ARB Contract No. 99-318

Determination of Non-Registration Rates

for On-Road Vehicles in California

Final Report

Prepared for:

California Air Resources Board

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Abstract

The College of Engineering, Center for Environmental Research and Technology (CE-CERT) has completed a statewide survey of vehicle registration in California. This work was conducted under a contract from the California Air Resources Board (CARB). The on-road vehicle fleet in California is composed of California registered vehicles, unregistered vehicles, and out-of-state vehicles. Obtaining accurate emissions estimates for all on-road vehicles requires an understanding of the percentage in each group as well as the types of vehicles in each group. The percent of unregistered vehicles on the road throughout the state is an important and largely unknown quantity.

The State of California now requires vehicle owners to show proof of insurance before it will issue or renew a vehicle's registration. Proof of emissions compliance is also required every other year for 1974 and newer vehicles. It is believed that these new measures have led to increases in the number of unregistered vehicles in the state – especially poorly maintained vehicles that cannot pass a smog test. Numerous studies have demonstrated that high-emitting vehicles are a significant source of emissions in California. Identifying and either repairing or retiring high-emitting vehicles is a high priority for CARB.

The objectives of this CARB-sponsored project were to determine the portion of in-use vehicles in California that are unregistered and to assess the number of out-of-state and out-of-country vehicles in use in California. With this information, CARB can update emissions inventories and develop regulatory strategies to reduce emissions from this subset of the vehicle population. The non-registration rates were determined using extensive field surveys at random locations in every county in the state and encompassing more than 98,000 identified vehicles. Data collection occurred between June 2000 and December 2000. The observed vehicle registration information was correlated with BAR Smog Check results as well as DMV registration information. Vehicle information was obtained through VIN decoding to provide information on the specific characteristics of the identified vehicles. The results of this study are detailed in this report.

Executive Summary

An accurate profile of the on-road vehicle fleet is essential for understanding and controlling pollution in urban areas. An important part of understanding the on-road vehicle fleet is the characterization of the unregistered vehicle population both in terms of number of vehicles and type of vehicles. A secondary, but still significant, component of the on-road fleet is the out-of-state and out-of-country vehicles. The Bourns College of Engineering-Center for Environmental Research and Technology (CE-CERT), under contract to the California Air Resources Board, conducted a study of the on-road fleet in California from June 2000 to December 2000. During this study, vehicles were photographed at various destination parking lots in every county in California. A total of 98,817 pictures having readable license plates were taken. After transcription of the license plate number from the photograph to Microsoft Excel spreadsheets, the data were VIN decoded by ARB staff, correlated with Smog Check results provided by Bureau of Automotive Repair staff, and correlated with Department of Motor Vehicles registration records.

Significant findings of this study include:

- A statewide average of 3.38% (rounded to 2 significant figures) unregistered California vehicles.
    - 2.41% short term (< 3 months).
    - 0.95% long term (3 months to 2 years).
    - 0.03% chronic (> 2 years).
- The percentage of unregistered vehicles found for individual counties ranged from 0% to 6.45%.
- More populous counties (population >300,000) tended to have higher percentages of unregistered vehicles.
- The percentage of out-of-state and out-of-country vehicles was over 10% for 5 counties on the state border.
- The percentage of out-of-country vehicles was very high (19.95%) in Imperial County.
- At the county level, significant regressions were found between median household income and percentage of unregistered vehicles.
- Home ownership percentage and population were not correlated with vehicle registration rates.
- At the ZIP code level, no significant regressions were found between demographic variables and vehicle registration rates.
- The percentage of vehicles passing their last Smog Check test decreased with increasing time since last current registration.
- Of the 13 chronic (more than 2 years) unregistered vehicles, 11 (84.6%) had passed their last Smog Check test.
- Older model years tended to have a higher percentage of unregistered vehicles.

1. Introduction

Development of regional air pollution control strategies requires accurate estimation of the regional emissions inventory. Understanding and accurately portraying the in-use vehicle population is one of the most important aspects of obtaining accurate emission inventory estimates. Mobile sources, by their nature, are difficult to accurately account for in emissions inventories. The registered vehicle population will account for a majority of the vehicles on the road. However, unregistered vehicles and out-of-state vehicles represent an important proportion of the total inventory as well.

The importance of the unregistered population increases if these vehicles are high-emitters. It has been speculated that in-state unregistered vehicles may have a disproportionate effect on the emissions inventory because the unregistered vehicle fleet may include higher percentages of higher-emitting or older vehicles. The state requirement that vehicles under 25 years of age demonstrate that they meet emissions standards before their registrations can be renewed is one of the factors that could contribute toward higher emitting vehicles in the unregistered fleet. Beginning in 1997, the State of California also began to require vehicle owners to show proof of insurance before it would issue or renew a vehicle's registration. When this law came into effect, a significant drop in the official DMV count of registered vehicles was observed relative to 1996 [Hunstad, 1999]. It is suspected that these two requirements may have increased the number of unregistered vehicles in the state, especially poorly maintained vehicles that cannot pass a smog test.

The issue of unregistered vehicles in California has been studied in the past. Hunstad [1999] conducted a study to characterize uninsured motorists and provide estimates of the number of uninsured vehicles. For this study, the primary source of data on total vehicle counts was the DMV database. In this study, the records for vehicles with expired registration were also considered. Hunstad also reviewed other estimates of non-registration, including studies by the California Energy Commission, estimates based on California Highway Patrol (CHP) violations, DMV driver's license records, estimates based on surveys, and fatal accident reports. Although the methodologies for each approach were significantly different, results showed reasonable agreement. To incorporate the different perspectives from these approaches into one estimate, Hunstad presented a weighted yearly average of the estimated percentage of unregistered vehicles for the period 1988-1997. Rates varied between 11.7% and 8.5%. In most cases, the trends for non-registration rates were upward in 1997, the year in which new insurance laws came into effect.

The current emissions inventory for on-road motor vehicles is based primarily on the population of vehicles registered with the DMV. Estimates of the unregistered vehicle population were added to the EMFAC vehicle population. In making these estimates, the California Air Resources Board (CARB) examined DMV records of non-registration rates that reported a rate of approximately 7.4% for passenger cars [CARB, 2000]. The files maintained by the DMV can contain vehicles that may have become inoperative or may be located outside of the county of record, however. Since these vehicles are not part of the in-use fleet that would actually be operated in the area designated, their inclusion would result in an overestimate of the actual on-road fleet. Separate field studies conducted in 1991 found non-registration rates of about 7.8% for instantaneously unregistered vehicles and 0.56% for chronically unregistered vehicles in the in-use fleet [Dulla et al., 1991]. Only a small number of vehicles were sampled in the roadside pull-over studies, however, and this information was collected over a limited geographical area.

The objective of this program was to obtain a better understanding of the population and use characteristics of unregistered vehicles. The primary component of this study was a statewide field survey conducted to provide an estimate of the State of California unregistered vehicle population. In total, photographic records were obtained for over 120,000 vehicles, including vehicles in every county in the state. After elimination of partial plates, out-of-focus plates, and obstructed plates, there were more than 98,000 vehicles in the database. This represents the most comprehensive study of vehicle non-registration rates to date and encompasses all regions of the state. In addition to the total non-registration rate, the following information was also sought:

> A breakdown of the time period of unregistration status into instantaneous (less than 3 months), prolonged (3 months to 2 years) and chronic (more than 2 years) categories by county for California.
>
> Characteristics of unregistered vehicles including, but not limited to, model year and make by region or county for California.
>
> The percentage and identity in each county of non-California vehicles or vehicles which originated out of county.

This report discusses the results of this field study based on over 98,000 records having readable license plate information.

2. Methodology

A comprehensive field survey was conducted to determine the population of unregistered vehicles throughout California. Population data from the 1990 Census was used since the 2000 Census was not yet available. Sampling was conducted in all California counties, with the sampling in each county proportional to the county population for the larger counties. For the smaller counties, attempts were made to identify at least 200 vehicles for each county, although for a number of the less populous counties this was not feasible. The minimum number of sites sampled for each county was 10 to ensure a reasonable distribution of destination types. Table 2.1 provides the target population distribution as well as the minimum targeted number of vehicles to be sampled in each county.

Table 2.1. Field Survey Distribution.

County	Population	% of total CA Population	# of vehicles to sample	County	Population	% of total CA Population	# of vehicles to sample
Los Angeles	8,863,164	29.8%	33,953	El Dorado	125,995	0.4%	483
San Diego	2,498,016	8.4%	9,570	Humboldt	119,118	0.4%	456
Orange	2,410,556	8.1%	9,235	Napa	110,765	0.4%	424
Santa Clara	1,497,577	5.0%	5,737	Imperial	109,303	0.4%	419
San Bernardino	1,418,380	4.8%	5,434	Kings	101,469	0.3%	389
Alameda	1,279,182	4.3%	4,901	Madera	88,090	0.3%	337
Riverside	1,170,413	3.9%	4,484	Mendocino	80,345	0.3%	308
Sacramento	1,041,219	3.5%	3,989	Nevada	78,510	0.3%	301
Contra Costa	803,732	2.7%	3,079	Sutter	64,415	0.2%	247
San Francisco	723,959	2.4%	2,774	Yuba	58,228	0.2%	223
Ventura	669,016	2.2%	2,563	Lake	50,631	0.2%	200
Fresno	667,490	2.2%	2,557	Tehama	49,625	0.2%	200
San Mateo	649,623	2.2%	2,489	Tuolumne	48,456	0.2%	200
Kern	543,477	1.8%	2,082	Siskiyou	43,531	0.1%	200
San Joaquin	480,628	1.6%	1,841	San Benito	36,697	0.1%	200
Sonoma	388,222	1.3%	1,487	Calaveras	31,998	0.1%	200
Stanislaus	370,522	1.2%	1,419	Amador	30,039	0.1%	200
Santa Barbara	369,608	1.2%	1,416	Lassen	27,598	0.1%	200
Monterey	355,660	1.2%	1,363	Glenn	24,798	0.1%	200
Solano	340,421	1.1%	1,304	Del Norte	23,460	0.1%	200
Tulare	311,921	1.0%	1,195	Plumas	19,739	0.1%	200
Marin	230,096	0.8%	882	Inyo	18,281	0.1%	200
Santa Cruz	229,734	0.8%	880	Colusa	16,275	0.1%	200
San Luis Obispo	217,162	0.7%	832	Mariposa	14,302	0.0%	200
Butte	182,120	0.6%	698	Trinity	13,063	0.0%	200
Merced	178,403	0.6%	683	Mono	9,956	0.0%	200
Placer	172,796	0.6%	662	Modoc	9,678	0.0%	200
Shasta	147,036	0.5%	563	Sierra	3,318	0.0%	200
Yolo	141,092	0.5%	541	Alpine	1,113	0.0%	200
				Total State Population	29,760,021		116,000

2.1 Site Selection

A critical component of the field survey was the selection of sites. To obtain a demographically representative sample, sampling within each county was resolved to the ZIP code level. ZIP codes for sampling were selected randomly from the list of ZIP codes for each county. Sampling within ZIP codes was then proportional to population within the ZIP code with samples taken at as many sites within the ZIP code as practical.

Sites for this study were selected in the field and were restricted to destinations rather than residences. This ensured a high probability that the vehicles captured in the survey were driven on some regular basis. Field teams were provided with ZIP code maps having major freeways and streets identified as well as businesses (Figure 2.1).

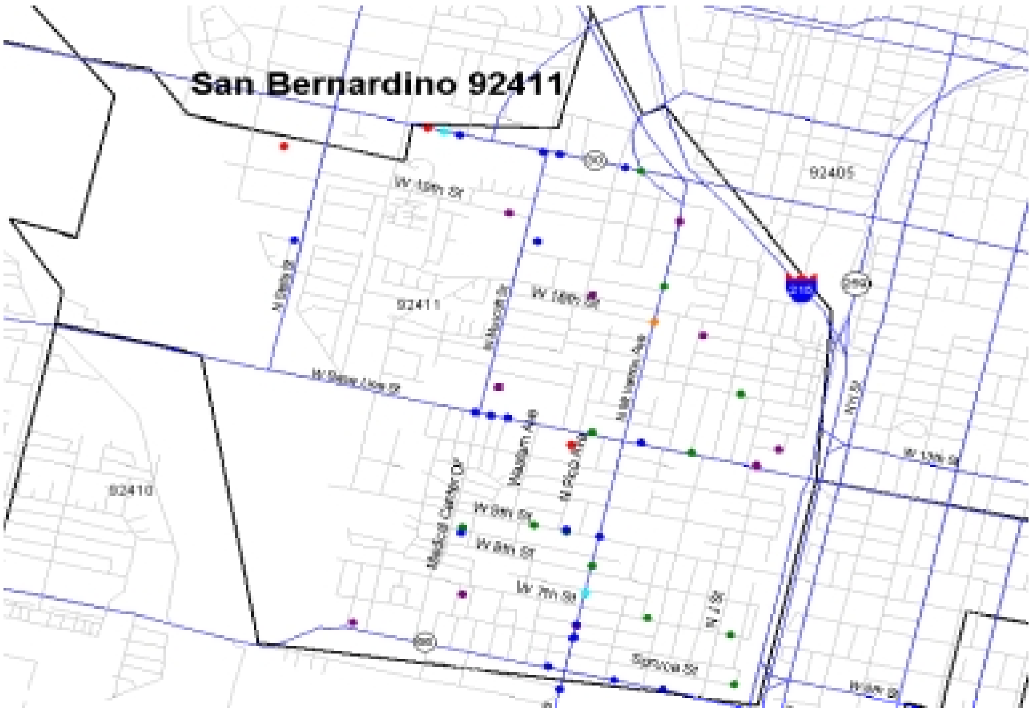

Figure 2.1. Sample ZIP Code Map.

2.1.1. Safety

Safety was also a critical concern in site selection. Local law enforcement agencies were contacted prior to conducting surveys to provide guidance in ensuring safety throughout the project. In total, four ZIP codes were deleted from the sampling plan based on their recommendations. The deleted ZIP codes were replaced with the next ZIP code within the random list for the appropriate county. This had negligible impact on the overall statistics obtained from the field study with 4 out of the total 409 ZIP codes in the study being replaced by random selection. It should be noted that in general, high crime areas were not excluded from the study but were instead sampled with greater caution. The only areas excluded were those that were identified as having active gang violence or significant drug-related activity.

2.2 Survey Teams and Field Equipment

Each survey team was composed of a driver and one or two photographers. Teams with two photographers were used in high-population-density areas as well as areas considered less safe. The most senior team member was responsible for all sampling related decisions as well as team safety.

Data collection was performed using Toshiba M-4 digital cameras (Figure 2.2). These cameras proved to be efficient and reliable, and most importantly, have a refresh time between shots of less than a second. One Toshiba M-70 digital camera was also used. It had a slower refresh rate (1.5 seconds vs. 0.8 seconds), however, so it was primarily used as a secondary camera. Refresh rates of less than a second were necessary for capturing a majority of the license plates in a row of parked cars while maintaining a normal rate of speed through the parking lot. The 1.5 second refresh rate of the M-70 camera was sufficient for more sparse rows of vehicles as well as less populated rural areas. The speed and clarity of the pictures allowed for rapid gathering of data. This was critical to obtain the most robust sample possible and to minimize potential adverse contact with the public. Data were stored on flash ram cards. Cameras were powered by a 12-volt inverter connected to the cigarette lighter for extended shooting time.

Figure 2.2. Toshiba PDR M-4 Digital Camera.

2.3 Data Capture

The digital photographic records were stored on flash media cards during the daily surveys. For locally based teams, the images were downloaded at CE-CERT. For the teams in the field overnight, the flash media cards were downloaded to a laptop computer following the completion of each day's sampling. Daily downloading of data and backup onto hard drive storage was part of the quality assurance protocol that governed the field work. For each survey site, records were obtained including the date and time the site was visited and a description of the site and its location such as city, county, as well as ZIP code.

