGE0513	1.074483	0.027465	39.12149	0.0000
DUM16ON	4534.751	1110.594	4.083176	0.0004
DUM19ON	3214.092	1913.976	1.679275	0.1051

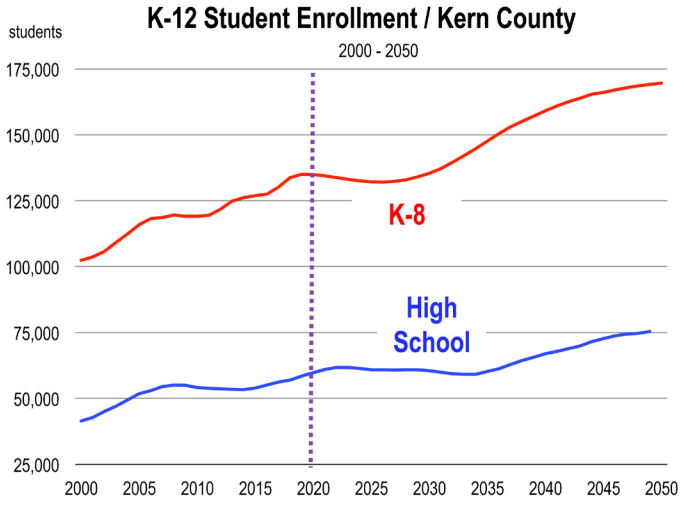
R-squared	0.988552	Mean dependent var	111048.5
Adjusted R-squared	0.987231	S.D. dependent var	14666.11
S.E. of regression	1657.282	Akaike info criterion	17.78731
Sum squared resid	71411202	Schwarz criterion	17.97414
Log likelihood	-262.8097	F-statistic	748.3641
Durbin-Watson stat	0.734337	Prob(F-statistic)	0.000000

The table presents the percentage of all households by income category in Kern County for the history and over the forecast.

Public School Enrollments

K-8 Student enrollment

K-8 enrollment in public schools is forecast from an equation that includes the population ages 5 to 13. This age cohort explains 99 percent of the variation in K through 8th grade school enrollment over time.



Regional Growth Forecast

Dependent Variable: ENROLL912
Method: Least Squares
Date: 10/25/19 Time: 11:28
Sample (adjusted): 1990 2019
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9854.748	1129.064	-8.728243	0.0000
AGE1417	1.122239	0.023111	48.55831	0.0000
DUM17ON	2982.474	750.0989	3.976108	0.0005
DUM19ON	865.7811	1219.441	0.709982	0.4840

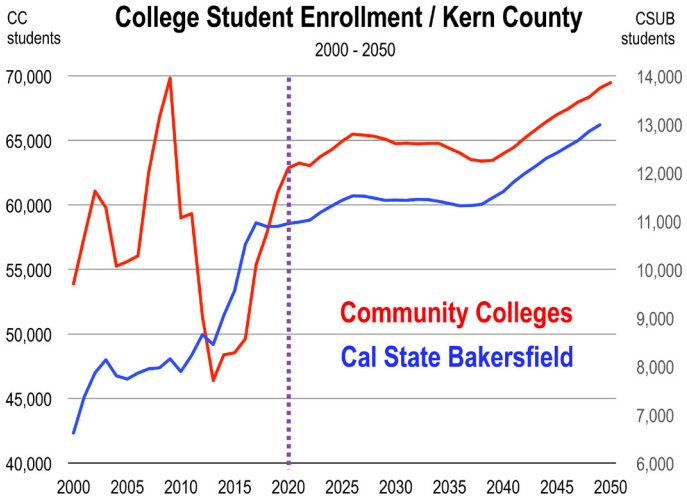
R-squared	0.990616	Mean dependent var	45365.07
Adjusted R-squared	0.989533	S.D. dependent var	9731.766
S.E. of regression	995.6312	Akaike info criterion	16.76820
Sum squared resid	25773317	Schwarz criterion	16.95502
Log likelihood	-247.5229	F-statistic	914.8890
Durbin-Watson stat	0.519526	Prob(F-statistic)	0.000000

Student Enrollment, grades 9-12

Public high school enrollment is forecast from an equation that includes the population ages 14 to 17.

Some further add factors are included to force the predicted line to overlay the actual in the final 2 years of actual data.

The fit of the equation is 99 percent, meaning that nearly all of the variability in public school student enrollment can be explained by the 14 to 17 year old age cohort.



Student Enrollment, CCs and CSUB

80 percent of students enrolled at Cal State Bakersfield in 2018 were under 25 years old. Consequently enrollments should be highly correlated with the 18 to 21 year old and the 22 to 24 year old population in the County. We found a very strong statistical correlation with 18 to 21 but not with 22 to 24.

The 2017 Student Age Demographics for the Kern Community College District.

(Bakersfield, Cerro Coso, and Porterville) are reported here:

There is a higher proportion of older aged students within the CCs in Kern County than at the 4 year university. Nevertheless, combined student enrollments at all 3 campuses plus the trade schools was principally correlated with the 18 to 21 year old population within the County. In fact, the unexplained variation in enrollment was 3 times as high with either the age 22 to 24 or age 20 to 29 age cohort, than with the 18 to 21 year old age group.

Unlike the CSUB regression equation, the unemployment rate exerted a positive influence on student enrollments at community colleges.[18] This is consistent with past research that we have conducted on the factors affecting community college student enrollment. When the economy softens and the unemployment rate rises, job opportunities are more scarce prompting more high school graduates to enter 2 year colleges which have no cost of tuition.

The Kern County unemployment rate is forecast to rise over the next several years, in tandem with a softening U.S. and California economy. This will produce higher enrollment at community colleges throughout California including Kern County.

Age	
19 or Younger	33.8%
20-24	30.2%
25-29	13.7%
30-39	12.7%
40-49	6.0%
50 or Older	3.5%
Not Reported	0.0%

[18] See Appendix D for the regression results of the community college system enrollment.

Regional Growth Forecast

Employment Forecasts

The updated employment forecasts for the 14 NAICS sectors are presented in the following charts. All of these forecasts are direct outputs from the Kern County macro-economic model.

The model was updated with revised history for 2017 and 2018, and available history for the 2019 calendar year. 2019 is an actual year and the forecast begins in 2020.

The model uses the exogenous U.S. and California forecasts by the UCLA Anderson Forecast from September 2019. The forecast is projected through the year 2050.

Many of the sectors are modeled from a specification that has employment in Kern County for industry i driven by employment in California for industry i, with other local factors that have been tested over time and are relevant to Kern County job demand.

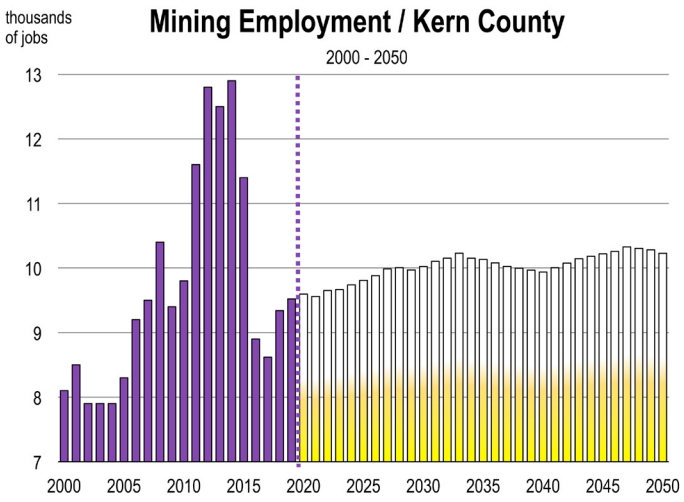
Farm employment is largely influenced by the inflation adjusted valuation of farm product output, or real crop value.