2.3.1. Sample Identification

An important part of the data gathering process was the identification of the location of each license plate photograph. The first photograph in each parking lot was of a dry-erase board with the pertinent information filled in (Figure 2.3). The sites were chosen to represent the businesses within the ZIP code. The type of business served by the sample parking lot was classified where possible, but frequently there were multiple businesses bordering the lot that made classification difficult. For example, a strip mall could contain a small grocery store, an insurance sales office, a video game arcade, and a dress shop, and border on a motel. Every effort was made to classify sites by primary business use, but many sites could not be assigned a clear label. Malls were frequently problematic because of the wide variety of businesses that exist within even the smaller malls. For malls where a primary use or uses could not be determined the site was classified by size (Table 2.2).

Table 2.2 Field Definition of Shopping Mall Classification.

Strip mall	Stores on one side of parking lot, not more than one block long.
Mini mall	Stores on two sides of parking lot, or one side over more than one block.
Mall	Stores on three or four sides of a parking lot, or stores covering an entire block.
Regional mall	Largest mall in the region and stores covering two or more blocks. Generally smaller in more rural areas than in heavily populated areas.

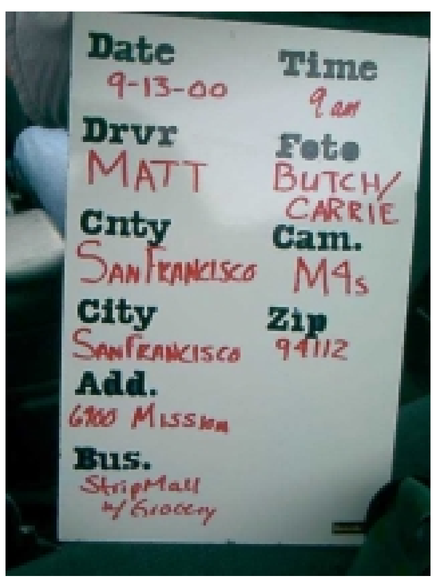

Figure 2.3. Example of Dry-Erase Sample Identification Board.

2.3.2 Photographic Data Collection

After identification of an individual parking lot for data collection, the sampling vehicle was driven through the lot at normal speed while the photographer(s) captured the license plates (Figure 2.4). In general, pedestrians did not notice the data collection activity. However, for team safety, window tinting was added to one of the vehicles for use in areas where there was thought to be a greater chance of observation by pedestrians.

Figure 2.4. Illustration of Pedestrian View of Data Collection Procedure.

2.3.3 License Plate Obstructions

Because of the need to blend in with normal activity in the parking lots it was not always possible to get a clear shot of all of the license plates. The majority of license plate photographs provided a clear picture of the plate, allowing for easy identification of the license as well as the month and year of registration and frequently make and model of the vehicle (Figure 2.5).

Figure 2.5. Unobstructed License Plate Photograph (License partially obscured for privacy).

In some cases, obstructions made the identification of full or partial vehicle information impossible. This included non-random obstructions such as trailer hitches that are more likely to appear on trucks than on cars (54/13) (Figure 2.6). Although it is possible to read the registration from the picture, the complete license plate number is not visible. The total number of non-random obstructions was less than 0.1% of the total readable plates and was ignored.

Figure 2.6. Non-Random License Plate Obstruction.

There were also random obstructions such as pedestrians (Figure 2.7) that were not biased towards any particular type of vehicle. The random obstructions were not considered to be a major problem because they are random and will not bias the results.

Figure 2.7. Random License Plate Obstruction.

2.4 Data Processing

To optimize the field surveying time, all photographic records were post processed back at CE-CERT.

2.4.1 Data Entry

A separate Microsoft MS^{TM} Excel spreadsheet was created for each ZIP code. The license plate data were entered into an Excel spreadsheet along with the time and date of collection, driver's name, photographer's name, make of vehicle, location, location description, and ZIP code. These data were recorded on the first photograph of each site.

Given the nature of the rapid data collection in the field and the need to get large numbers of records, a percentage of the license plate photographs collected in the field were unreadable. The overall unreadable license plate rate averaged about 20% with a range from 1% to over 40% in some ZIP codes. The highest percentages of unreadable license plates were typically at sites surveyed during rain or near sundown. It was also found that the ability of the cameras to focus rapidly (essential for maintaining typical driving speed) degraded slightly with camera age. The cameras were used extensively in a short time period that was not typical of consumer camera usage. Up to 20,000 pictures were taken on each camera in the summer months, sometimes including several thousand pictures per day. On a limited number of occasions, some 32 MB memory chips also had failures that were attributed to excessive heat.

Picture files that were unreadable were simply left out of the spreadsheets during data entry since these records did not affect the determination of the unregistered vehicle rate or any other important statistics. Field teams attempted to collect 10% to 20% extra photographs for each ZIP code to compensate for the expected unreadable percentage.

The vehicle make and model were visually determined for roughly half of the vehicles photographed by the data entry team. This information was primarily collected to estimate the rate of plate switching that might occur in the in-use fleet. While it is not expected that this type of registration cheating is common, it was decided that it could not be ruled out without collecting the observed make and model data on a significant portion of the vehicles to match up with the DMV make and model information corresponding to the observed license plates.

2.4.2 Data Validation

Data validation consisted of double entry and cross-checking of a 5% sub-sample of the data. In addition, random spot checks of individual vehicles throughout the data set were conducted during the data entry process. Additional screening of the data was conducted based on checking for unusual driving distances and for differences between the observed vehicle make/model and the VIN decoded make/model. License plate numbers identified in the screening process are checked by re-examining the photograph and corrected if necessary. The error rate for data entry of license plate numbers was consistently well below 1%.

2.4.3 DMV/VIN Decoding

To determine the characteristics of the unregistered vehicles and determine out-of-county activity, the database from the field survey was cross-referenced with a DMV vehicle registration (VR) database. ARB staff used the license plate numbers in conjunction with a VIN decoder to obtain the data for the California registered vehicles. The VR reports are produced periodically and contain various types of VR information. For our analysis, the data were reduced to home ZIP code and vehicle model year, make and model. The VIN dataset does contain transmission type, engine displacement, and other vehicle-specific information which would be useful in emissions modeling.

3. Results

License plate data collection began in June 2000 and ended in December 2000. During this time all counties were sampled, and data were collected in a total of 409 ZIP codes throughout the state. Figure 3.1 is a map of California showing the locations of ZIP codes where data were collected. In this section, results are first given for the observed data, followed by an analysis of BAR Smog Check data, and, finally, a comparison of DMV information is provided. The observed data section contains analyses on the data collected in the field. The BAR Smog Check data is compared with the registration status of vehicles, with a special note made of unregistered vehicles. Comparison of the observed registration data and the DMV registration data was also used to establish the percentage of vehicles that may have tags that were not purchased for the observed vehicle.

Figure 3.1. Centroid Location of Sampled ZIP Codes.

3.1 Observed Data

For this section, all registration figures are taken from observed data collected in the field. Vehicles that have had their registration stickers stolen or lost by the owner would appear to be unregistered, but would in fact be registered. Conversely, owners who have stolen a registration sticker would appear to be registered in the observed data.

3.1.1 County Registration Rates

More than 98,800 records have been analyzed from the field survey. These data are presented in Table 3.1. For Table 3.1, “Front” indicates that the vehicle’s license plate number (LPN) was captured from the front of the vehicle and thus no registration information is available from the picture. “Dealer” indicates the vehicle’s LNP was a paper plate or a dealership plate of a newly purchased vehicle used before the issued license plate is received. The category “Unknown” was given to photographed vehicles for which either the picture quality prevented identification of the month if the vehicle had a registration year of 2000 or the year sticker was missing. For this study, a vehicle was considered registered if the year sticker was 2001 and unregistered if the year sticker is 1999 or older regardless of the month. For the vehicles with year 2000 stickers, the month of registration was evaluated against the time period when the vehicle was identified to determine the registration status. The percent unregistered was calculated by dividing the number of unregistered vehicles by the sum of registered vehicles, unregistered vehicles and dealer plates (registration is paid at the time of vehicle purchase, so it was assumed dealer plates are registered vehicles).

The overall average non-registration rate in California is near 3.4% with a range of 0 to 6.45% for different counties. These data are represented in Figure 3.2 in the form of a histogram. These data show that roughly 50% of the counties have unregistration rates ranging between 2% and 4%. Nearly all counties had non-registration rates below 5%. As a subset, the data for the most populous counties (population greater than 300,000) is shown in Figure 3.3. In general, the larger counties had a tendency toward higher non-registration rates than the overall distribution, with non-registration rates in larger counties generally ranging from 2% to 5%.

The counties with non-registration rates of less than 1% were generally smaller counties with sample sizes of fewer than 500 vehicles. In some small counties, no unregistered vehicles were found in the field data. Alpine County has the highest rate of unregistered vehicles at 6.45%, but this figure may be due in part to the small number of samples that could be obtained in the county. Calaveras, San Diego, and Madera counties have the next-highest non-registration rates of 5.22%, 4.99% and 4.51%, respectively.

Table 3.1. Registration Rates by County.

County	Total	Registered	Unregistered	Instantaneous	Long Term	Chronic	Dealer	Front	No Plate	Out of State	Out of Country	Unknown	% Unreg
Alameda	3529	2688	72	54	18	0	52	238	1	38	0	440	2.56
Alpine	54	29	2	2	0	0	0	0	0	16	0	7	6.45
Amador	142	118	3	3	0	0	1	8	0	3	0	9	2.46
Butte	561	427	11	8	3	0	3	57	0	9	0	54	2.49
Calaveras	159	127	7	6	1	0	0	10	1	2	0	12	5.22
Colusa	64	53	1	1	0	0	1	2	1	0	0	6	1.82
Contra Costa	2597	1929	42	30	12	0	44	131	3	21	0	427	2.08
Del Norte	234	150	0	0	0	0	1	29	2	30	0	22	0.00
El Dorado	496	379	17	14	3	0	6	33	2	27	0	32	4.23
Fresno	2059	1652	67	53	14	0	33	146	0	2	0	159	3.82
Glenn	132	107	1	1	0	0	0	1	0	0	0	23	0.93
Humboldt	393	288	6	2	4	0	1	37	0	3	0	58	2.03
Imperial	411	234	7	4	3	0	6	34	0	6	82	42	2.83
Inyo	168	130	3	2	1	0	0	11	0	14	0	10	2.26
Kern	1401	1042	46	37	9	0	16	130	1	4	0	162	4.17
Kings	313	204	3	3	0	0	1	23	1	32	0	49	1.44
Lake	153	104	1	0	1	0	1	24	0	3	0	20	0.94
Lassen	125	77	3	2	1	0	0	27	1	3	0	14	3.75
Los Angeles	25835	20153	749	535	211	3	317	2146	15	214	3	2238	3.53
Madera	323	251	12	10	1	1	3	11	0	6	0	40	4.51
Marin	901	735	13	10	3	0	3	33	1	4	0	112	1.73
Mariposa	155	117	3	1	2	0	1	6	0	2	0	26	2.48
Mendocino	312	242	3	3	0	0	1	26	0	3	0	37	1.22
Merced	699	546	24	19	5	0	7	41	0	12	0	69	4.16
Modoc	56	37	1	1	0	0	0	10	0	1	0	7	2.63
Mono	298	233	5	4	1	0	0	16	0	13	0	31	2.10
Monterey	1218	839	25	17	7	1	17	88	0	36	0	213	2.84
Napa	314	246	8	6	2	0	4	18	0	5	0	33	3.10
Nevada	253	166	5	5	0	0	2	23	0	34	0	23	2.89
Orange	9468	7421	251	171	76	4	169	665	18	138	4	802	3.20
Placer	689	502	16	12	4	0	5	48	0	25	0	93	3.06
Plumas	146	106	2	2	0	0	2	11	0	3	0	22	1.82
Riverside	4262	3026	144	83	60	1	94	238	6	123	0	631	4.41
Sacramento	3337	2573	90	50	37	3	53	233	12	37	0	339	3.31
San Benito	188	142	3	1	2	0	0	8	0	4	0	31	2.07
San Bernardino	4417	3115	117	72	44	1	89	314	11	148	0	623	3.52
San Diego	9584	7226	385	300	83	2	110	708	3	230	22	900	4.99
San Francisco	2840	2154	100	74	25	1	33	226	3	85	0	239	4.37
San Joaquin	1241	885	12	8	4	0	4	102	5	6	0	227	1.33
San Luis Obispo	1057	825	23	19	4	0	3	70	0	15	0	121	2.70
San Mateo	2705	2112	75	54	19	2	35	144	8	60	0	271	3.38
Santa Barbara	1464	1144	37	27	10	0	20	74	0	32	0	157	3.08
Santa Clara	4109	3084	91	55	33	3	74	271	6	43	0	540	2.80
Santa Cruz	875	639	21	15	6	0	7	67	0	9	0	132	3.15
Shasta	866	648	3	3	0	0	7	59	0	20	0	129	0.46
Sierra	36	20	0	0	0	0	0	5	0	6	0	5	0.00
Siskiyou	235	181	0	0	0	0	1	17	0	4	0	32	0.00
Solano	782	570	4	3	1	0	17	58	1	5	0	127	0.68
Sonoma	1404	1100	28	17	11	0	7	54	1	7	0	207	2.47
Stanislaus	1329	1076	40	29	11	0	2	94	1	8	0	108	3.58
Sutter	206	161	4	2	2	0	3	10	0	3	0	25	2.38
Tehama	250	185	2	2	0	0	1	23	0	4	0	35	1.06
Trinity	159	116	0	0	0	0	0	14	0	1	0	28	0.00
Tulare	875	653	6	6	0	0	1	28	0	5	0	182	0.91
Tuolumne	145	101	3	2	1	0	0	17	1	4	0	19	2.88
Ventura	2073	1574	61	48	13	0	43	120	1	22	0	252	3.64
Yolo	502	368	16	15	1	0	0	45	1	5	0	67	4.17
Yuba	218	158	3	3	0	0	1	9	1	4	0	42	1.85
Total	98817	75168	2677	1906	749	22	1302	7091	108	1599	111	10761	3.38

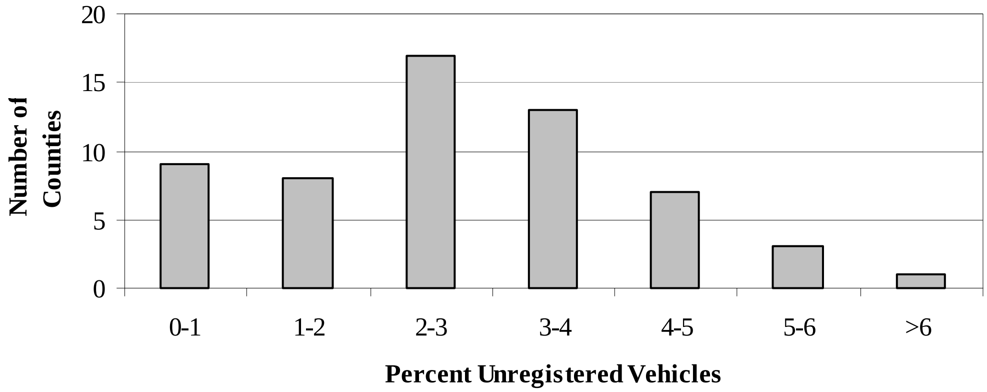

Figure 3.2. Percent Unregistered Vehicles Histogram by All Counties.

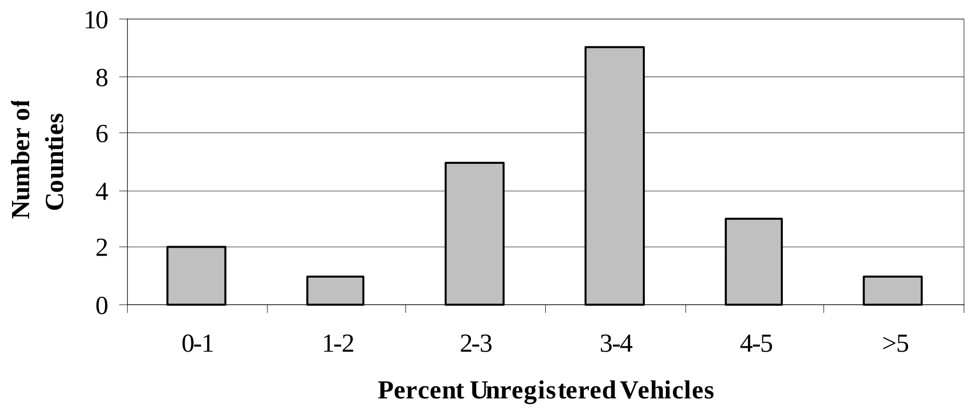

Figure 3.3. Percent Unregistered Vehicles Histogram by Large Counties.

Figure 3.4 shows how registration status varies throughout the state. In general, higher non-registration rates were found in Southern California as well as the counties surrounding the Bay Area. It is interesting to note that on a county basis the more rural northern California counties had a lower non-registration rate than the more urban counties. Areas that only require emissions testing with change of ownership had non-registration rates ranging from 0 to 6.45%. Basic areas that have biennial testing had non-registration rates ranging from 0 to 4.5%. Non-registration rates for areas that are a mixture of enhanced, basic and change of ownership ranged from under 1% to 5.4%. Overall, there does not seem to be a correlation between different Smog Check areas and registration status.

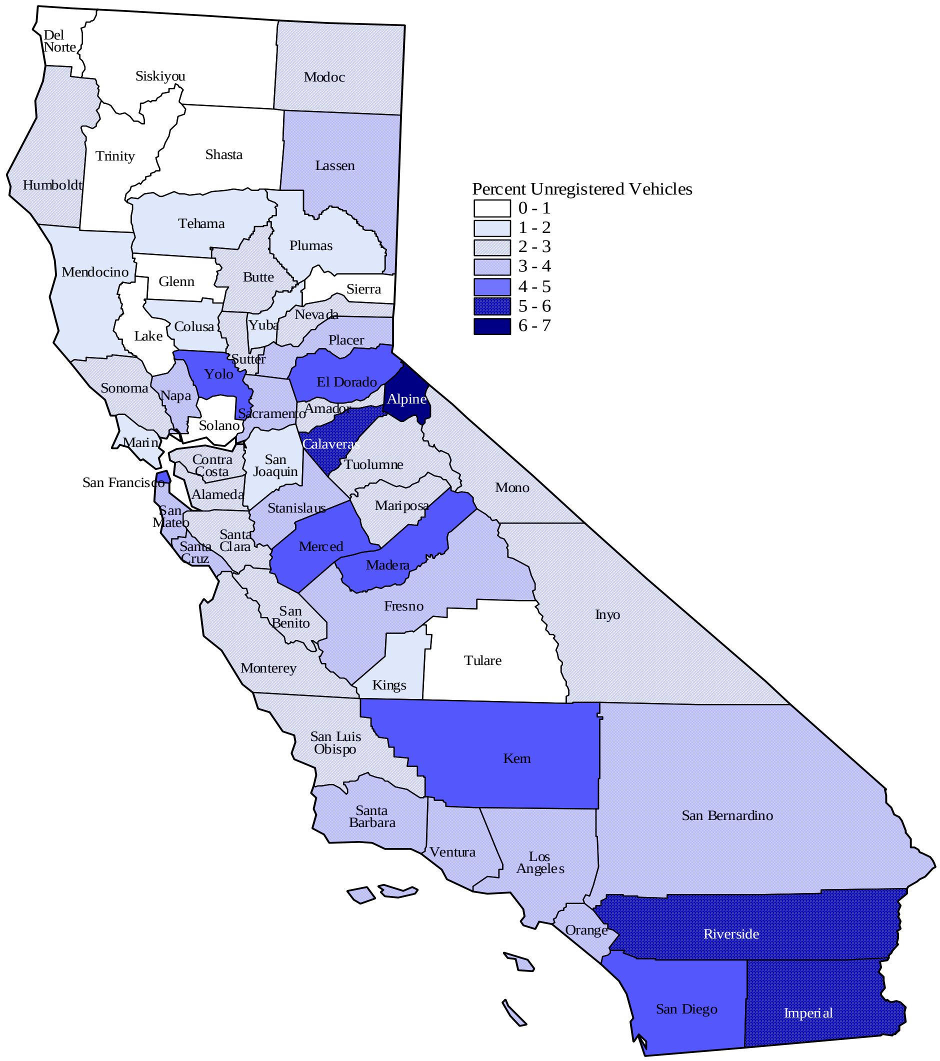

Figure 3.4. On-Road Registration Status of California Registered Vehicles by County.

The individual ZIP code data showed a wider range of non-registration rates than the overall county data. Kern, San Diego, and San Benito counties all had at least one ZIP code with a non-registration rate above 20%. Almost one third of the ZIP codes with non-registration rates over 10% had median household incomes less than $25,000 and over 45% renter-occupied housing. The highest non-registration rate for a single ZIP code was found in Kern County, with 33% of the vehicles captured in that ZIP code being unregistered.

Figure 3.5 presents the breakdown of the overall 3.38% non-registration rate by the length of time unregistered. A total of 2.41% of the California licensed vehicles were classified as Instantaneous (less than 3 months) unregistered. A total of 0.95% of the California licensed vehicles were classified as Long Term (3 months to 2 years) unregistered. Chronic unregistered accounted for 0.03% of the California licensed vehicles.

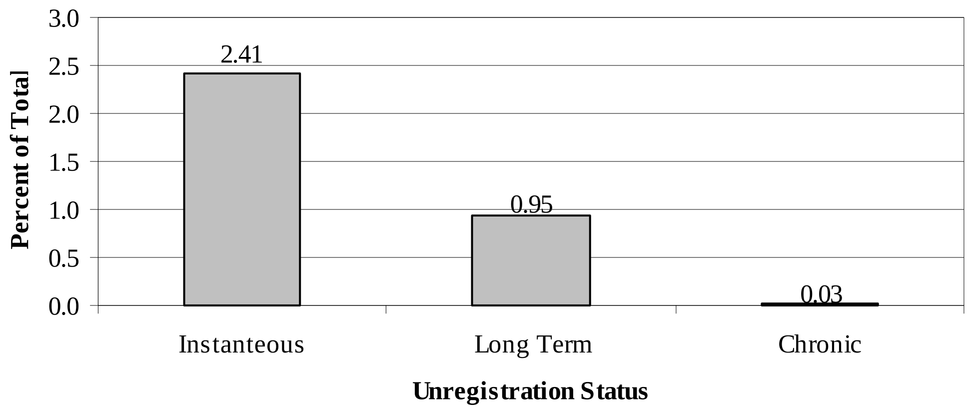

Figure 3.5. Length of Time for Vehicle Non-registration.

3.1.2 Out-of-state Vehicles

The proportion of out-of-state vehicles varied considerably from county to county as shown in Figure 3.6. In general, higher percentages of out-of-state vehicles were found in the border counties and counties and ZIP codes having well known tourist attractions. As seen in Figure 3.6, border counties such as Del Norte, Sierra, Nevada, Alpine, Inyo, and Imperial as well as Kings County in the Central Valley have relatively high proportions (>10%) of out-of-state vehicles.

3.1.3 Percent Missed Vehicles

Taking into account the number of unregistered vehicles and out-of-state vehicles found in each county, the percentage of vehicles that would not be accounted for in a typical inventory based on DMV registered vehicle data was calculated. These results are presented in Figure 3.7. These results show that in general, the percentage of vehicles not accounted for by DMV registration was typically 10% or less.

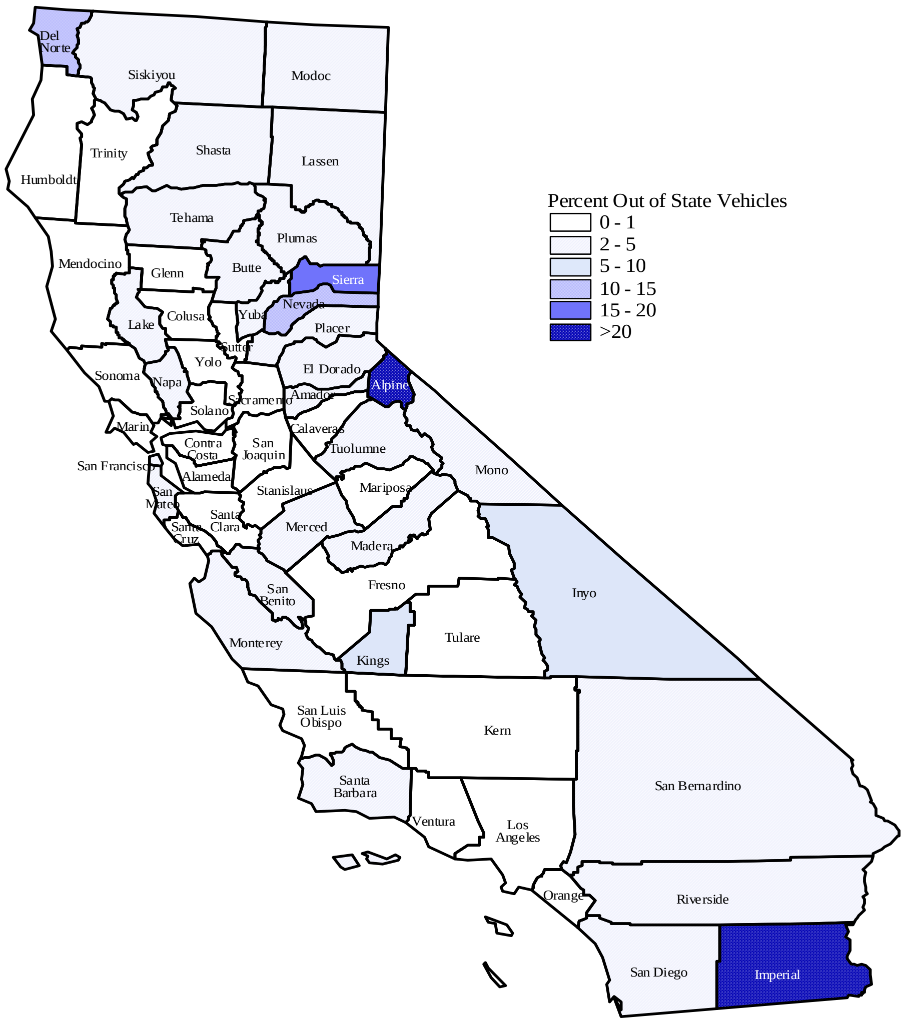

Figure 3.6. Proportion of Out-of-State Vehicles by County.

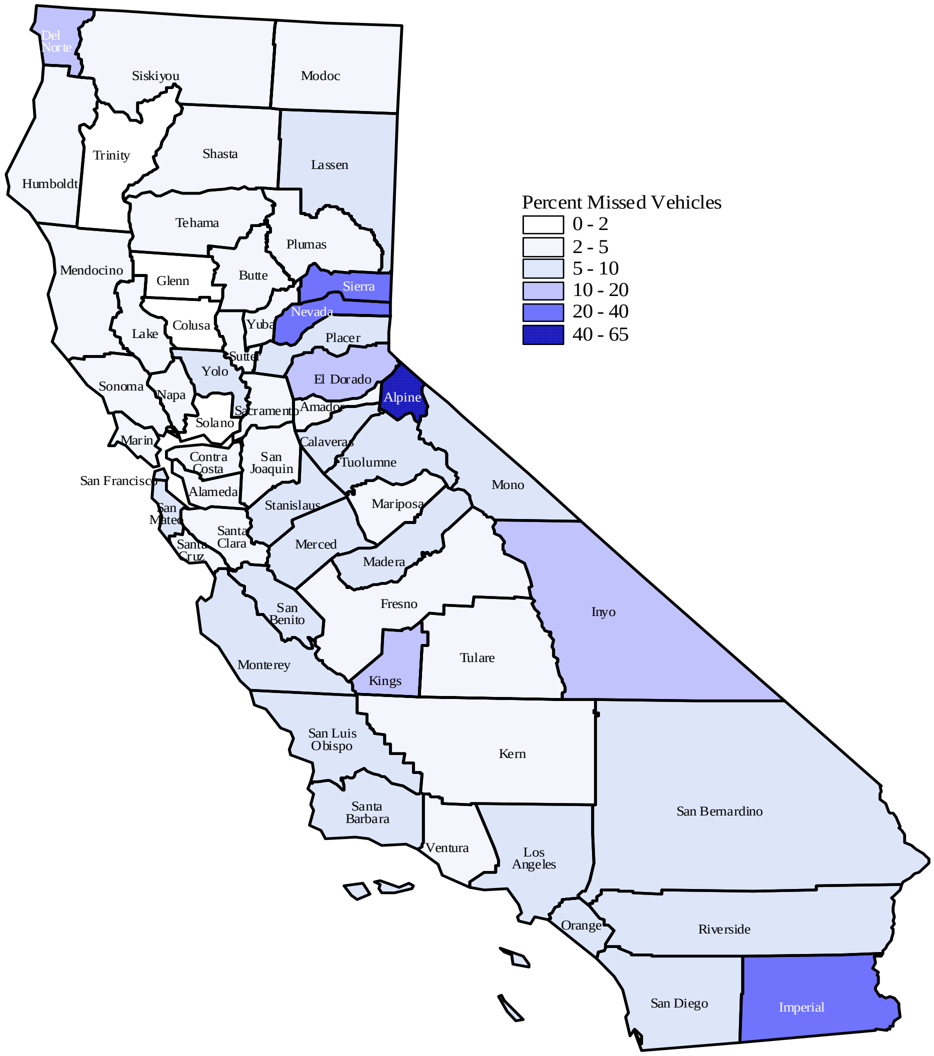

Figure 3.7. Proportion of Missed Vehicles by County.

3.1.4 Demographic Analysis

Demographic data for the sampled counties and ZIP codes were collected for correlation analysis with the vehicle registration rates. The population data, owner occupancy, owner percentage, renter occupancy and renter percentage data are all from the 2000 Census. The income data were obtained from the 1990 Census because the 2000 Census income data were not available at the time of this report.

Analysis was also conducted on the observed vehicles to check for correlation between the demographics of the registration ZIP code and the percentage of vehicles registered. ZIP codes that had less than 25 vehicles observed in the study were removed from the analysis because the small number of samples makes estimation of the rate of registration highly variable.

The summary results of the regression analysis are presented in Table 3.2 for the observation ZIP codes and counties and for the registration ZIP codes. The complete results are presented on the following pages in Tables 3.3 to 3.10, and Figures 3.8 to 3.15.

Table 3.2. Summary of Demographic Regression Results for Observation ZIP Code.

Variable	Regression p-value	R-square	Regression Type
Observation County			
Household Income	*0.0040*	0.250	Quadratic
Population	0.0962	0.049	Not Significant
Owner Percent	0.2766	0.021	Not Significant
Observation ZIP Code			
Household Income	0.6620	0.0005	Not Significant
Population	0.6575	0.001	Not Significant
Owner Percent	0.8776	0.0001	Not Significant
Registration ZIP Code			
Household Income	0.8453	0.000	Not Significant
Population	*0.0066*	0.009	Linear

The finding of significant regressions on household income at the county level and on population at the zip code level do indicate that further research on demographic links to vehicle registration should be conducted. However, the low r-squares of the regressions make it quite evident that the relationship is weak with the current analysis.

Regression Summary
% Unreg vs. Median HI ($)

Count	58
Num. Missing	1
R	.500
R Squared	.250
Adjusted R Squared	.223
RMS Residual	1.267

ANOVA Table
% Unreg vs. Median HI ($)

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	2	29.383	14.692	9.157	.0004
Residual	55	88.246	1.604		
Total	57	117.629			

Regression Coefficients
% Unreg vs. Median HI ($)

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	-9.308	3.036	-9.308	-3.066	.0034
Median HI ($)	.001	1.879E-4	3.668	3.744	.0004
Median HI ($)^2	-9.640E-9	2.778E-9	-3.400	-3.470	.0010

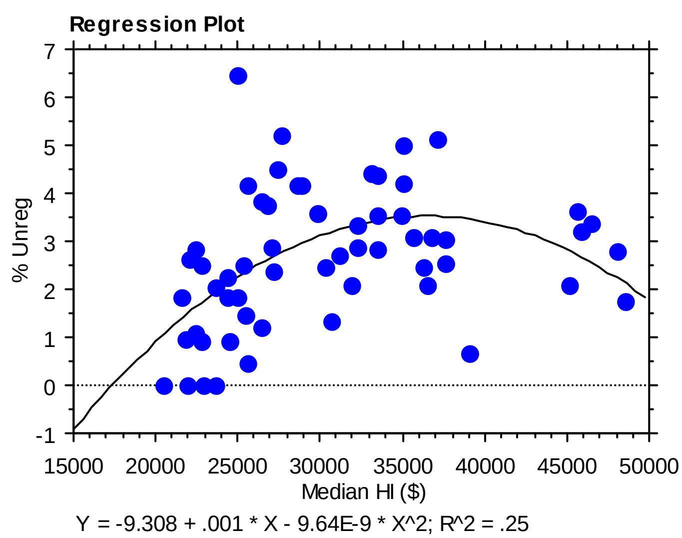

Figure 3.8. County household income regression summary, ANOVA table, regression coefficients, and regression plot of average county household income against % unregistered vehicles.