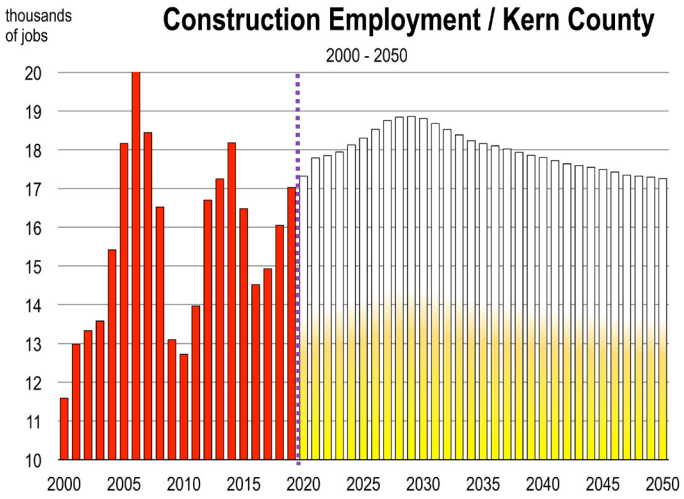
For the construction sector, jobs are highly correlated with the new housing permits and new non-residential investment.

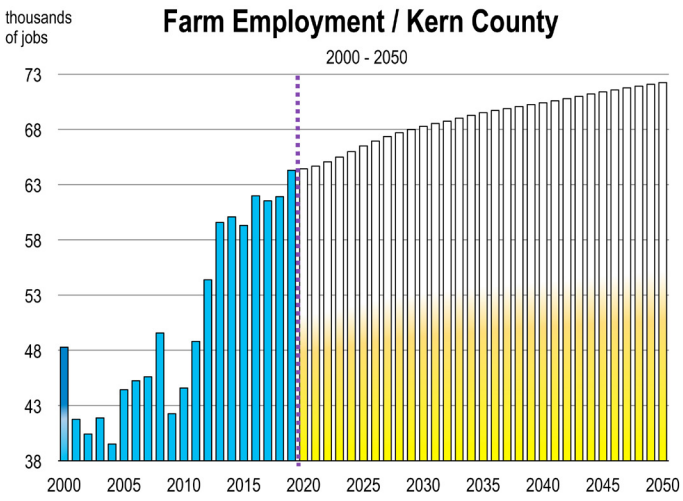
Crude oil price movement over time is a principal factor in explaining the variation in mining employment. Eighty percent of mining employment is oil and gas extraction.

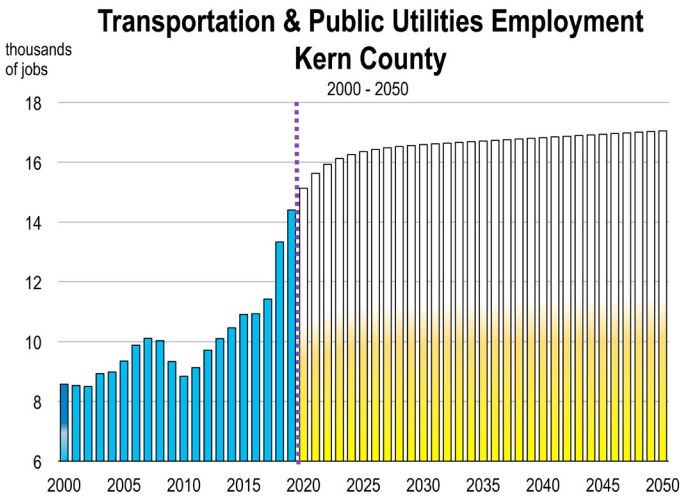
Local manufacturing is influenced by state manufacturing movements, both in the durable and non-durable sectors.

This is also true for transportation and utilities employment, though population growth in Kern County is also a factor.

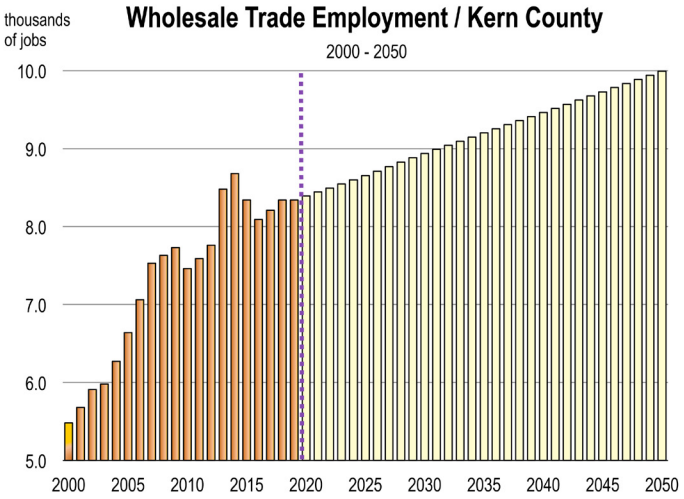


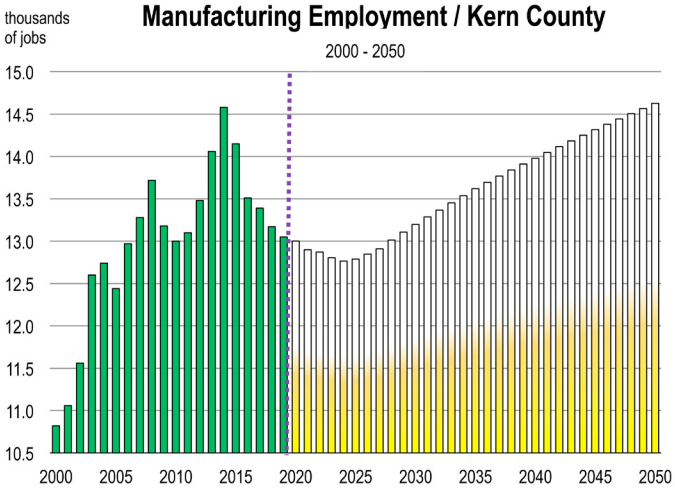






Regional Growth Forecast

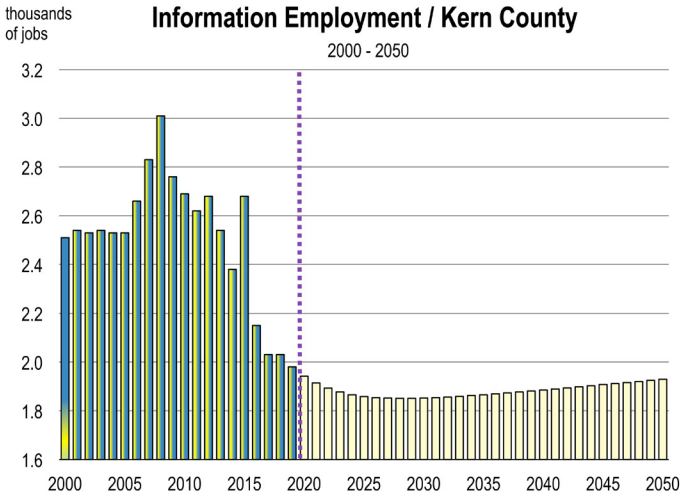


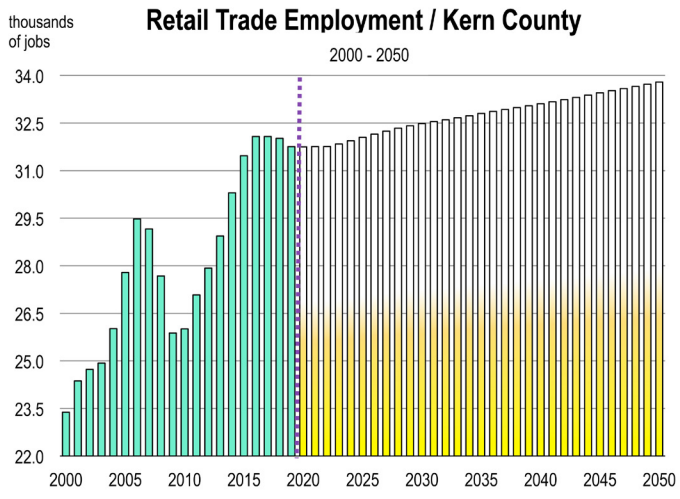


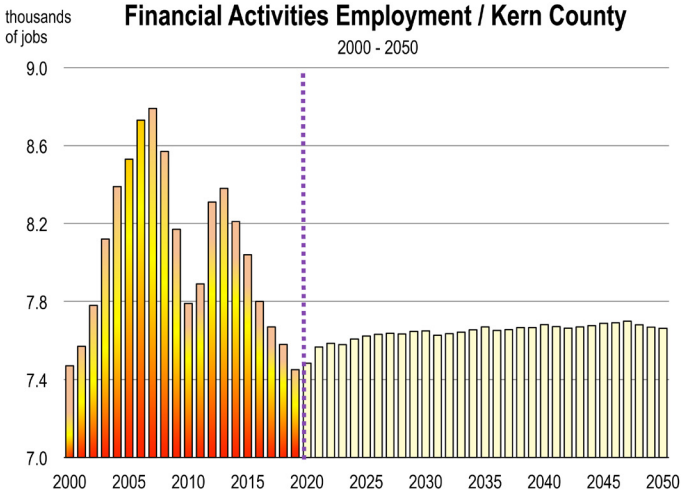
Wholesale trade and retail trade are correlated with retail demand for goods and services in Kern County. And local retail trade sales are largely driven by household incomes.

The information industry is dominated by newspaper publishing, telecommunications, and other publishing. All of these sectors are shrinking due to structural changes caused by technological change. Information also includes film and video production including the production of video games. In regions like Santa Clara, San Francisco and Los Angeles, information employment has demonstrated substantial growth. However, in most California counties, it is in steady decline.

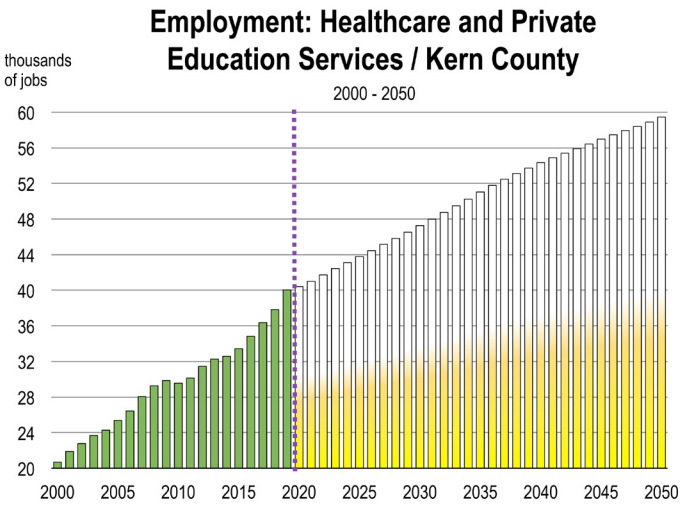
Employment in healthcare is population driven, with special consideration for the older age populations. This is discussed in more detail below.

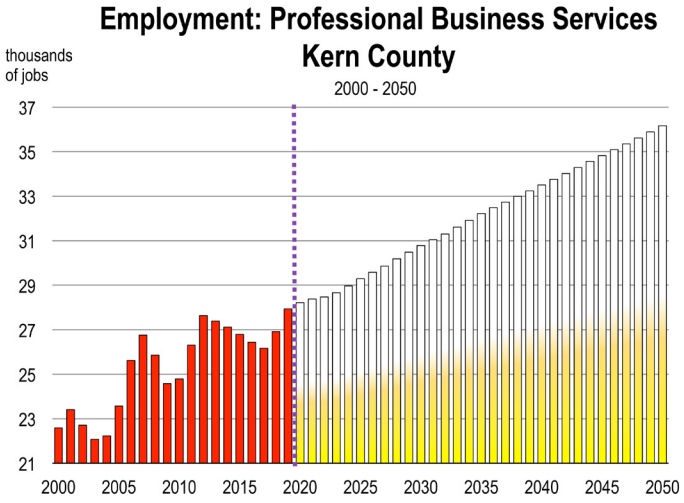


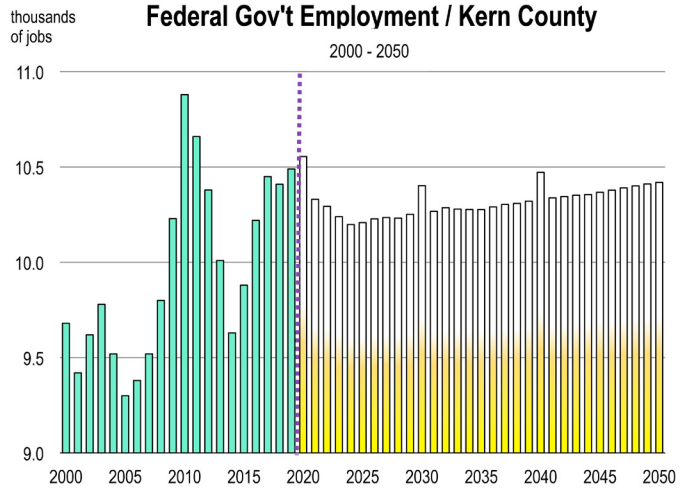




Regional Growth Forecast

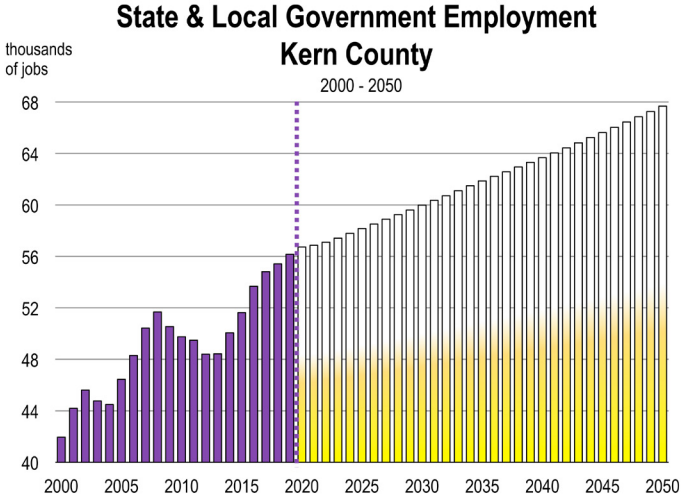






Federal government employment is comprised of federal government offices like the IRS, Social Security Administration, and the Forest Service. In Kern County however, a large share of federal employment is civilian scientific and administrative employment at China Lake NAS and Edwards AFB. Consequently, the DOD budget was found to be a significant factor in explaining federal civilian employment over time.

Local government employment including the State government is mostly jobs held by teachers and staff within the K-12 schools, the community colleges, and at Cal State Bakersfield. Consequently, student enrollment explains much of the variation in state and local government employment.