Regression Summary
% Unreg vs. population

Count	58
Num. Missing	1
R	.221
R Squared	.049
Adjusted R Squared	.032
RMS Residual	1.414

ANOVA Table
% Unreg vs. population

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	5.722	5.722	2.864	.0962
Residual	56	111.907	1.998		
Total	57	117.629			

Regression Coefficients
% Unreg vs. population

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	2.517	.202	2.517	12.431	<.0001
population	2.344E-7	1.385E-7	.221	1.692	.0962

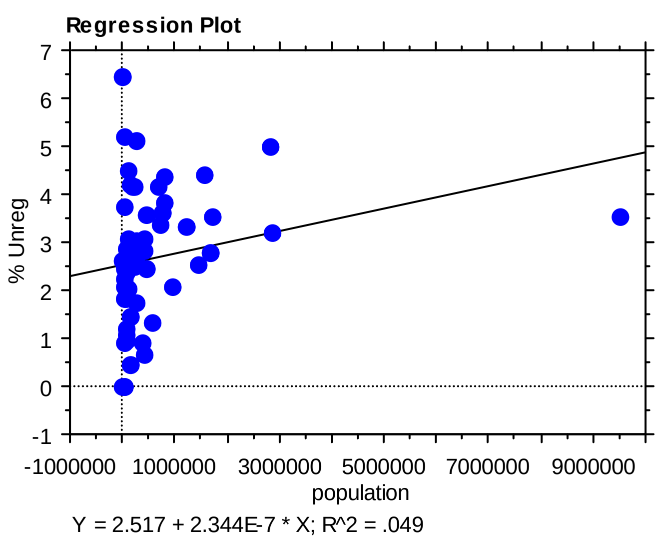

Figure 3.9. County population regression summary, ANOVA table, regression coefficients, and regression plot of county population against % unregistered vehicles.

Regression Summary
% Unreg vs. Owner %

Count	58
Num. Missing	1
R	.145
R Squared	.021
Adjusted R Squared	.004
RMS Residual	1.434

ANOVA Table
% Unreg vs. Owner %

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	2.482	2.482	1.207	.2766
Residual	56	115.147	2.056		
Total	57	117.629			

Regression Coefficients
% Unreg vs. Owner %

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	4.436	1.633	4.436	2.716	.0088
Owner %	-.028	.026	-.145	-1.099	.2766

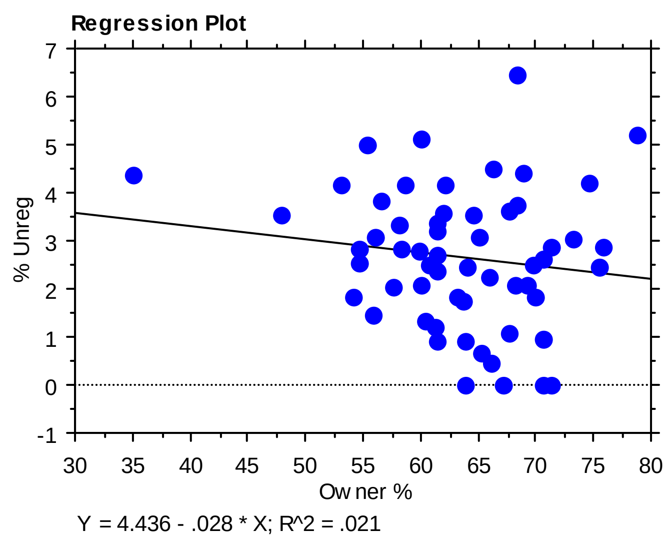

Figure 3.10. County percent home ownership regression summary, ANOVA table, regression coefficients, and regression plot of county home ownership % against % unregistered vehicles.

Regression Summary
% Unreg vs. Median household income (dollars)

Count	392
Num. Missing	17
R	.022
R Squared	4.906E-4
Adjusted R Squared	•
RMS Residual	3.915

ANOVA Table
% Unreg vs. Median household income (dollars)

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	2.934	2.934	.191	.6620
Residual	390	5977.849	15.328		
Total	391	5980.784			

Regression Coefficients
% Unreg vs. Median household income (dollars)

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	3.127	.524	3.127	5.966	<.0001
Median household income (dollars)	5.949E-6	1.360E-5	.022	.438	.6620

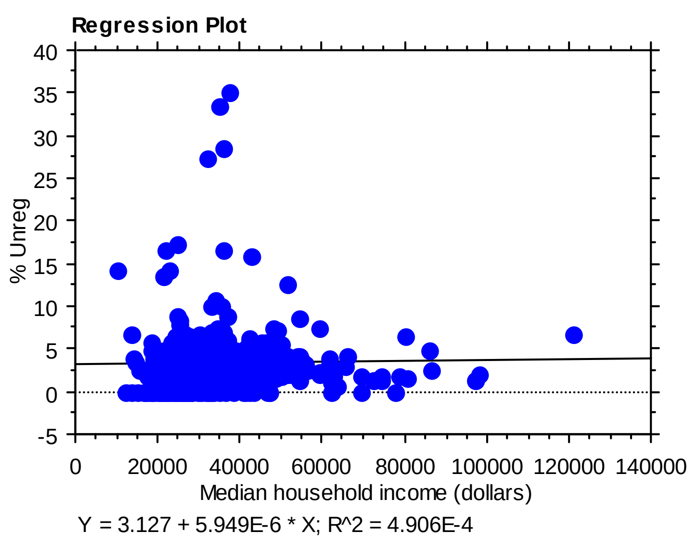

Figure 3.11. Observation ZIP code household income regression summary, ANOVA table, regression coefficients, and regression plot of observation ZIP code median household income against % unregistered vehicles.

Regression Summary
% Unreg vs. population

Count	395
Num. Missing	14
R	.022
R Squared	.001
Adjusted R Squared	•
RMS Residual	3.921

ANOVA Table
% Unreg vs. population

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	3.027	3.027	.197	.6575
Residual	393	6040.976	15.371		
Total	394	6044.003			

Regression Coefficients
% Unreg vs. population

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	3.498	.324	3.498	10.807	<.0001
population	-4.547E-6	1.025E-5	-.022	-.444	.6575

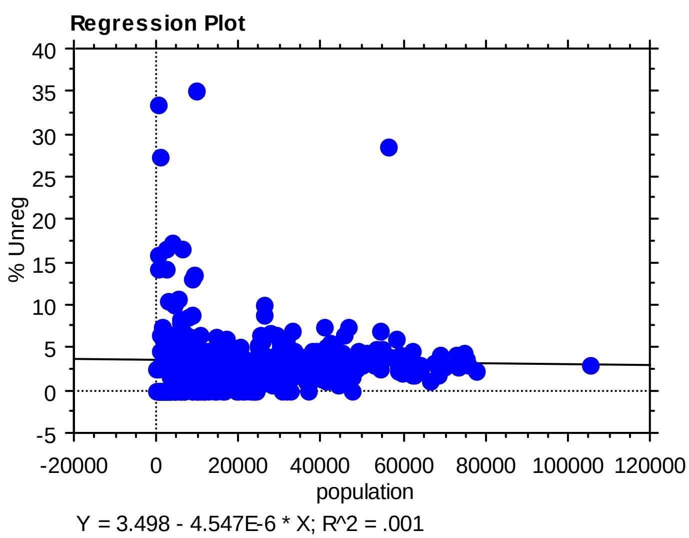

Figure 3.12. Observation ZIP code population regression summary, b) ANOVA table, and c) regression coefficients, and regression plot of observation ZIP code population against % unregistered vehicles.

Regression Summary
% Unreg vs. Owner %

Count	395
Num. Missing	14
R	.008
R Squared	6.044E-5
Adjusted R Squared	•
RMS Residual	3.922

ANOVA Table
% Unreg vs. Owner %

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	.365	.365	.024	.8776
Residual	393	6043.638	15.378		
Total	394	6044.003			

Regression Coefficients
% Unreg vs. Owner %

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	3.279	.709	3.279	4.627	<.0001
Owner %	.002	.011	.008	.154	.8776

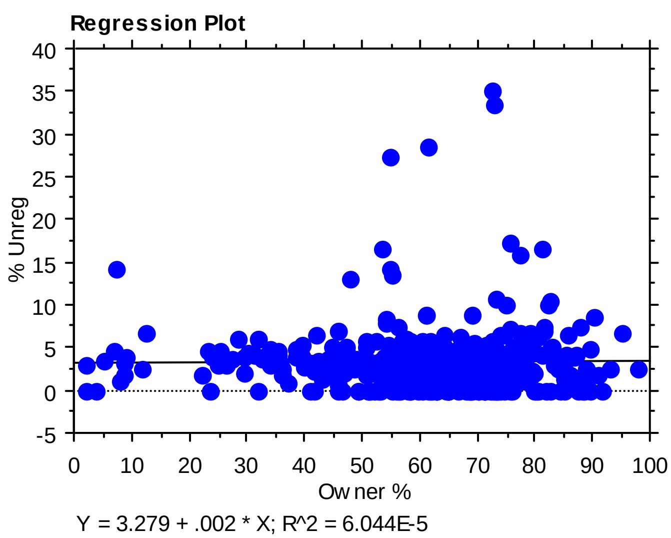

Figure 3.13. Observation ZIP code home ownership percentage summary, ANOVA table, regression coefficients, and regression plot of observation ZIP code population against % Unregistered vehicles.

Regression Summary
Percent Unregistered vs. Median HI (1990)

Count	813
Num. Missing	58
R	.007
R Squared	4.694E-5
Adjusted R Squared	•
RMS Residual	2.729

ANOVA Table
Percent Unregistered vs. Median HI (1990)

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	.284	.284	.038	.8453
Residual	811	6040.780	7.449		
Total	812	6041.064			

Regression Coefficients
Percent Unregistered vs. Median HI (1990)

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	3.213	.285	3.213	11.261	<.0001
Median HI (1990)	1.371E-6	7.028E-6	.007	.195	.8453

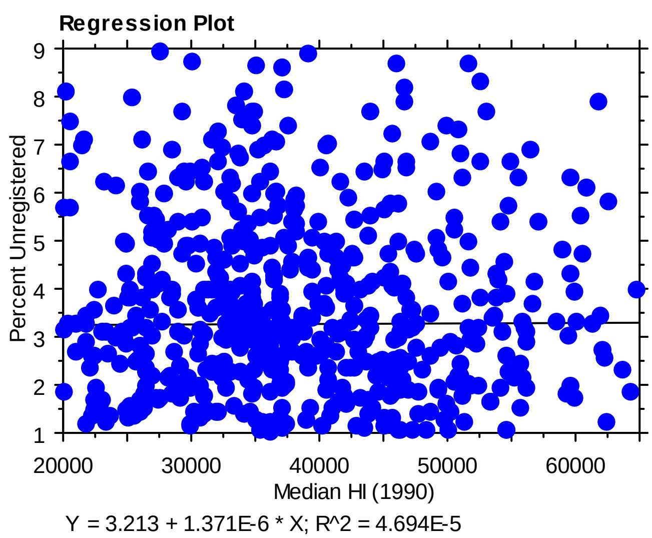

Figure 3.14. Registration ZIP code home ownership percentage summary, ANOVA table, regression coefficients, and regression plot of registration ZIP code median income against % unregistered vehicles.

Regression Summary
Percent Unregistered vs. Population(1990)

Count	813
Num. Missing	58
R	.095
R Squared	.009
Adjusted R Squared	.008
RMS Residual	2.717

ANOVA Table
Percent Unregistered vs. Population(1990)

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	54.824	54.824	7.427	.0066
Residual	811	5986.240	7.381		
Total	812	6041.064			

Regression Coefficients
Percent Unregistered vs. Population(1990)

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	2.768	.206	2.768	13.442	<.0001
Population(1990)	1.540E-5	5.651E-6	.095	2.725	.0066

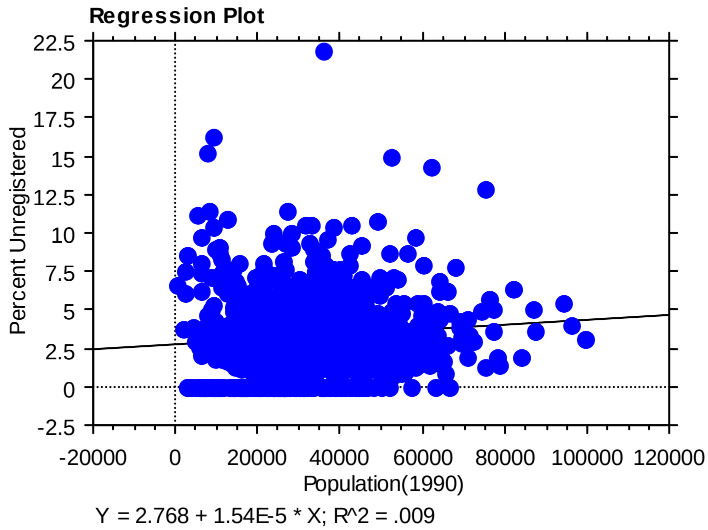

Figure 3.15. Registration ZIP code population summary, ANOVA table, regression coefficients, and regression plot of registration ZIP code population against % unregistered vehicles.

3.1.5 Business Types

The data collection sites were characterized, sorted, and summarized (Table 3.3). Malls, retail stores, and businesses were the predominant collection sites in this study.

Table 3.3. Summary Table of Data Collection Site Classifications.

Business	Total	% Registered	% Unregistered
Airport	29	82.76	0.00
Area Mall	297	81.48	3.37
Bank	1016	78.05	3.94
BART Station	106	70.75	2.83
Business	13827	77.84	2.76
Church	202	64.36	3.96
Civic Center	37	91.89	2.70
Down Town	2428	78.21	2.18
Education	4118	76.98	2.16
Entertainment	224	87.50	1.79
Food	4718	75.29	2.48
Government	173	73.99	2.31
Grocery	4145	79.76	2.27
Highway	36	61.11	0.00
Hospital	659	79.06	2.28
Hotel	392	70.15	5.36
Library	81	85.19	6.17
Mall	14387	79.79	2.45
Medical	3273	77.70	2.63
Metrolink	209	71.29	3.83
Mini Mall	8532	76.75	3.32
Mission	45	73.33	4.44
Park and Ride	483	66.25	3.93
Parking	1973	77.60	3.50
Post Office	44	79.55	2.27
Public	50	82.00	2.00
Recreation	1344	73.21	2.90
Regional Mall	486	75.51	2.06
Retail	11675	77.05	2.08
Strip Mall	6700	79.42	2.45
Swapmeet	51	90.20	1.96
Unknown	17077	75.41	3.23
Total	98817	77.39	2.71

3.2 BAR Data

The license plate numbers for all California registered and unregistered vehicles (over 90,000) were sent to the Bureau of Automotive Repair (BAR) for cross-referencing with Smog Check data. The BAR provided smog check test results for all vehicles having a license plate match from mid-1996 to the present. The observed plates were matched with data from both the BAR90 and BAR97 programs. The data provided were marked “good” or “bad” by the BAR. As noted by the BAR, “bad” files do not necessarily have invalid test data, but may have an incorrect entry such as VIN number. Since the data were matched based on license plate numbers, these data were included. These data accounted for about 1,400 records out of the 66,436 BAR matches.

The cross-tabulation of the Smog Check data and the observed data yielded 66,436 matching records. Registration status by Smog Check test results are shown in Table 3.4. The smog check test results are broken into 6 categories: pass, fail, gross polluter, tampered, test aborted, and unknown (where no results were recoreded). The majority of the vehicles in all categories passed their last Smog Check. A large number of unkown and aborted Smog Check results are from the data marked “bad” by the BAR. The percentage of vehicles passing the last Smog Check drops with the length of time since the vehicle was last registered (Table 3.5) and the percent failed smog check increases.