Regional Growth Forecast

Additional Modifications to Employment Sectors Accommodate More Detailed Sector Forecasts

Professional Business Services

The Professional Business Services Sector was categorized into 3 two-digit NAICS sub-sectors:

- Professional, Technical and Scientific Services (54)
- Management Services (55)
- Administrative and Waste Management (56)

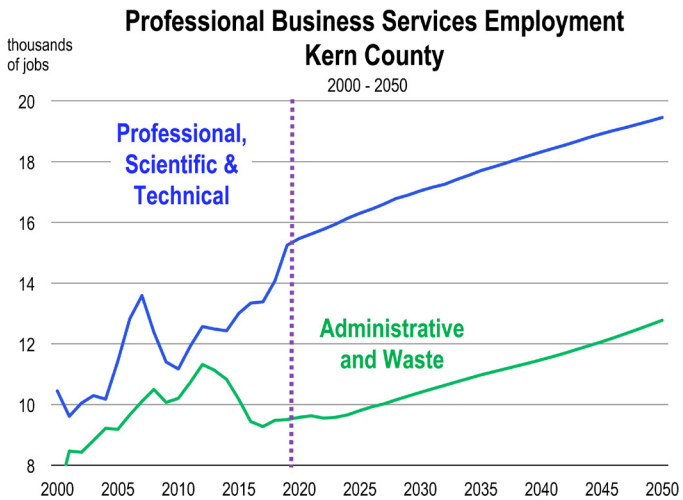
The sum of these sectors is equal to the broader Industrial classification.

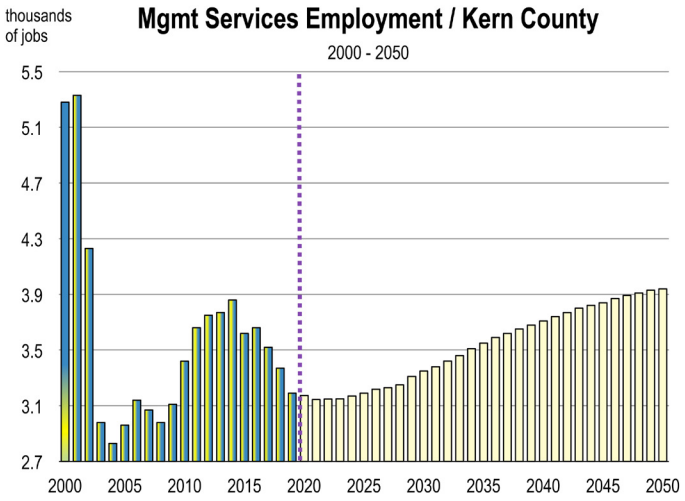
Management services was not found to be strongly correlated with general business activity but instead, with general management employment throughout California.

Professional, Technical, and Scientific Services (PTS) is the principal category of the broader Professional Business Services in Kern County and includes Legal services, accounting services, architectural services, engineering services, computer and technical design and consulting, scientific research, and advertising and public relations.

Legal services are largely correlated with total business activity which itself is strongly influenced by population.

Business activity is typically represented in regional systems by the expansion and contraction of total employment, since employment is a proxy for output which itself is largely unavailable at the regional level.





Administrative Support and Waste Management also includes remediation services, building security, maintenance, and landscaping. Abbreviate this AW. This sector represents janitors, cleaners, laborers and material movers, landscaping and grounds-keeping workers, office clerks, and security guards.

Administrative Support and Waste Management varies with business activity and is largely represented by temporary employment agencies that provide contract administrative work to businesses as needed.

In the regression equation explaining AW, the causal factors include general employment conditions in the county, the local unemployment rate and relative real wages for the Kern County economy (vis a vis California).

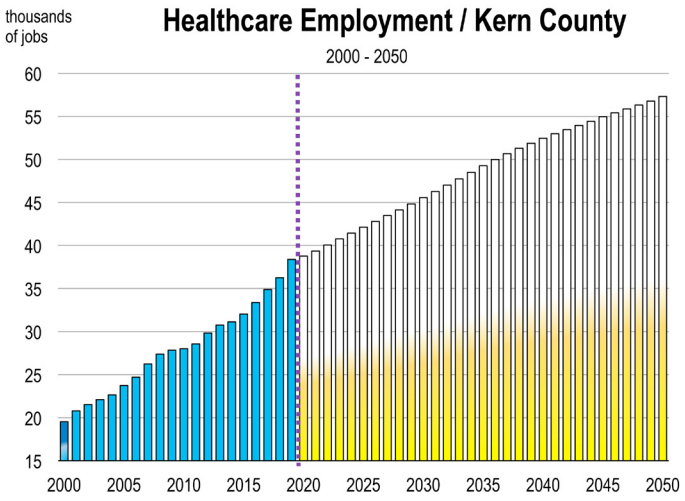
The forecast has employment in AW rising gradually over time, at a rate of growth the is less than the rate of growth observed from 2010 to 2019.

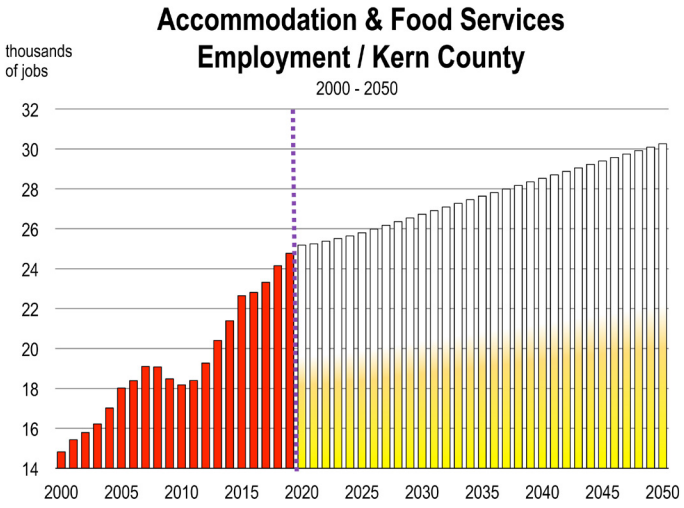
Education and Healthcare

Separate categories for each were developed. Education is private education services (NAICS 61) and Healthcare and Social Assistance (62) is a broad category which includes all conventional and non-conventional jobs in healthcare and healthcare related fields.

Private educational services moves with public education services, which is largely represented by State and local government because it includes all K-12 public schools the community colleges, and Cal State Bakersfield.

Regional Growth Forecast





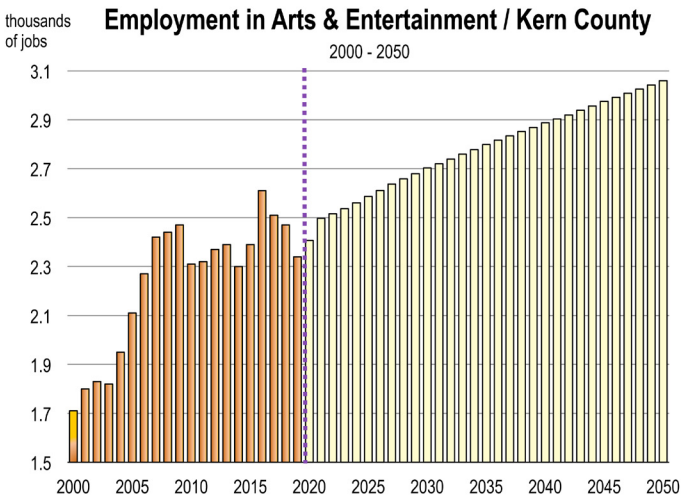
Healthcare employment is correlated with the population. However, the correlation is even stronger with an aging population, since older age populations demand healthcare services more than younger age populations.

Leisure and Hospitality

This sector now includes two components instead of one:

- Arts, Entertainment, and Recreation (71), and
- Accommodations and Food Ser4vices (72)

The former category of employment in leisure services would vary with the demand by residents and visitors for entertainment and recreation. The latter category will vary with the demand by visitors---both business visitors and vacation visitors---and residents who purchase food away from home. Consequently, firms in NAICS 72 will require more workers when there are more hotels and motels and restaurants and bars.



Arts and Entertainment employment is limited in Kern County. Of the broader Leisure and Hospitality sector, the Arts/ Entertainment/Recreation subsector accounts for just 2,340 workers, or just 8.6 percent. This leaves the accommodation and food services sector with nearly 25,000 workers and 91.4 percent of all Leisure and Hospitality jobs.

Testing of the equation with alternative theoretical designs yielded a forecasting equation with total employment explaining the most variation in NAICS 71. Leisure services in California plus the population of Kern County structured as a partial adjustment model produced an r-square of 99.3 percent for the equation explaining accommodation and food services employment.

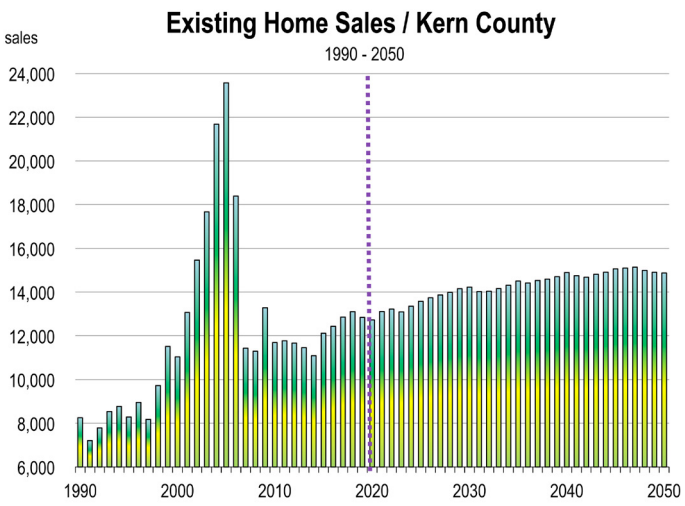
However, more work on this specification may be required because the growth rates over the forecast are much slower than during the most recent 8 years. Consequently, further testing during the month of October is forthcoming before a final forecast of the arts/entertainment/recreation series is accepted for this assignment.

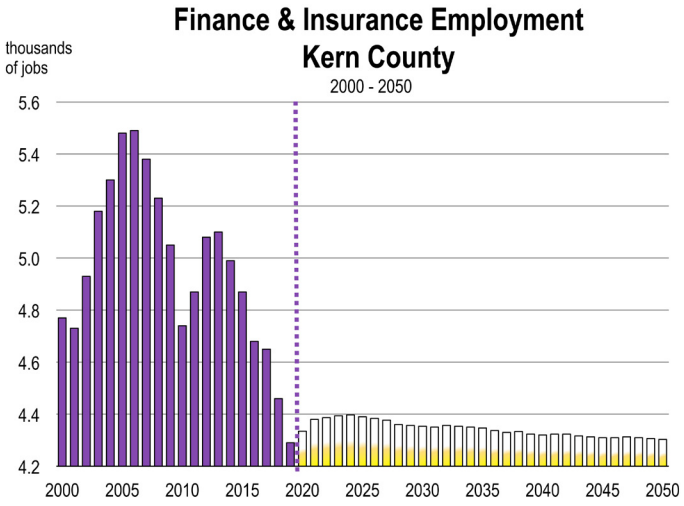
Financial Activities

Real Estate

The extent of existing home sales in Kern County is the principal driver of financial activities related to real estate. Home sales are forecast in the model and this forecast is used to determine employment in real estate activity related to the rent, lease or purchase of homes.

Regional Growth Forecast





Finance and Insurance

Most of the NAICS sector defined as Finance and Insurance is lending for home mortgages. Most of the insurance activity is for residential homes but also includes all insurances. This sector which is comprised of banking, lending and insurance sectors has, as a result of rapid changes in technology and the internet, become substantially less labor intensive over time. Workers have been reduced by substantial merger activity in this industry, and have been replaced with ATMs, online internet agents, bank websites offering clients greater ability to manipulate personal and business bank accounts online, and more austere customer service at financial institutions. Consequently, regional financial activity has undergone serious consolidation over the last ten years.

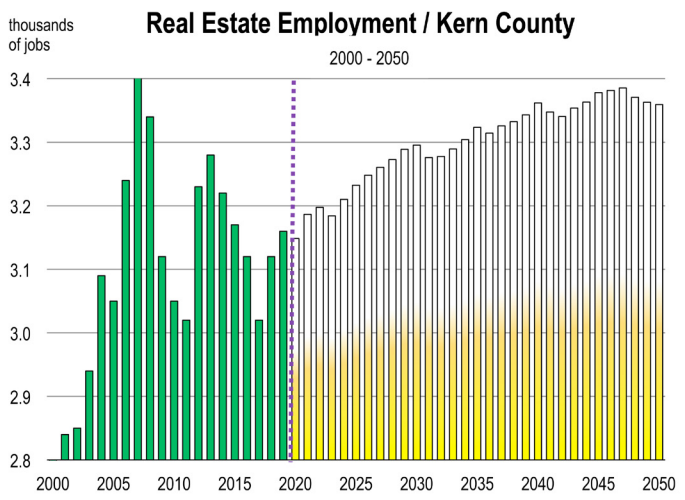
The forecast for finance and insurance employment moves slightly higher over the short term but reverses and consolidates further over time.

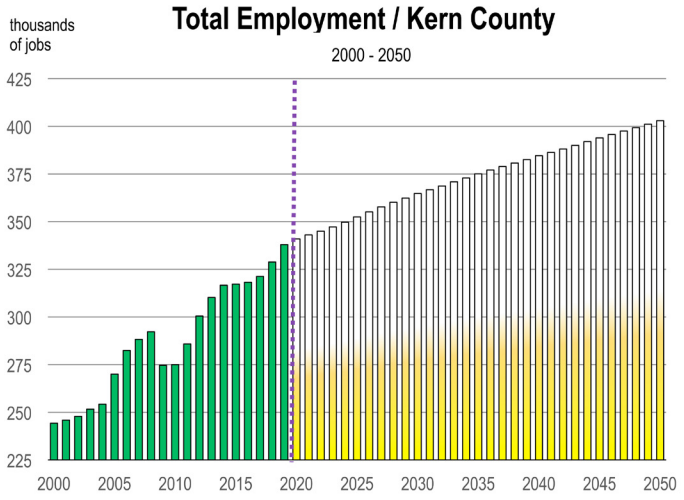
Total Employment

The sum of all 20 NAICS sectors modeled as separate forecast equations yield total wage and salary employment in Kern County.

Therefore, the total employment forecast is the product of how the economy generates jobs in particular industries, based entirely on economic factors that are part of a larger macro-economic model of the local County economy.

Total Employment 2015 - 2050							
2015	2020	2025	2030	2035	2040	2045	2050
317,200	341,000	352,500	364,700	374,800	384,100	393,300	402,200





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US Median Household Income Update, October 2, 2019

https://www.marketingcharts.com/demographics-and-audiences/household-income-110403

Kern County Econometric Model by the California Economic Forecast and Longer term forecasts prepared annually for Cal Trans. See:

https://dot.ca.gov/programs/transportation-planning/economics-data-management/transportation-economics/long-term-socio-economic-forecasts-by-county

Bureau of Justice Prisoner statistics

Bureau of Justice Statistics, Annual Probation Survey, Annual Parole Survey, Annual Survey of Jails, Census of Jail Inmates, and National Prisoner Statistics Program, 1980-2016

https://www.bjs.gov/index.cfm?ty=kfdetail&iid=488

https://www.sentencingproject.org/wp-content/uploads/2016/01/Trends-in-US-Corrections.pdf

Prison Population forecast by State

https://apps.urban.org/features/prison-population-forecaster/

State data

https://www.cdcr.ca.gov/research/population-reports-2/

Federal data

https://www.bop.gov/about/statistics/population_statistics.jsp#old_pops

High Speed Rail

https://www.hsr.ca.gov/docs/communication/info_center/factsheets/Southern_California_Factsheet.pdf