Table 3.4. Cross-tabulation of BAR Smog Check Test Results with Registration Status.

Status	Total	Pass	Failed	Gross Polluter	Tampered	Aborted	Unknown
Registered	51974	50423	682	250	25	391	203
Instantaneous	1449	1385	30	13	2	12	7
Long Term	601	549	18	19	2	10	3
Chronic	13	11	1	1	0	0	0
Front	4921	4716	91	44	4	44	22
Unknown	7387	7015	157	66	13	83	53
Total	66346	64100	979	393	46	540	288

Table 3.5 Cross-tabulation of BAR Smog Check Test Results with Registration Status as Percent.

Status	Total	Pass	Failed	Gross Polluter	Tampered	Aborted	Unknown
Registered	100.00	97.02	1.31	0.48	0.05	0.75	0.39
Instantaneous	100.00	95.58	2.07	0.90	0.14	0.83	0.48
Long Term	100.00	91.35	3.00	3.16	0.33	1.66	0.50
Chronic	100.00	84.62	7.69	7.69	0.00	0.00	0.00
Front	100.00	95.83	1.85	0.89	0.08	0.89	0.45
Unknown	100.00	94.96	2.13	0.89	0.18	1.12	0.72

The Smog Check data for chrnoically unregistered vehicles are important since it is possible that Smog Check regulations lead to vehicle non-registration. The results for the 13 chronic unregistered vehicles with recent Smog Check test result information are presented in Table 3.6. Of particular interest are the 3 vehicles that were chronically unregistered when observed by the survey team (2000), but had since taken and passed a Smog Check test in 2001. One vehicle identified as unregistered in the field study was tested and found to be a gross polluter in 2000, indicating that the lack of registration for the vehicle may have been related to failing Smog Check.

The BAR smog check database also contained vehicle characteristics such as vehicle make, model, and model year. Figure 3.16 is a model year histogram for registered and unregistered vehicles in the BAR database. There are small differences in the histograms, with the percentage of unregistered vehicles being slightly higher for the mid-1970s to mid-1980s model years and the percentage of registered vehicles higher in the late 1980s to mid-1990s model years. The unregistered vehicle fleet is still dominated by the short-term unregistered vehicles so that the observed fleet profile is dominated by the newer vehicles. In the next section, we will examine the longer-term unregistered portion of the fleet on a model year basis.

Table 3.6. Smog Check Status of Chronic Unregistered Vehicles.

Registration Status	Vehicle	County	Test Date	Test Result
Chronic	1	Los Angeles	10/12/99	Pass
Chronic	2	Madera	5/12/00	Pass
Chronic	3	Monterey	9/27/96	Failed
Chronic	4	Orange	9/26/96	Pass
Chronic	5	Orange	10/7/97	Pass
Chronic	6	Orange	4/28/98	Pass
Chronic	7	Sacramento	3/20/97	Pass
Chronic	8	San Bernardino	6/5/01	Pass
Chronic	9	San Diego	5/1/00	Gross Polluter
Chronic	10	San Diego	3/27/01	Pass
Chronic	11	San Francisco	4/21/01	Pass
Chronic	12	San Mateo	3/8/97	Pass
Chronic	13	San Mateo	10/26/98	Pass

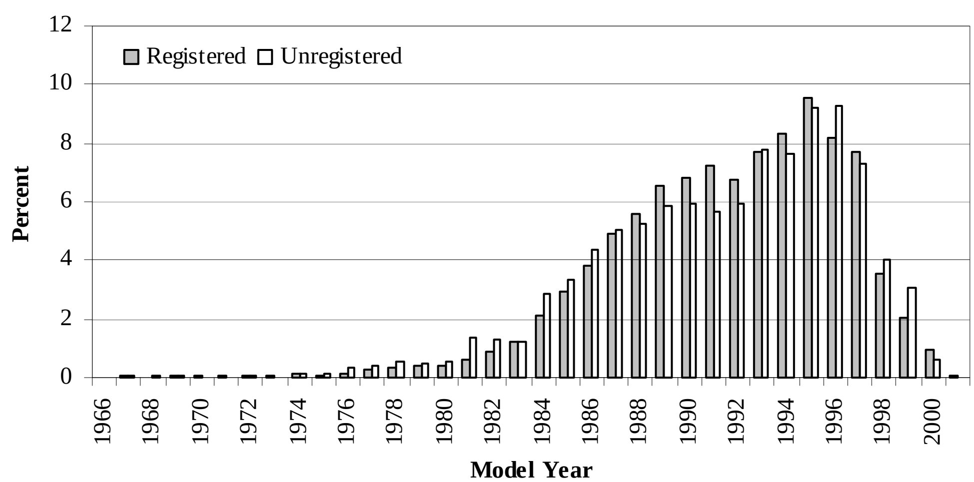

Figure 3.16. Model Year Histogram for all Unregistered and Registered Vehicles with Matching BAR Data.

3.3 DMV Vehicle Registration Data

The observed license plates were VIN decoded to obtain the model year and home ZIP code of the vehicles. This was used for the analysis in the following sections. The plates were also run through an earlier DMV database to obtain registration and vehicle status as listed by the DMV to correlate with the data collected in the field.

3.3.1 Vehicle Characteristics

The valid license plate data collected in this study was VIN decoded to obtain vehicle characteristics. The VIN decoding software did not match a portion of the 1999 model year and most of the 2000 model year vehicles because of the short time delay between data collection and VIN decoding. Future updates of the software are expected to recognize most of the 1999 and 2000 model year vehicles. The resulting database was cross-tabulated with the observed data to obtain model year data for all vehicles having readable California license plates. A model year distribution was created for all the collected vehicles (Figure 3.17). The model year distribution is heavily weighted to newer vehicles, as expected. It is likely that the majority of the paper dealer plates are 1999 and 2000 model year vehicles that would increase the proportions of the 2000 model year in particular.

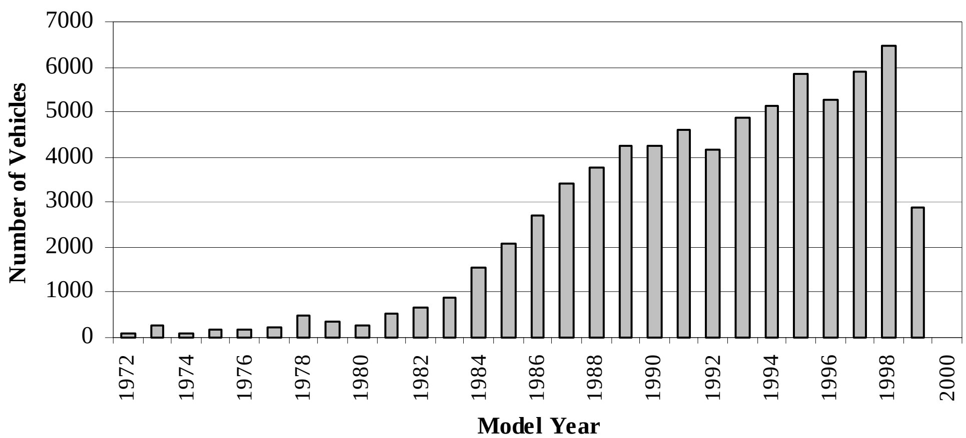

Figure 3.17. Model Year Histogram for all Observed Vehicles**.**

The model year histogram for long term (>3 months, <2 years) and chronic (>2 years) unregistered vehicles is shown in Figure 3.18 using the number of unregistered vehicles. Figure 3.19 shows the percent unregistered for each model year category. One out of the 11 total model year 2000 vehicles has a non-registration status of long-term, causing the percentage for that model year to be high. However, future analysis of this data with updated VIN decoding software is likely to sharply reduce this proportion. Comparison of these figures with Figure 3.17 shows that, unlike the vehicle population as a whole, the unregistered vehicle population is heavily weighted to the older model years. These results are consistent with unregistered vehicles being older and potentially high emitter vehicles that would make a disproportionate contribution to the emissions.

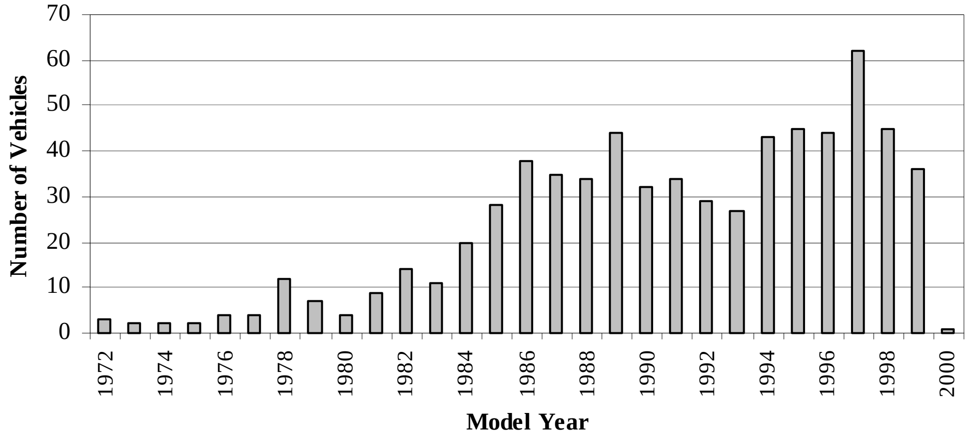

Figure 3.18. Model Year Histogram of Unregistered Vehicles > 3 Months.

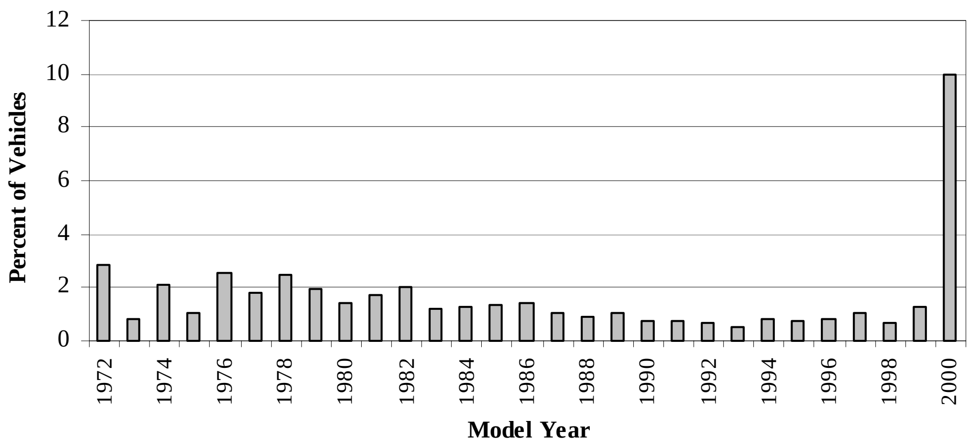

Figure 3.19. Percent of Unregistered Vehicles > 3 Months of Total Vehicles in Model Year.

To look at unregistered vehicle characteristics by region, California was divided into 7 regions (Northern California, Bay Area, Central California, Los Angeles County, Orange County, San Diego County, and Southern California) for analysis. This was done to ensure sufficient vehicles in each category for valid histograms. Model year histograms were created for each region and are shown in Figure 3.20.

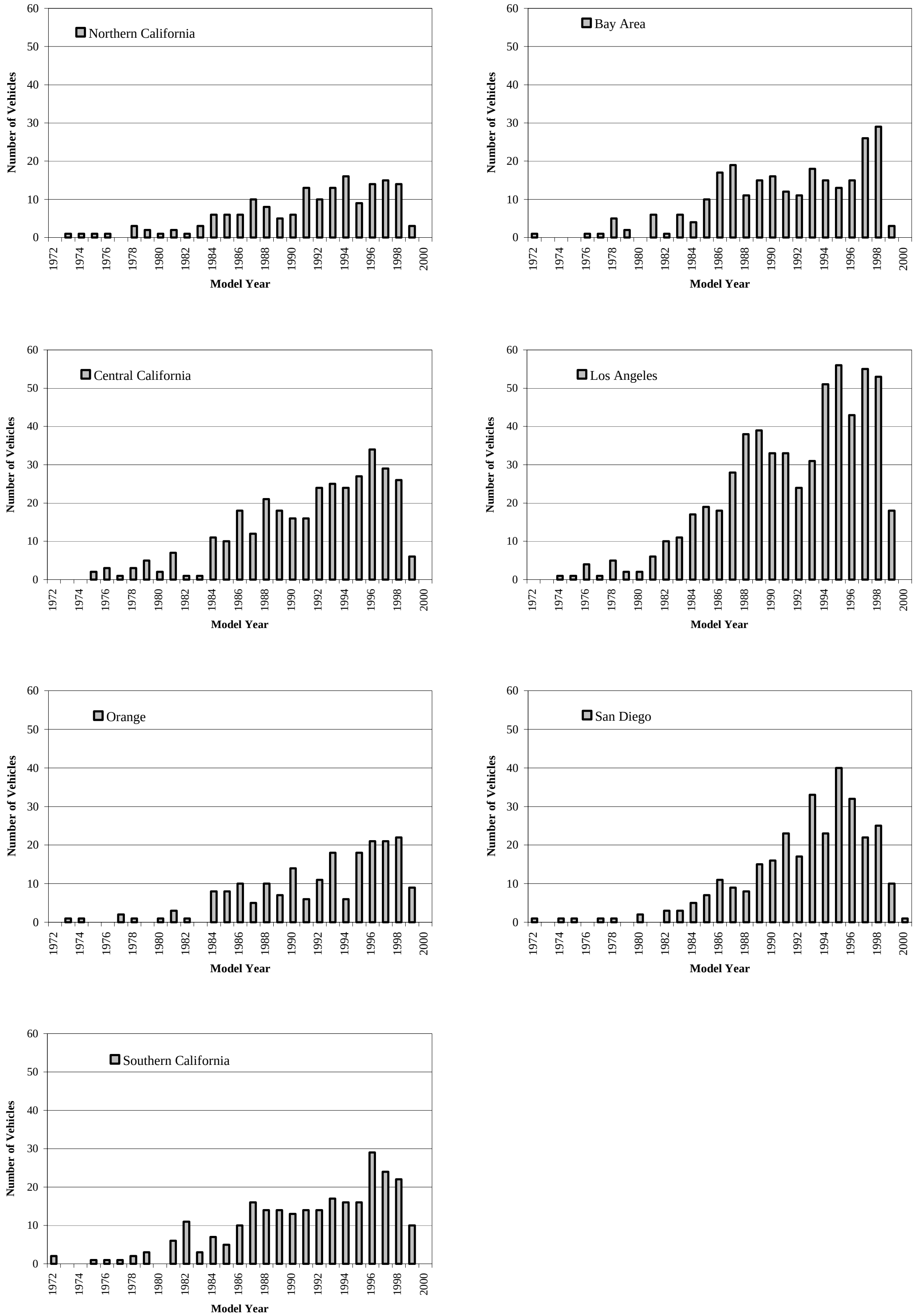

Figure 3.20. Model Year Histograms for Unregistered Vehicles by Region.

There are some differences in the unregistered vehicle fleet between regions, but Southern California and the Bay Area have similar histograms. Figure 3.21 shows vehicle type by region. The majority of unregistered vehicles are passenger cars, and they are all fueled by gasoline. The age distribution of registered vehicles versus unregistered vehicles by region is presented in Appendix B.

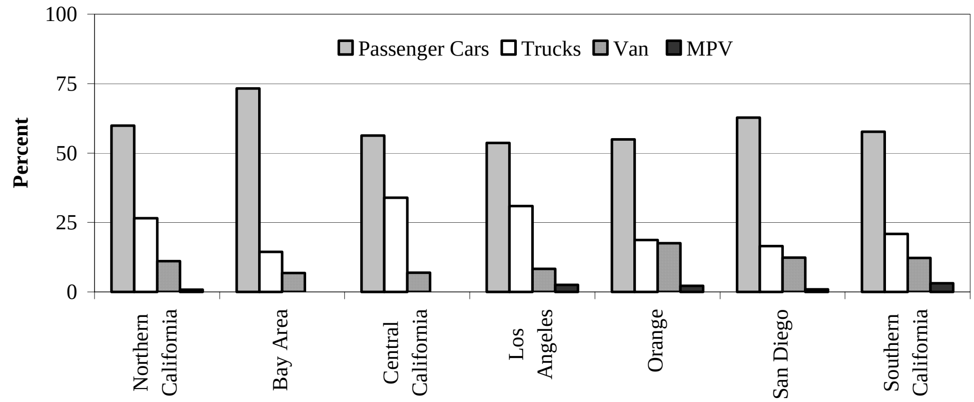

Figure 3.21. Histogram for Vehicle Type by Region.

The vehicle types in the DMV records were compared with the vehicle types captured in the field for each of the 2,171 unregistered vehicles with matching DMV data. The 56 vehicles that did not have matching descriptions were visually checked against the photograph from the field. Out of the 56 mismatched vehicles, 24 were found to have make and model in the observed database matching the photograph of the vehicle and license plate. It was concluded that the DMV incorrectly listed the vehicle make and model. For 8 of these vehicles, the DMV and BAR vehicle type matched, but differed from the observed plate. Of these, 2 license plates were Smog Checked on dates very close to the date of observation, thus leading to the possible conclusion that their plates were switched.

The VIN decoded data also contained the home ZIP code of the registered vehicle. A cross-county travel matrix was created based on an analysis of where the vehicle was recorded versus where it is registered. This very large table is provided in Appendix C. Cross-county travel was characterized by business type and is also shown in Appendix D. The top five businesses that promote cross-county travel are business, malls, retail, food and education. This is slightly different from the top five observed intra-county travel locations of business, retail, malls, food and grocery.

Table 3.7 is a simplified cross-county table, showing the percentage of intra-county vehicles, inter-county vehicles, out of state vehicles, and out of country vehicles. This table helps characterize the travel patterns throughout the state. The table also shows the average model year for vehicles with origins in and out of the county. With a few exceptions, the average model year varies little for vehicles traveling in their registered county versus outside.

Table 3.7. Percent of Vehicles that Originate Inside County of Data Captured, Outside the County, Out of the State, Out of the Country and the Average Model Year of the California Vehicles.

County	% Intra-County	% Inter-County	% Out of State	% Out of Country	Avg MY In County	Avg MY Out of County
Alameda	58.20	40.34	1.45	0.00	1992	1992
Alpine	11.36	52.27	36.36	0.00	1992	1994
Amador	50.96	46.15	2.88	0.00	1991	1993
Butte	45.31	52.58	2.11	0.00	1991	1990
Calaveras	53.57	44.64	1.79	0.00	1991	1992
Colusa	66.67	33.33	0.00	0.00	1991	1993
Contra Costa	66.39	32.52	1.09	0.00	1992	1992
Del Norte	66.06	15.76	18.18	0.00	1991	1992
El Dorado	53.15	38.74	8.11	0.00	1992	1993
Fresno	63.95	35.92	0.13	0.00	1991	1992
Glenn	51.38	48.62	0.00	0.00	1990	1992
Humboldt	68.87	30.13	0.99	0.00	1991	1991
Imperial	56.25	13.19	2.08	28.47	1991	1993
Inyo	8.04	79.46	12.50	0.00	1988	1992
Kern	80.35	19.24	0.41	0.00	1992	1992
Kings	56.22	30.92	12.85	0.00	1991	1993
Lake	73.58	23.58	2.83	0.00	1990	1993
Lassen	69.07	27.84	3.09	0.00	1991	1993
Los Angeles	81.64	17.18	1.16	0.02	1991	1992
Madera	59.29	38.05	2.65	0.00	1990	1991
Marin	55.07	44.33	0.61	0.00	1992	1993
Mariposa	76.27	22.03	1.69	0.00	1991	1990
Mendocino	75.11	23.53	1.36	0.00	1992	1993
Merced	70.38	27.31	2.31	0.00	1992	1991
Modoc	78.38	18.92	2.70	0.00	1990	1986
Mono	52.43	41.26	6.31	0.00	1990	1992
Monterey	70.44	25.40	4.16	0.00	1991	1991
Napa	33.17	64.36	2.48	0.00	1993	1991
Nevada	14.72	64.42	20.86	0.00	1991	1993
Orange	69.07	28.91	1.96	0.06	1992	1992
Placer	43.79	51.12	5.09	0.00	1991	1992
Plumas	64.81	32.41	2.78	0.00	1990	1990
Riverside	67.74	28.16	4.09	0.00	1992	1993
Sacramento	69.96	28.51	1.54	0.00	1991	1993
San Benito	4.86	92.36	2.78	0.00	1993	1992
San Bernardino	68.01	27.32	4.66	0.00	1992	1992
San Diego	84.73	11.63	3.32	0.32	1992	1993
San Francisco	41.91	53.98	4.10	0.00	1991	1992
San Joaquin	67.42	31.91	0.68	0.00	1991	1992
San Luis Obisbo	66.93	31.09	1.98	0.00	1991	1993
San Mateo	53.29	43.60	3.11	0.00	1992	1992
Santa Barbara	69.98	26.96	3.06	0.00	1991	1992
Santa Clara	73.86	24.71	1.44	0.00	1992	1993
Santa Cruz	75.78	22.88	1.34	0.00	1991	1991
Shasta	66.89	29.82	3.29	0.00	1991	1992
Sierra	40.74	37.04	22.22	0.00	1994	1992
Siskiyou	71.11	26.67	2.22	0.00	1990	1992
Solano	56.48	42.59	0.93	0.00	1992	1992
Sonoma	78.50	20.83	0.67	0.00	1992	1992
Stanislaus	68.12	31.08	0.79	0.00	1991	1992
Sutter	57.52	40.52	1.96	0.00	1992	1991
Tehama	70.59	27.06	2.35	0.00	1991	1991
Trinity	69.64	29.46	0.89	0.00	1989	1990
Tulare	75.12	24.07	0.81	0.00	1992	1992
Tuolumne	37.23	58.51	4.26	0.00	1992	1992
Ventura	79.77	18.74	1.49	0.00	1992	1993
Yolo	35.26	63.42	1.32	0.00	1992	1993
Yuba	49.41	48.24	2.35	0.00	1990	1991
Total	71.15	26.46	2.24	0.16	1991	1992

3.3.2 Vehicle Registration Comparison

The data collected for this project consisted of visual observations of license plate number and registration status. After collection of the license plate numbers, the DMV registration status for the California registered vehicles was obtained by CE-CERT staff. The vehicles of primary interest in this analysis are those that are observed to be registered, but which are considered unregistered by the DMV. Possible reasons for this to occur include switched license plates, registration stickers which were not properly obtained for the vehicle, errors in license plate identification, or data entry errors in the DMV data. The results of this comparison are presented in Table 3.8.

Table 3.8. Cross-tabulation of Registration Status.

Reg	Total	DMV Currently Registered	DMV Not Currently Registered	DMV Planned Non Operation	DMV Status Pending	DMV Evidence of Use
Registered	47393	42198	1244	1174	2167	308
Unregistered	1796	1538	71	47	100	25
Instantaneous	1231	1114	22	25	44	16
Long Term	545	413	43	22	54	8
Chronic	20	11	6		2	1
Front	4546	4021	138	114	203	28
Unknown	7232	6435	178	171	321	65
Total	60967	54192	1631	1506	2791	426

3.3.3 Vehicle Insurance Comparison

In the original scope of work it was proposed to include a comparison of vehicle registration status with vehicle insurance status. After discussion with Department of Insurance (Hunstad, 2002) several problems with the analysis were discovered. The main problem was that the DOI does not keep a database of insurance status for all vehicles. Individual insurance companies maintain their own databases of their own customers. For research purposes the DOI had compiled a database from the 10 largest insurance companies for 1998; however, it was estimated that this database would not cover roughly 25% of the vehicle fleet. Thus the DOI data has a potential bias if the lower income drivers have a tendency to use the smaller companies as their insurance carrier. The second potential problem with the DOI data was that it was for the 1998 calendar year. This had the potential to introduce a second bias because these data do not have any relevance for establishing the insurance status of vehicles that have been sold during the intervening two years.

Because of the potential bias in the data resulting from the age and composition of the available insurance data it would be impossible to draw meaningful conclusions from the results of a registration/insurance analysis.

4. Conclusions

An estimate of approximately 3.38% (rounded to 2 significant figures) for the vehicle unregistration rate was obtained based on analysis of more than 98,817 vehicle records collected in a field study in California. This included vehicles unregistered for a period of less than 3 months (2.41% of total), vehicles unregistered between 3 months and 2 years (0.95% of total), and vehicles unregistered for more than 2 years (0.03% of total). These rates are somewhat lower than the rates used in the current version of EMFAC.

About half of the counties had non-registration rates between 2% and 4%, with most counties having non-registration rates below 5%. In general, the more populous counties (population greater than 300,000) had a tendency toward higher unregistration rates, with unregistration rates in larger counties generally ranging from about 2% to 5%.

In general, the percentage of out-of-state vehicles observed in this study was less than 5%, with the higher concentrations near the state border and near tourist attractions. The percentage of out-of-state and out-of-country vehicles was more than 10% for 5 counties on the state border. The percentage of out-of-country vehicles was very high (19.95%) in Imperial County, with a high influx of vehicles licensed in Mexico.

Demographic analysis was conducted at the county level of aggregation as well as at the individual ZIP code level. At the county level significant regressions of percentage of unregistered vehicles were found for median household income. Home ownership and population percentages were not correlated with vehicle registration rates. At the ZIP code level no significant regressions were found between demographic variables and vehicle registration rates.

The analysis of BAR Smog Check results for the California registered vehicles found several points of interest. The majority of the vehicles, even the chronic unregistered vehicles, passed their last Smog Check test. Of the 13 chronic (more than 2 years) unregistered vehicles, 11 (84.6%) had passed their last Smog Check test. However, the percentage of vehicles passing their last Smog Check test decreased with increasing time since last current registration.

Analysis of the VIN decoded data showed that the unregistered vehicles identified in this study were all gasoline powered vehicles. The composition of the unregistered vehicle fleet varied between regions of the state, but passenger cars were predominant in all regions. Older model years tended to have a higher percentage of unregistered vehicles and the longer term unregistered vehicle fleet tended to be older than the registered vehicle fleet.

5. References

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Hunstad, L. (1999) Estimating Uninsured Vehicle and Unregistered Vehicle Rates: Sensitivity to Data and Assumptions. Report by California Department of Insurance, July.

Hunstad, L. (2002) Personal communication, February 21.

Appendices

- Appendix A: List of ZIP Codes where Field Data Were Collected
- Appendix B: Model Year Histograms for Registered and Unregistered Vehicles
- Appendix C: Cross County Travel Matrix
- Appendix D: Cross County Travel Matrix by Business Type

Appendix A – List of ZIP Codes where Field Data Were Collected

County	Zip Code	Total
Alameda	94501	401
Alameda	94539	289
Alameda	94541	330
Alameda	94550	428
Alameda	94566	168
Alameda	94578	203
Alameda	94579	122
Alameda	94580	147
Alameda	94587	329
Alameda	94601	251
Alameda	94607	156
Alameda	94609	141
Alameda	94611	179
Alameda	94618	144
Alameda	94705	88
Alameda	94707	61
Alameda	94709	92
Alpine	96120	54
Amador	95642	142
Butte	95916	22
Butte	95926	306
Butte	95954	72
Butte	95966	161
Calaveras	95222	159
Colusa	95987	64
Contra Costa	94513	466
Contra Costa	94517	76
Contra Costa	94526	235
Contra Costa	94530	210
Contra Costa	94547	184
Contra Costa	94553	314
Contra Costa	94556	92
Contra Costa	94572	115
Contra Costa	94583	255
Contra Costa	94598	197
Contra Costa	94608	156
Contra Costa	94801	193
Contra Costa	94805	104
Del Norte	95531	234
El Dorado	95682	261
El Dorado	95684	35
El Dorado	96150	200
Fresno	93625	57
Fresno	93234	101
Fresno	93609	53
Fresno	93611	179

County	Zip Code	Total
Riverside	92586	155
Riverside	92587	59
Riverside	92596	60
Sacramento	95624	231
Sacramento	95641	44
Sacramento	95690	17
Sacramento	95693	12
Sacramento	95814	157
Sacramento	95815	258
Sacramento	95816	172
Sacramento	95821	681
Sacramento	95822	339
Sacramento	95824	222
Sacramento	95826	452
Sacramento	95828	445
Sacramento	95829	40
Sacramento	95842	267
San Benito	95023	168
San Benito	95043	20
San Bernardino	91710	756
San Bernardino	91763	281
San Bernardino	92307	645
San Bernardino	92308	370
San Bernardino	92309	70
San Bernardino	92311	504
San Bernardino	92316	334
San Bernardino	92327	24
San Bernardino	92336	68
San Bernardino	92337	52
San Bernardino	92345	644
San Bernardino	92354	322
San Bernardino	92358	47
San Bernardino	92365	14
San Bernardino	92371	60
San Bernardino	92372	46
San Bernardino	92278	180
San Diego	91901	161
San Diego	91905	16
San Diego	91917	7
San Diego	91963	7
San Diego	91977	507
San Diego	91978	156
San Diego	92014	225
San Diego	92021	411
San Diego	92025	432
San Diego	92026	434

Fresno	93612	364
Fresno	93616	33
Fresno	93622	90
Fresno	93630	112
Fresno	93648	96
Fresno	93654	235
Fresno	93656	61
Fresno	93657	281
Fresno	93660	40
Fresno	93664	26
Fresno	93675	34
Fresno	93703	297
Glenn	95988	132
Humboldt	95521	171
Humboldt	95504	222
Imperial	92227	165
Imperial	92231	225
Imperial	92249	4
Imperial	92281	17
Inyo	93514	168
Kern	93203	119
Kern	93215	94
Kern	93226	5
Kern	93238	18
Kern	93240	55
Kern	93250	62
Kern	93252	14
Kern	93280	60
Kern	93283	5
Kern	93306	438
Kern	93308	332
Kern	93312	126
Kern	93505	73
Kings	93203	167
Kings	93204	29
Kings	93245	117
Lake	95423	153
Lassen	93160	125
Los Angeles	90005	293
Los Angeles	90006	531
Los Angeles	90007	816
Los Angeles	90020	110
Los Angeles	90021	76
Los Angeles	90022	1170
Los Angeles	90023	741
Los Angeles	90039	546
Los Angeles	90043	315
Los Angeles	90047	836
Los Angeles	90049	637

San Diego	92036	65
San Diego	92056	440
San Diego	92082	137
San Diego	92101	220
San Diego	92104	473
San Diego	92105	663
San Diego	92108	124
San Diego	92110	300
San Diego	92111	457
San Diego	92115	487
San Diego	92117	521
San Diego	92118	109
San Diego	92119	280
San Diego	92124	323
San Diego	92126	710
San Diego	92127	142
San Diego	92128	328
San Diego	92131	199
San Diego	92145	59
San Diego	92154	586
San Diego	92803	605
San Francisco	94102	220
San Francisco	94104	54
San Francisco	94105	321
San Francisco	94110	512
San Francisco	94112	369
San Francisco	94114	213
San Francisco	94117	342
San Francisco	94121	288
San Francisco	94122	521
San Joaquin	95203	161
San Joaquin	95205	282
San Joaquin	95209	340
San Joaquin	95212	74
San Joaquin	95215	21
San Joaquin	95220	8
San Joaquin	95237	32
San Joaquin	95320	128
San Joaquin	95330	125
San Joaquin	95337	70
San Luis Obisbo	93422	227
San Luis Obisbo	93402	120
San Luis Obisbo	93405	189
San Luis Obisbo	93428	84
San Luis Obisbo	93430	85
San Luis Obisbo	93433	95
San Luis Obisbo	93442	90
San Luis Obisbo	93445	55
San Luis Obisbo	93449	112