Appendix A

Log-linear regression results for: Births

Dependent Variable: LOG(BIRTHS). **Kern County Births**
Method: Least Squares
Date: 10/01/19 Time: 11:00
Sample (adjusted): 1970 2019
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.041601	0.313669	-0.132628	0.8951
LOG(AGE2544+AGE2224)	0.157618	0.095723	1.646603	0.1068
DUM06ON	-0.001174	0.017362	-0.067607	0.9464
DUM15ON	-0.05443	0.027954	-1.947105	0.0579
DUM19ON	-0.002017	0.045207	-0.04462	0.9646
LOG(BIRTHS(-1))	0.799721	0.104319	7.666149	0

R-squared	0.984213	Mean dependent var	9.285367
Adjusted R-squared	0.982419	S.D. dependent var	0.297464
S.E. of regression	0.039442	Akaike info criterion	-3.515818
Sum squared resid	0.068449	Schwarz criterion	-3.286375
Log likelihood	93.89544	F-statistic	548.6217
Durbin-Watson stat	1.211149	Prob(F-statistic)	0

C = constant;

AGE2544 = population aged 25 to 44;

AGE2224 = population aged 22 to 24;

DUMxxON = forecast adjustment factors for xx calendar years

BIRTHS(-1) = lagged dependent variable

Log-linear regression results for: Deaths

Dependent Variable: LOG(DJUL). **Kern County deaths**
Method: Least Squares
Date: 09/30/19 Time: 11:11
Sample (adjusted): 1971 2019
Included observations: 49 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.68963	0.114404	23.50998	0
LOG(AGE75)	0.566809	0.011486	49.34865	0
DUM18ON	0.003405	0.025596	0.133026	0.8948

R-squared	0.983401	Mean dependent var	8.346967
Adjusted R-squared	0.982679	S.D. dependent var	0.254865
S.E. of regression	0.033543	Akaike info criterion	-3.892724
Sum squared resid	0.051755	Schwarz criterion	-3.776898
Log likelihood	98.37173	F-statistic	1362.594
Durbin-Watson stat	1.077461	Prob(F-statistic)	0

C = constant;

AGE75 = population aged 75 and over, Kern County;

DUM18ON = forecast adjustment factor

Appendix B

Derivation of Net In-migration by age

Our internal database contains Kern County population by single-age-year. Using this data on population by age, along with data on deaths by age group (collected from the Centers for Disease Control), we estimated net migration by age group.

This calculation was performed as follows, using the age cohort of 15 – 24 year olds as an example:

> Net migration for age group 15–24 in 2017 = (Population for age group 15–24 in 2017) – (Population for age group 14–23 in 2016) – (Deaths among age group 15–24 in 2017)

We made these estimates for 1999 – 2017 for the following age groups:

- Under 5 years old
- 5-14 years old
- 15-24 years old
- 25-34 years old
- 35-44 years old
- 45-54 years old
- 55-64 years old
- 65-74 years old
- 75-84 years old
- 85 years and older

To reduce data estimation error and improve forecast accuracy, we collapsed these groups into the following categories:

- under age 25
- ages 25 to 44
- ages 45 to 64
- age 65 and over

Appendix C

Forecast of Net In-migration by age

Empirically, we have observed the principal cause of variations in net in-migration to be factors which impact wealth and quality of life decisions by individuals or the household.

Household location decisions largely depend on employment opportunities, the affordability of housing and quality of life factors.

These factors do not generally change for households. For individuals however, age is a contributing factor. Most individuals less than 25 years either live with their parents or are in community colleges or universities if not in an entry level job. Consequently, their decision t migration is influenced by their parents, job availability, and the cost of housing for the older end of this age group.

RHP is the Kern County home price. RHPCA is the home price for all of California. When RHP/RHPCA declines, relative home prices (and rental prices for rental housing) are more affordable in Kern County than generally elsewhere in Californi.

UR/URCA is the ratio of the Kern County unemployment rate to the statewide rate. When the ratio rises, there is relatively higher unemployment (and therefore job openings) in Kern than generally elsewhere in California.

The increase of migration aged 25 to 44 year old (NIPJUL2544) will impart a positive influence on 0 to 24 year olds because these age cohorts are often in the same household.

Housing stock or supply also imparts a positive influence on migration choices especially adjusting for housing prices. Job opportunities in particular professions, such as the professional, scientific and technical services further represent an attraction for new in-migrants especially aged 25 to 44.

Regression Results for net in-migration population by age

Dependent Variable: NIPJUL024. Net Migration ages 0 to 24

Method: Least Squares
Date: 10/01/19 Time: 11:42
Sample (adjusted): 1999 2019
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8986.96	4310.859	2.084726	0.0535
RHP/RHPCA	-18638.09	7962.508	-2.340731	0.0325
UR/URCA	-606.9812	1254.41	-0.483878	0.635
NIPJUL2544	0.843453	0.132086	6.385622	0
DETWS(-1)+DETWS	95.05861	28.09542	3.38342	0.0038

R-squared	0.782624	Mean dependent var	2461.905
Adjusted R-squared	0.728281	S.D. dependent var	2662.322
S.E. of regression	1387.781	Akaike info criterion	17.51306
Sum squared resid	30814979	Schwarz criterion	17.76175
Durbin-Watson stat	1.301127	Prob(F-statistic)	0.000036

RHP=real housing price Kern County

RHPCA=real housing price California

UR = ratio of unemployment rates: Kern County to California

NIPJUL2544 = net in-migration population, ages 25 to 44, Kern County

DETWS = Kern County jobs created

DETWS(-1) = Kern County jobs created, lagged one year

Dependent Variable: NIPJUL2544 Net Migration ages 25 to 44

Method: Least Squares
Date: 10/01/19 Time: 11:52
Sample (adjusted): 1999 2019
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1316.165	10677.94	0.12326	0.9037
RHP/RHPCA	-85.13299	6764.134	-0.012586	0.9901
DETWS(-2)	69.59237	43.5217	1.599027	0.1321
UNITS	0.726254	0.123324	5.889012	0
DUM19ON	-256.6323	1302.151	-0.197083	0.8466
RYEPW/RASALCA	-3.793141	13.45284	-0.281958	0.7821
D(EPST)	2034.932	576.2419	3.531386	0.0033

R-squared	0.817378	Mean dependent var	1486.048
Adjusted R-squared	0.739112	S.D. dependent var	2359.658
S.E. of regression	1205.248	Akaike info criterion	17.28796
Sum squared resid	20336722	Schwarz criterion	17.63613
Durbin-Watson stat	1.242687	Prob(F-statistic)	0.000172

RHP=real housing price Kern County

RHPCA=real housing price California

DETWS(-2) = Kern County jobs created, lagged two years

UNITS = total new units permitted in Kern County

RYEPW/RASALCA = ratio of average salary: Kern County to California

DE(EPST) = Change in Kern County employment in Professional, Scientific, Technical Services

Appendix C, *continued...*

In this equation, 45 to 64 year old net migrants were positively impacted by new single family home building, the growth of leisure services in Kern County, general migration throughout the state, and relative income in Kern County, vis a vis California.