Los Angeles	90201	841
Los Angeles	90210	407
Los Angeles	90211	175
Los Angeles	90240	491
Los Angeles	90254	267
Los Angeles	90260	648
Los Angeles	90262	103
Los Angeles	90270	764
Los Angeles	90278	668
Los Angeles	90502	464
Los Angeles	90604	584
Los Angeles	90670	265
Los Angeles	90710	489
Los Angeles	90810	611
Los Angeles	90815	734
Los Angeles	90902	140
Los Angeles	91006	388
Los Angeles	91007	585
Los Angeles	91011	335
Los Angeles	91016	746
Los Angeles	91024	196
Los Angeles	91040	396
Los Angeles	91203	312
Los Angeles	91311	305
Los Angeles	91316	350
Los Angeles	91321	463
Los Angeles	91331	1250
Los Angeles	91406	651
Los Angeles	91602	261
Los Angeles	91604	627
Los Angeles	91722	1191
Los Angeles	91733	796
Los Angeles	91765	774
Los Angeles	91776	651
Los Angeles	91789	792
Los Angeles	91792	467
Los Angeles	93510	142
Los Angeles	93551	435
Madera	93637	67
Madera	93638	162
Madera	93643	27
Madera	93644	67
Marin	1	307
Marin	94901	263
Marin	94947	331
Mariposa	95311	19
Mariposa	95338	136
Mendocino	95482	312
Merced	93620	73

San Mateo	94027	88
San Mateo	94028	88
San Mateo	94030	296
San Mateo	94060	43
San Mateo	94063	363
San Mateo	94065	102
San Mateo	94070	294
San Mateo	94074	16
San Mateo	94080	463
San Mateo	94301	170
San Mateo	94402	335
San Mateo	94403	447
Santa Barbara	93103	287
Santa Barbara	93105	211
Santa Barbara	93110	163
Santa Barbara	93434	82
Santa Barbara	93437	115
Santa Barbara	93454	540
Santa Barbara	93460	66
Santa Clara	94086	503
Santa Clara	94303	361
Santa Clara	95002	34
Santa Clara	95008	323
Santa Clara	95035	363
Santa Clara	95051	401
Santa Clara	95070	189
Santa Clara	95117	247
Santa Clara	95120	48
Santa Clara	95123	424
Santa Clara	95125	347
Santa Clara	95126	208
Santa Clara	95130	109
Santa Clara	95132	269
Santa Clara	95133	174
Santa Clara	95134	38
Santa Clara	Commuter	71
Santa Cruz	95003	208
Santa Cruz	95006	103
Santa Cruz	95019	75
Santa Cruz	95062	304
Santa Cruz	95066	98
Santa Cruz	95073	87
Shasta	96001	188
Shasta	96002	215
Shasta	96003	251
Shasta	96007	124
Shasta	96019	25
Shasta	96028	9
Shasta	96051	2

Merced	95303	9
Merced	95317	7
Merced	95322	49
Merced	95334	73
Merced	95340	399
Merced	95369	12
Merced	95388	77
Modoc	96101	56
Mono	93546	298
Monterey	93905	346
Monterey	93920	69
Monterey	93923	186
Monterey	93926	114
Monterey	93927	88
Monterey	93930	109
Monterey	93932	19
Monterey	93955	207
Monterey	93960	80
Napa	94558	195
Napa	94589	119
Nevada	95724	39
Nevada	95959	95
Nevada	96161	117
Nevada	96162	2
Orange	90630	725
Orange	90631	1425
Orange	92620	460
Orange	92625	97
Orange	92627	858
Orange	92648	505
Orange	92655	129
Orange	92677	550
Orange	90680	478
Orange	92701	900
Orange	92706	907
Orange	92708	1272
Orange	92805	926
Orange	92807	236
Placer	95650	97
Placer	95677	199
Placer	95724	19
Placer	95746	154
Placer	95747	108
Placer	96145	112
Plumas	95947	30
Plumas	00028	116
Riverside	91760	101
Riverside	92203	72
Riverside	92220	177

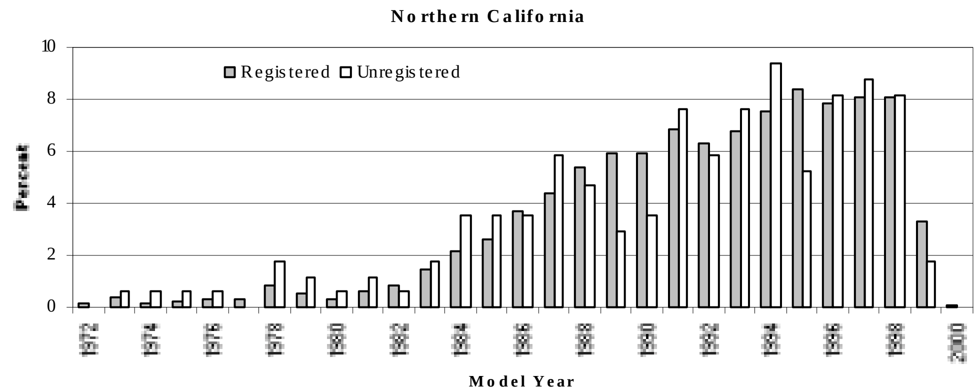
Shasta	96065	7
Shasta	96073	45
Sierra	96124	27
Sierra	00033	9
Siskiyou	96097	235
Solano	0	235
Solano	94512	6
Solano	94535	124
Solano	94571	38
Solano	95620	176
Solano	95688	203
Sonoma	95403	206
Sonoma	95405	168
Sonoma	95409	183
Sonoma	95425	59
Sonoma	95436	52
Sonoma	95448	129
Sonoma	95472	187
Sonoma	95476	420
Stanislaus	93656	32
Stanislaus	95316	36
Stanislaus	95350	298
Stanislaus	95351	395
Stanislaus	95356	129
Stanislaus	95360	47
Stanislaus	95361	115
Stanislaus	95380	224
Stanislaus	95382	53
Sutter	95917	4
Sutter	95993	202
Tehama	96080	250
Trinity	96093	159
Tulare	93212	78
Tulare	93223	41
Tulare	93235	20
Tulare	93256	35
Tulare	93265	26
Tulare	93270	26
Tulare	93271	11
Tulare	93277	262
Tulare	93291	258
Tulare	93618	118
Tuolumne	95370	145
Ventura	91360	268
Ventura	93001	227
Ventura	93003	359
Ventura	93015	95
Ventura	93022	39
Ventura	93023	142

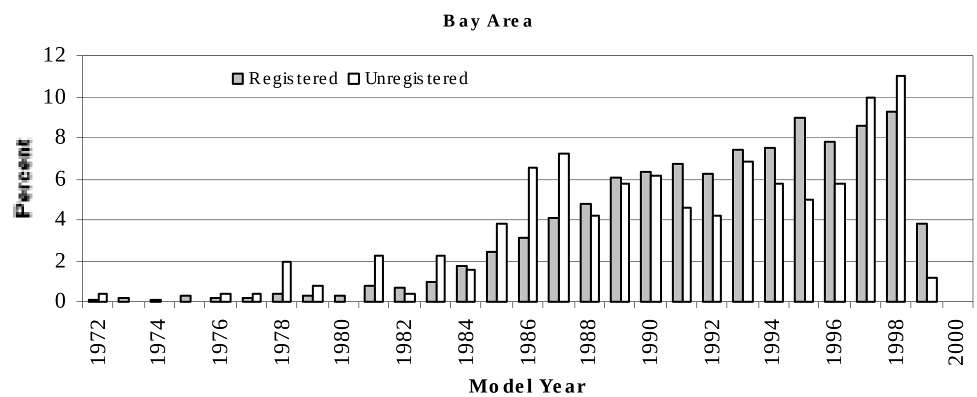
Riverside	92225	190
Riverside	92230	75
Riverside	92254	97
Riverside	92260	417
Riverside	92262	315
Riverside	92320	127
Riverside	92505	530
Riverside	92506	792
Riverside	92507	223
Riverside	92530	164
Riverside	92539	37
Riverside	92544	483
Riverside	92555	116
Riverside	92567	72

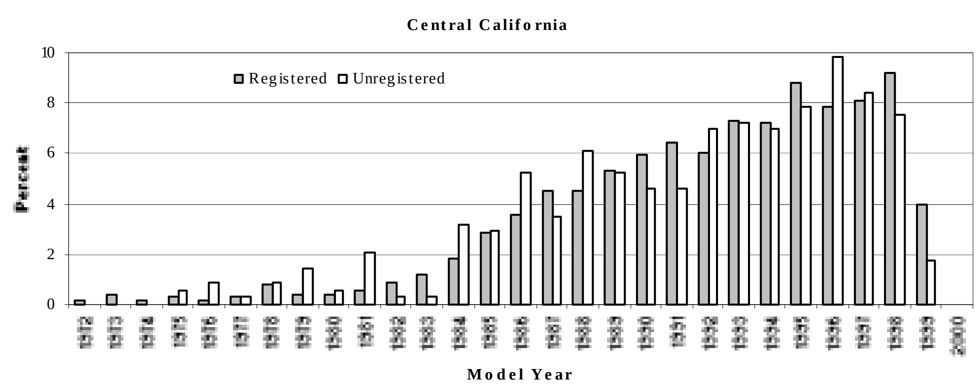
Ventura	93033	462
Ventura	93035	169
Ventura	93043	23
Ventura	93063	289
Yolo	95605	160
Yolo	95612	33
Yolo	95618	105
Yolo	95695	204
Yuba	95901	218
Total		98817

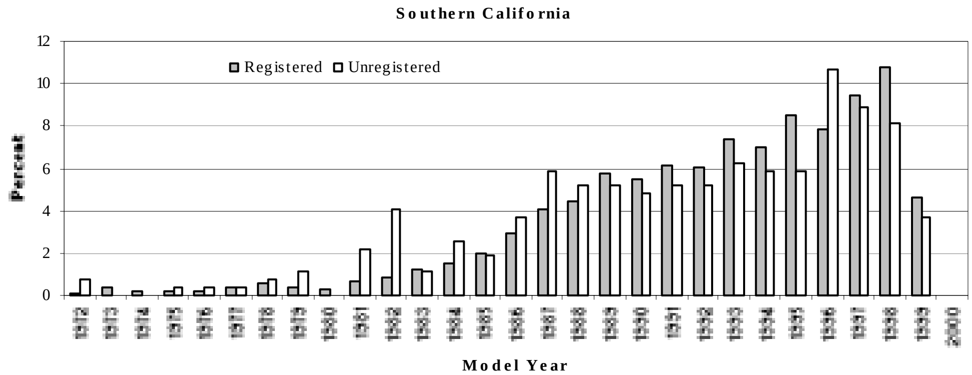
Appendix B – Model Year Histograms for Registered and Unregistered Vehicles

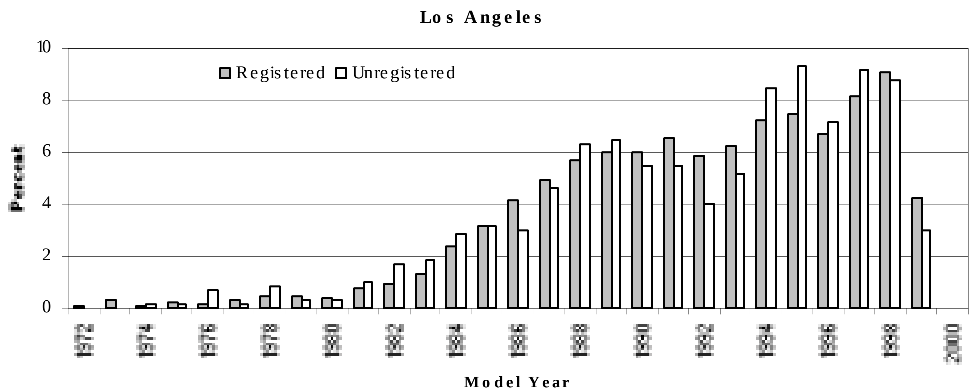
Model year histograms for registered and unregistered vehicles were created by region to characterize the vehicles. The State of California was divided into 7 regions (Northern California, Bay Area, Central California, Southern California, Los Angeles County, Orange County, and San Diego County) to ensure a sufficient number of vehicles were in each category. Model year histograms for unregistered vehicles appear in the main report and are also included here for comparison.

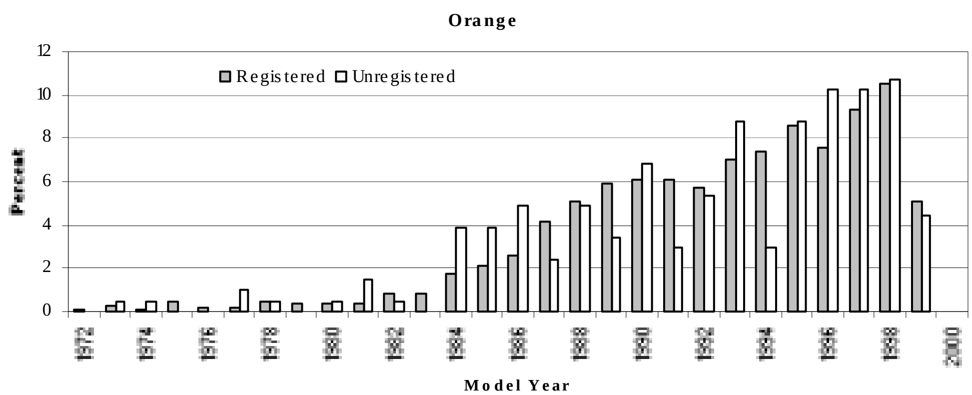







Southern California
Registered
Unregistered
Percent
Model Year


Los Angeles
Registered
Unregistered
Percent
Model Year


Orange
Registered
Unregistered
Percent
Model Year

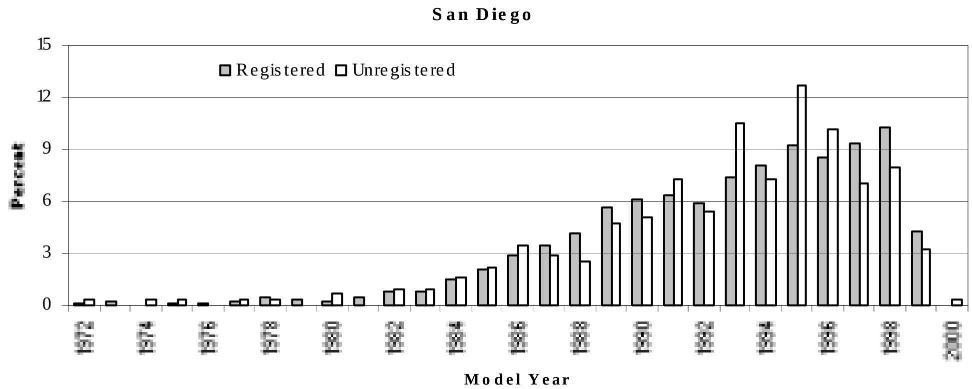


Figure B.1. Model Year Histograms for Registered and Unregistered Vehicles by Region.