Dependent Variable: NIPJUL4564. Net Migration ages 45 to 64
Method: Least Squares
Date: 10/01/19 Time: 12:05
Sample (adjusted): 1999 2019
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-29000.53	12975.47	-2.235027	0.0411
SFU	0.243182	0.074445	3.266603	0.0052
ELEISURE/ELEISURECA	1629796	811745.4	2.007768	0.063
DUM11ON	-1810.944	294.9618	-6.139588	0
NIPCA	6.872668	3.255513	2.111086	0.052
RYPPCCA/RYPPC	4260367	2468978	1.725559	0.105

R-squared	0.867584	Mean dependent var	-439.5238
Adjusted R-squared	0.823445	S.D. dependent var	1201.666
S.E. of regression	504.921	Akaike info criterion	15.52164
Sum squared resid	3824179	Schwarz criterion	15.82007
Log likelihood	-156.9772	F-statistic	19.65588
Durbin-Watson stat	3.056604	Prob(F-statistic)	0.000004

SFU=single family units permitted in Kern County

ELEISURE/ELEISURECA =ratio of employment in Leisure Services: Kern County to California

NIPCA = Net in-migrating population in California

UNITS = total new units permitted in Kern County

RYPPCCA/RYPPC = ratio of per capita personal income: Kern County to California

DUM11ON = forecast adjustment factor

Dependent Variable: NIPJUL65. Net Migration ages 25 to 44 65 & over
Method: Least Squares
Date: 10/01/19 Time: 12:06
Sample (adjusted): 1999 2019
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19914.35	6318.977	3.151515	0.0071
UNITS	0.004982	0.094271	0.052843	0.9586
RHP/RHPCA	-310.1356	3620.939	-0.085651	0.933
RHP	0.002781	0.003951	0.703775	0.4931
DUM15ON	-78.17609	358.8354	-0.217861	0.8307
DENSITY	-5739.006	1891.428	-3.034219	0.0089
DUM18ON	412.1494	396.4513	1.039596	0.3161

R-squared	0.536629	Mean dependent var	1443.571
Adjusted R-squared	0.338042	S.D. dependent var	512.1639
S.E. of regression	416.7007	Akaike info criterion	15.16382
Sum squared resid	2430953	Schwarz criterion	15.51199
Log likelihood	-152.2201	F-statistic	2.702231
Durbin-Watson stat	2.681041	Prob(F-statistic)	0.0588

Units = units permitted in Kern County

RHP=real housing price Kern County

RHPCA=real housing price California

DUM15ON = forecast adjustment factor

DENSITY = Average household size in Kern County

DUM18ON = forecast adjustment factor

Appendix D

White Population and Net In-Migration, California, 2000 to 2019

White population in California declined by an estimated 90,000 between 2010, in tandem with a slowdown in job creation and the fallout and ultimate job collapse when the housing bubble burst. Growth in the white population commenced with the return in overall job growth in California, and the recovery in home prices.

The regression equation used to forecast the white non-Hispanic population in Kern County incorporates these factors. The fit of the equation is an impressive 97 percent for the 2000 to 2019 historical period, The partial adjustment specification (the inclusion of a dependent lag) of the equation is used to capture the impact of a longer temporal influence of the other exogenous factors in the equation----namely: net migration, home prices, and unemployment---on the behavior of the white non-Hispanic population over time.

POPWHITE = white non-Hispanic population, Kern County

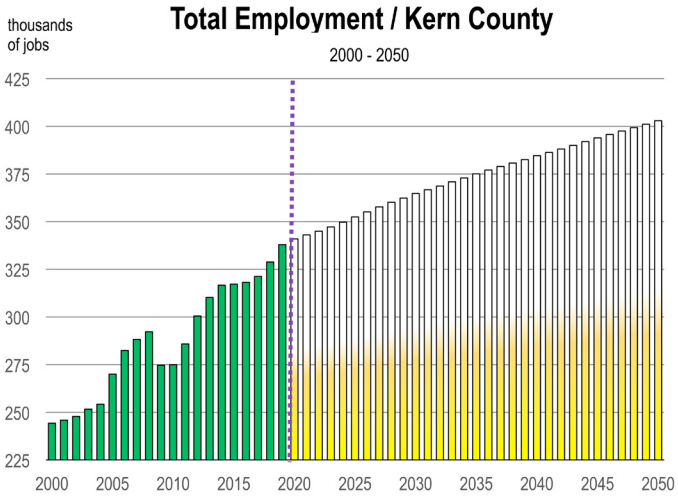
RHPCA = inflation adjusted median home price, California

UR = Kern County unemployment rate

NIPJUL = net in-migrating population, Kern County

c = constant or intercept

The minus numbers in parenthesis represent the time lags (in years) on each of the included exogenous factor.



Dependent Variable: POPWHITE
Method: Least Squares
Date: 10/29/19 Time: 10:53
Sample (adjusted): 2000 2019
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	149664.4	22106.26	6.770224	0.0000
DUM19ON	1519.352	904.7157	1.679369	0.1152
RHPCA(-1)	0.017032	0.002172	7.842198	0.0000
UR(-2)	440.5692	115.5261	3.813592	0.0019
NIPJUL(-1)	0.153720	0.043008	3.574223	0.0031
POPWHITE(-1)	0.502820	0.066894	7.516650	0.0000

R-squared	0.965401	Mean dependent var	329273.9
Adjusted R-squared	0.953045	S.D. dependent var	3795.139
S.E. of regression	822.3751	Akaike info criterion	16.50560
Sum squared resid	9468211.	Schwarz criterion	16.80432
Log likelihood	-159.0560	F-statistic	78.12804
Durbin-Watson stat	2.232807	Prob(F-statistic)	0.000000

Appendix E

Average Household Size by Housing Type

Model specifications and Estimation Results

Dependent Variable: DENSITYSF Average HH size – single family
Method: Least Squares
Date: 10/31/19 Time: 14:57
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.496197	0.95567	0.519214	0.6131
(POPJUL-POPGQ)/HH	0.801544	0.298004	2.689713	0.0197
DUM19ON	0.058789	0.055234	1.064362	0.3081

R-squared	0.602649	Mean dependent var	3.074
Adjusted R-squared	0.519757	S.D. dependent var	0.065115
S.E. of regression	0.049601	Akaike info criterion	-2.992767
Sum squared resid	0.029523	Schwarz criterion	-2.851157
Log likelihood	25.44575	F-statistic	6.063915
Durbin-Watson stat	1.639091	Prob(F-statistic)	0.015135

Dependent Variable: DENSITYMH. Average HH size – mobile homes
Method: Least Squares
Date: 10/31/19 Time: 15:01
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.638586	1.272345	-3.645698	0.0045
(POPJUL-POPGQ)/HH	1.493434	0.432868	3.450093	0.0062
AGE4564	-1.04E-06	1.63E-06	-0.637158	0.5383
HHMH	0.000118	1.50E-05	7.903687	0
DUM17ON	-0.117834	0.028172	-4.182747	0.0019

R-squared	0.89795	Mean dependent var	2.106
Adjusted R-squared	0.857131	S.D. dependent var	0.101334
S.E. of regression	0.038302	Akaike info criterion	-3.425414
Sum squared resid	0.014671	Schwarz criterion	-3.189397
Log likelihood	30.6906	F-statistic	21.99791
Durbin-Watson stat	1.980117	Prob(F-statistic)	0.000061

Dependent Variable: DENSITYMF. Average HH size – multi-family
Method: Least Squares
Date: 10/31/19 Time: 15:00
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.565611	1.718521	0.329127	0.7482
(POPJUL-POPGQ)/HH	0.538718	0.54109	2.995616	0.3408
DUM19ON	-0.065128	0.104574	-0.622793	0.5461
UR	0.005778	0.009378	1.616132	0.5503

R-squared	0.648549	Mean dependent var	2.352667
Adjusted R-squared	0.583665	S.D. dependent var	0.084892
S.E. of regression	0.088372	Akaike info criterion	-1.791344
Sum squared resid	0.085906	Schwarz criterion	-1.602531
Log likelihood	17.43508	F-statistic	0.639707
Durbin-Watson stat	2.377968	Prob(F-statistic)	0.605112

POPJUL = population, Kern County

POPGQ = population in group quarters, Kern County

HH = number of households, Kern County

AGE4564 = population ages 45 to 64, Kern County

HHMH = housing stock, mobile homes, Kern County

UR = unemployment rate, Kern County

DUM19ON = forecast adjustment factor

Appendix F

Households by Income Category

Model specifications and Estimation Results

These regression equations are for Household Income categories:

Dependent Variable: HHY024
Method: Least Squares
Date: 10/31/19 Time: 10:55
Sample (adjusted): 2006 2019
Included observations: 14 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	36154.92	14598.43	2.47663	0.0383
DETWS	-45.71621	80.04181	-0.571154	0.5836
UR(-1)	790.5012	267.7798	2.952057	0.0184
EFARM/ETWS	58315.13	63664.58	0.915975	0.3865
DUM19ON	3081.989	2570.982	1.19876	0.2649
HH024(-1)	0.98376	0.435706	2.257852	0.0539

R-squared	0.777782	Mean dependent var	67176.36
Adjusted R-squared	0.638896	S.D. dependent var	3448.034
S.E. of regression	2071.991	Akaike info criterion	18.40794
Sum squared resid	34345186	Schwarz criterion	18.68182
Log likelihood	-122.8555	F-statistic	5.600133
Durbin-Watson stat	2.751567	Prob(F-statistic)	0.016417

HHY024 = households with income of $24,999 or less

PDETWS = wage and salary jobs created

UR(-1) = unemployment rate, Kern County, lagged one year

EFARM/ETWS= ratio of farm employment to total employment

DUM19ON = forecast adjustment factor

HH024(-1) = dependent lag

Dependent Variable: HHY2549
Method: Least Squares
Date: 10/31/19 Time: 10:58
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	38757.89	24044.05	1.611954	0.1414
AGE2544	0.112845	0.104547	1.079369	0.3085
DETWS	62.51231	51.74451	1.208095	0.2578
NIPJUL2544	0.57339	0.281456	2.037227	0.0721
DUM16ON	3015.189	1496.757	2.014481	0.0748
DUM19ON	-1183.498	2211.292	-0.535207	0.6055

R-squared	0.749145	Mean dependent var	66449.47
Adjusted R-squared	0.60978	S.D. dependent var	2419.293
S.E. of regression	1511.273	Akaike info criterion	17.76847
Sum squared resid	20555526	Schwarz criterion	18.05169
Log likelihood	-127.2635	F-statistic	5.375447
Durbin-Watson stat	2.188826	Prob(F-statistic)	0.014553

HHY2549 = households with income between $25,000 and $49,999

AGE2544 = population aged 25 to 44, Kern County

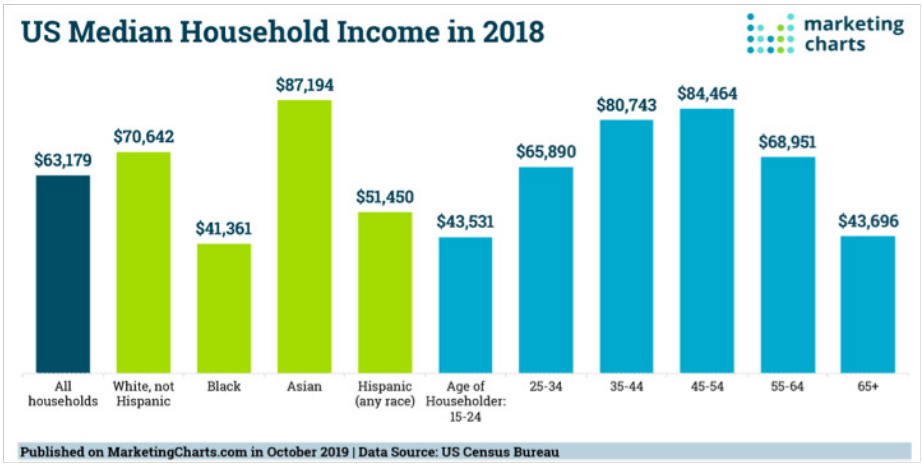
DETWS = wage and salary jobs created, Kern County

NIPJUL2544 = net migration of populations aged 25 to 44, Kern County

EMFG = employment in manufacturing, Kern County

DUM16ON= forecast adjustment factor

DUM19ON = forecast adjustment factor



Source: US Median Household Income Update, October 2, 2019

https://www.marketingcharts.com/demographics-and-audiences/household-income-110403

Appendix F, *continued...*

Dependent Variable: HHY5099
Method: Least Squares
Date: 10/31/19 Time: 13:24
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-35459.67	29517.09	-1.201327	0.2549
EPST+EFI+EGOVT+EMFG	644.7522	567.2904	1.136547	0.2799
AGE4564+AGE2544	0.12453	0.070919	1.755963	0.1069
DUM19ON	-2539.175	3118.669	-0.814185	0.4328

R-squared	0.744327	Mean dependent var	74098.6
Adjusted R-squared	0.674598	S.D. dependent var	4832.639
S.E. of regression	2756.73	Akaike info criterion	18.90466
Sum squared resid	83595172	Schwarz criterion	19.09347
Log likelihood	-137.7849	F-statistic	10.67458
Durbin-Watson stat	2.398922	Prob(F-statistic)	0.00138

HHY5099 = households with income between $50,000 and $99,999

EPST = employment in professional, scientific, and technical services, Kern County

EFI= employment in finance, Kern County

EGOVT= employment in the public sector, Kern County

EMFG = employment in manufacturing, Kern County

AGE4564 = population aged 45 to 64, Kern County

AGE2544 = population aged 25 to 44, Kern County

DUM19ON = forecast adjustment factor

Dependent Variable: HHY100
Method: Least Squares
Date: 10/28/19 Time: 16:39
Sample (adjusted): 2005 2019
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-102317.8	26743.41	-3.825907	0.0028
EPST+EFI+ERE+EGOVT	816.9353	461.8022	1.769015	0.1046
AGE4564	0.456151	0.084526	5.396586	0.0002
DUM19ON	-609.3485	3080.372	-0.197817	0.8468

R-squared	0.915486	Mean dependent var	47154.73
Adjusted R-squared	0.892437	S.D. dependent var	7942.012
S.E. of regression	2604.725	Akaike info criterion	18.79122
Sum squared resid	74630493	Schwarz criterion	18.98003
Log likelihood	-136.9341	F-statistic	39.71879
Durbin-Watson stat	0.990667	Prob(F-statistic)	0.000003

HHY100 = households with income of $100,000 or more

EPST = employment in professional, scientific, and technical services, Kern County

EFI= employment in finance, Kern County

ERE = employment in real estate, Kern County

EGOVT= employment in the public sector, Kern County

AGE4564 = population aged 45 to 64, Kern County

DUM19ON = forecast adjustment factor

Appendix G

Community Colleges Enrollment

Student enrollment over the 1992 to 2019 time period at community colleges in Kern County was largely driven by the population ages 18 to 21 and how the unemployment rate moved over time.

Deteriorating economic conditions represented by a rising unemployment rate are positively correlated with rising student enrollment.

Model specifications and Estimation Results

Dependent Variable: ENROLLCC
Method: Least Squares
Date: 10/01/19 Time: 14:22
Sample (adjusted): 1993 2019
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	23427.74	7608.382	3.079201	0.0053
AGE1821	0.595801	0.154333	3.860485	0.0008
D(UR)	3108.425	979.7879	3.172549	0.0042
DUM18ON	2040.14	5444.692	0.374703	0.7113

R-squared	0.572992	Mean dependent var	51979.33
Adjusted R-squared	0.517295	S.D. dependent var	9903.468
S.E. of regression	6880.626	Akaike info criterion	20.64676
Sum squared resid	1.09E+09	Schwarz criterion	20.83874
Log likelihood	-274.7313	F-statistic	10.28773
Durbin-Watson stat	0.612642	Prob(F-statistic)	0.000173

ENROLLCC = Community college enrollment

AGE1821 = age cohort of Kern County Population, ages 18 to 21

D(UR) = change in the Kern County unemployment rate

DUM18ON = forecast adjustment factor