Appendix C – Cross County Travel Matrix

County	Alameda	Alpine	Amador	Butte	Calaveras	Colusa	Contra Costa	Del Norte	El Dorado	Fresno	Glenn	Humboldt	Imperial	Inyo	Kern	Kings	Lake	Lassen	Los Angeles	Madera	Marin	Mariposa
Alameda	1522			2	6	1	261		1	10		1	2		1		3		56	3	15	1
Alpine		5	1				4		2	1									4			
Amador	1		53		11		1		2													
Butte	8			193			10	1			4	2			1				9		2	
Calaveras	6		4		60		7		1												1	
Colusa						28					1								1		1	
Contra Costa	219		1		2	2	1274		2	6					3				43	1	15	
Del Norte							2	109				7							6	1	1	
El Dorado	11		2				3		177	3	1				3				8			
Fresno	15						12			979			1		8	61			39	35		1
Glenn	1			6		6	1			1	56										1	
Humboldt	5						6	2		3		208			1				9			
Imperial										1		1	162		1				12			
Inyo	2												1	9	1				13			
Kern	1						3		1	5					785				74	2	1	
Kings				1			1	1		19					2	140			13	2		
Lake							1	2									78		2		1	
Lassen			1				1	1	1									67	1			
Los Angeles	35		3	2			32	1	3	20		2	12	1	43	6	3	1	15071	1	4	1
Madera	2						5			33					2	2			5	134		5
Marin	21						49	1	3	1		2					2	1	16		364	
Mariposa	3																		2	2		90
Mendocino	4						1			1							12		6			
Merced	6		1				9		1	9					3	1	1		9			5
Modoc																		1	1			
Mono	4						1						1	3	2				18	1		1
Monterey	14				2		8			3			2			2	1		24	1		
Napa	6						12		1			1			1				7		5	
Nevada	4			2			8		2	1					1			1	3		6	
Orange	11			1			13	1	1	6		1	7		14	2	2		1311	1	3	1
Placer	7			1	1		4		19	1		3							10		2	
Plumas	2						1			1								3				
Riverside	7				1		6		1	3		4	9		6		1		220	2	1	
Sacramento	33		5	6	3	6	25		48	11		2			1	3	2	2	51		2	
San Benito	7						1			6					1	1	1		3			
San Bernardino	14						2						3		10				377	1	2	
San Diego	20			2			12		2	17		2	31		8	1	2		228	2	3	
San Francisco	114			1			93		1	5		2	1		1		1		54	1	97	
San Joaquin	28		7	1	8		11		3	5					1				16		1	1
San Luis Obisbo	6		1				10			16		1	1		15	5			40	2	2	
San Mateo	126		2		1		53		2	5	1	1	1		2	1	1		37	1	5	
Santa Barbara	6				1		5			2		1	3	1	6	1		1	61		2	
Santa Clara	215		1	2			43			4					2	1	2		59	2	6	1
Santa Cruz	5			1			12			3		2	1		1				4		2	
Shasta	8			4	1		4		2	5	2	2	1						18			
Sierra									1										2			
Siskiyou	2			4			1	2											2	2		2
Solano	11			1		1	21					1					2		8	2	3	
Sonoma	12			1			16		1	3		5			4	1	3		19		34	
Stanislaus	14		1		6	1	11		1	12	1	1	1		3				16	3	1	2
Sutter				8		1					1								4			
Tehama	3			5				1	1		3							1	2			1
Trinity	1											2			1				1			
Tulare							2		1	32					12	35			20	1		
Tuolumne	6				3		2			2									7	1		3
Ventura	5						1		2						4	1		1	149			
Yolo	3			1		3	5		2	2		1	1			1			11			
Yuba				2		1			1						1		1		5			
Total	2556	5	83	247	106	50	2066	122	286	1237	70	255	241	14	951	265	118	79	18187	204	583	115

County	Mendocino	Merced	Modoc	Mono	Monterey	Napa	Nevada	Orange	Placer	Plumas	Riverside	Sacramento	San Benito	San Bernardino	San Diego	San Francisco	San Joaquin	San Mateo	Sanluis Obispo
Alameda	1	3			6	2	3	14	4	1	2	18		5	9	60	41	65	5
Alpine								3							1			2	
Amador	1	1						1				9		1	1	2	2	1	2
Butte	1	2			1	2	3	1	2	2		13		1	3	3	4	4	
Calaveras					1		2	1				2					5		
Colusa									1									1	
Contra Costa	1				4	9		12	7		5	24		5	10	27	20	35	1
Del Norte							1				2	1					3	1	
El Dorado					2	1		3	6		1	34		1	2	3	3	7	
Fresno		59	1		3	1	1	14	4	1	9	13		3	8	2	5	6	3
Glenn							1	1	2			4		1				1	
Humboldt					1		3	1	4		3	8		3	9	1	2	3	2
Imperial								1			4	1		6	5	1		1	
Inyo				49				4			3	1		2	4	1			
Kern		1		1	1			12			4	1	1	9	8	2	3	1	5
Kings		1					1	2	1			1		2	4			1	1
Lake						2			1		1	2			2				
Lassen	1								1	6	1	3		1	1			1	
Los Angeles	5	6	1	4	7		2	1069	9		278	30		779	213	14	11	51	12
Madera		3			2			1			1	2		1	3	1	1	1	
Marin	5				1	5	1	6	4			11		2	4	30		15	1
Mariposa		6						1			1	1			1	1		1	
Mendocino	166	1				2		1	2			2			1	3		1	
Merced	2	366			2			4	1		3	4	1	1	1	1	7	10	
Modoc			29		1			1				1							
Mono				108				14			8	1		9	5	1		1	
Monterey		4			610			11	3	1	6	10	1	1	6	10	4	10	9
Napa						67		3				3		1	2	3		6	
Nevada	1				1	2	24	1	25	3	1	6				1	2	5	1
Orange		1		3	4	1	1	4867	3		216	21		163	120	2	2	20	4
Placer					1	1	15	5	215	1	1	122		3	2	4	2	4	
Plumas				1		1	2		3	70		3		4	2	1		1	
Riverside		1			1	1		139	1		2035	2		301	77	1	4	16	2
Sacramento	1	3			6	1	14	12	107	2	8	1686		12	15	18	52	27	2
San Benito					9						3	2	7		1	1		2	
San Bernardino		1			3			128	1		216	4		2158	39	1	2	12	10
San Diego	1	2		1	5	2	1	139	2	1	115	16		58	5877	5	4	22	12
San Francisco	5				9	9	2	18	3		8	15		4	12	868	8	472	4
San Joaquin	2	4			3		1	3	3		1	32		4	4	2	598	15	4
San Luis Obisbo		1		1	4	1		8			3		1	5	13	4	1	5	508
San Mateo	4				3	2	3	6	2		7	17		6	11	184	8	1028	3
Santa Barbara		1						12		1	2	4		7	5	2	2	9	84
Santa Clara	2	4			16		2	30	5		9	12	3	7	14	44	16	135	2
Santa Cruz					12	1		9	2		1	6	5	2	5	3	4	6	2
Shasta					2			4	4		2	9		2	2	1	1	7	2
Sierra									2			1						1	
Siskiyou								2	3			4			1	2		1	
Solano					1	7	1	2	5		3	26			4	5	2	7	
Sonoma	11				3	14		10			3	12			4	11	2	17	1
Stanislaus		68			4	2		4	3		2	22		3	3	6	69	8	
Sutter		1					1		4		1	4			1		3		
Tehama										1		7					2	3	
Trinity					2	1			1			2		1		1			
Tulare		2		1		1	1	5	1		2	4		4	3	1	3	5	4
Tuolumne		3										2		1		3	8	2	
Ventura				1	1	1		23			8	2		13	5	3	2	8	2
Yolo					1	1	1	7	6			138		1	1	3	8	8	
Yuba						1	1	1	8			7			1	1	2	2	1
Total	210	545	31	170	733	141	88	6616	461	90	2979	2388	19	3593	6525	1344	918	2074	689

County	Santa Barbara	Santa Clara	Santa Cruz	Shasta	Sierra	Siskiyou	Solano	Sonoma	Stanislaus	Sutter	Tehama	Trinity	Tulare	Tuolumne	Ventura	Yolo	Yuba	Out of State	Out of Country	Total
Alameda	2	373	8			2	29	15	13	1				2	4	4		38	0	2577
Alpine		3	1					1										16	0	28
Amador		6	1						4					1				3	0	101
Butte		7	1	8			2	3	1	7	53		1	1	2	1	58	9	0	417
Calaveras		7	2	1				4	3					2		1		2	0	110
Colusa		1							1	4	1					1	1	0	0	42
Contra Costa	3	45	1	2			85	9	8	2			2	1	5	5	2	21	0	1898
Del Norte							1											30	0	135
El Dorado		13	1	1			3	2	2			2	4		2	5		27	0	306
Fresno	3	14	2	2			1		3	1			215	1	3			2	0	1529
Glenn		1		3			2	1		2	15					2	1	0	0	109
Humboldt		10		2		2	3	4	1		1	2						3	0	299
Imperial		1						2							1			6	82	200
Inyo	2		1												5			14	0	98
Kern	3	5		2				1	3				25		12	1		4	0	973
Kings		2	2										20					32	0	217
Lake							2	6			1			1		1		3	0	103
Lassen		2		2				1			2							3	0	94
Los Angeles	36	50	5	1		1	10	16	11	2	1	1	11	2	357	5	2	214	3	18243
Madera	1	4					1		2				3	2	2	1		6	0	220
Marin	3	14	2				14	74	1			1	1	1	1			4	0	657
Mariposa		1	1						3					1	1			2	0	116
Mendocino		1					1	9	1		1					1	1	3	0	218
Merced		18						1	37		1		1	1	1			12	0	508
Modoc							1			1								1	0	36
Mono	2	3	1				1	2					1		5			13	0	193
Monterey	2	34	28	1		1	2	3	4		2		2		6	1	1	36	0	830
Napa		3		1			62	12								1		5	0	197
Nevada		8	3	3			1	6		1					1		5	34	0	129
Orange	14	28	4	1			2	3	2		2	1	10		33	1		138	4	6904
Placer		14	2				4	1	1	4	1			1	5	9		25	0	466
Plumas			1	1	1		2	2			1			1			1	3	0	105
Riverside	3	9					4	2	1				2		16	1	1	123	0	2881
Sacramento	1	41	3	2		1	32	9	18	10	3		3	1	10	64	9	37	0	2373
San Benito		91	3												1			4	0	140
San Bernardino	7	7		1			1	3	1				1	1	19			148	0	3025
San Diego	13	20	3	3		2	4	4	3				9	1	25	4		230	22	6684
San Francisco	8	76	6	3		1	35	25	7		2		1	1	7	5	1	85	0	1986
San Joaquin	1	26		1			5	2	80				1	3		2	2	6	0	881
San Luis Obisbo	37	13	1				2		5		1		12		19			15	0	744
San Mateo	4	287	9	2			13	13	2		2			4	4	5	1	60	0	1869
Santa Barbara	732	6	1	1			4	3	2		1		1		42	2		32	0	1014
Santa Clara	2	2212	50	1			6	10	10		1		8	2	8	3		43	0	2952
Santa Cruz	2	52	510					3					2		2	3	1	9	0	664
Shasta	1	11	2	406		12	1	1	2	1	51	8		1	4	3		20	0	587
Sierra		1			11			1							1			6	0	21
Siskiyou		4		12		128	2									2		4	0	176
Solano		15	1	2		1	305	3	2	2	1		1		3	85	1	5	0	535
Sonoma	1	9	5			2	5	818	4						2	2		7	0	1035
Stanislaus	1	21	2				2	1	686		2		1	11	2	1	1	8	0	999
Sutter	1	1	1	2				1	2	88						2	23	3	0	150
Tehama	1	3		11							120	1						4	0	166
Trinity		2		14			1				1	78			1	1		1	0	111
Tulare		2	1				3		2				462					5	0	610
Tuolumne		4	1				1		4					35	1	1		4	0	90
Ventura	35	2	1	1		1	2	2					1		1179			22	0	1456
Yolo	2	7	1	2		1	14	2	1	4						134	2	5	0	375
Yuba		1		2			3		3	33						4	84	4	0	166
Total	923	3591	668	497	12	155	674	1081	936	163	267	94	801	78	1792	364	198	1599	111	69748

Appendix D: Cross-County Travel Matrix by Business Type

County	Business	Total	Alameda	Alpine	Amador	Butte	Calaveras	Colusa	Contra Costa	Del Norte	El Dorado	Fresno	Glenn	Humboldt	Imperial	Inyo	Kern	Kings	Lake	Lassen	Los Angeles	Madera	Marin	Mariposa	Mendocino	Merced	Modoc	Mono	Monterey	Napa	Nevada	Orange	Placer	Plumas	Riverside
Alameda	Food	287	265						14			1									6	2	1						2				1		
Alameda	Unknown	346	292				1		29			5		1	1				1		5		1	1		1						2	1		
Alameda	Mall	328	78			2	2	1	58						1		1		1		6	1	1			1						2			1
Alpine	Unknown	28		5	1				4		2	1									4											5			
Amador	Grocery	60	1		33		6				1														1	1						1			
Amador	Retail	32			16		7		1		1																								
Amador	Entertainment	5			5																														
Butte	Mini Mall	65	1			20			1				1								1		1								1			1	
Butte	Food	59				27			1												1					1			1						
Butte	Mall/Grocery	46	3			25			1																1					1					
Calaveras	Retail	55	2				27		7																				1		1				
Calaveras	Medical	22	3		3		11																								1				
Calaveras	Mini Mall	21	1				14				1																					1			
Colusa	Grocery/Food	28						22															1										1		
Colusa	Down Town	13						6					1								1														
Contra Costa	Unknown	713	61					1	543		1	4					1				12		8							4		3	5		3
Contra Costa	Medical	232	16		1		1		213			1					2				5		2						1	2					2
Contra Costa	Mall/Grocery	122	55						56		1										5	1	1		1							1			
Del Norte	Retail	93								76				5							2	1									1				
Del Norte	Hospital	46							2	33				2							4		1												2
El Dorado	Strip Mall	200	6		1				2		182	1					2				3											2	4		
El Dorado	Unknown	28	1		1						22						1				1								1						
El Dorado	Mall	58	3						1		52	1									2								1			1	1		
Fresno	Down Town	446	3						2			392			1		2	20			10	7				5	1		1	1		5	2		1
Fresno	Mall	276	6						5			185					5	7			11	9				4						5	1	1	2
Fresno	Business	232	1						1			193						3			6	10				1			1			3			3
Glenn	Food	67				2		5	1			1	28										1								1		2		
Glenn	Grocery	42	1			4		1					31																			1			
Humboldt	Education	135	5						4			3		77			1				8								1		3	1	3		3
Humboldt	Retail/Grocery	83							3	1				71							1												1		
Humboldt	Mall/Grocery	75								1				60																					
Imperial	Unknown	173										1		1	141		1				10											1			4
Imperial	Retail	27													21						2														
Inyo	Unknown	98	3												1	3	1				13							43				4			3
Kern	Unknown	186							1			1					174				7											2			1
Kern	Education	158															143				7	1							1			1			
Kern	Down Town	77							1			2					62				10	1													
Kings	Down Town	101				1			1	1		10					1	71			8	2				1						1	1		
Kings	Strip Mall	35										3						27			4														
Kings	Unknown	47										6					1	32			1										1	1			
Lake	Unknown	65								2									48		2		1							1			1		1
Lake	Retail	22																	19											1					
Lake	Business	15							1										13																
Lassen	Recreation	24			1															17					1										
Lassen	Unknown	23							1											14													1	4	1
Lassen	Grocery	20																		18														1	
Los Angeles	Business	3463	6			1			6			1			2		5				2841			1	1	1		1	2		1	226	5		50
Los Angeles	Retail	2326	3			1			3			1			4		8				1984		1					1	1			186	1		38
Los Angeles	Mall	1512	2		1				4		1	5					2				1239					1			2			118			27
Madera	Unknown	114	1						3			11					3	1			4	71				3			1						1
Madera	Mini Mall	53							2			18						1				29		4					1						
Madera	Retail	29	1						1			1										18		1								1			
Marin	Retail	154	6						12		2								1		5		80		2					1		1	1		
Marin	Mini Mall	116	3						12											1	2		74									1	1		
Marin	Park and Ride	103	1						4					1							1		66							2		2			
Mariposa	Strip Mall	68	2																			2		51		6									
Mariposa	Mini Mall	36																			1			32								1			
Mariposa	Unknown	12	1																		1			7											1
Mendocino	Grocery	37	3						1			1							6		4				16							1	1		
Mendocino	Mall	40	1																6		1				28	1							1		
Mendocino	Business	30																			1				23										
Merced	Down Town	230	3						5			3							1		4			3		188			3						3
Merced	Mall/Grocery	64										5					1	1			2				1	50						1			
Merced	Business/Medical	48	1						1																	40									
Modoc	Down Town	28																		1	1						23		1						
Modoc	Hotel	6																									6					1			
Mono	Unknown	193	6						1						1	3	2				10	1		1				108				16			6
Monterey	Unknown	438	6						3			1						3	1		16	1				3			333			8	3	1	1
Monterey	Mini Mall	52	3				1		2																				45						
Monterey	Business	84	1												2						2								65			1			1
Napa	Grocery	54	1						5												2		1							2		1			
Napa	Strip Mall	53							4												3		1							21		1			
Napa	Entertainment	46	5						1					1							1		1							23					

County	Business	Sacramento	San Benito	San Bernardino	San Diego	San Francisco	San Joaquin	San Mateo	San Luis Obispo	Santa Barbara	Santa Clara	Santa Cruz	Shasta	Sierra	Siskiyou	Solano	Sonoma	Stanislaus	Sutter	Tehama	Trinity	Tulare	Tuolumne	Ventura	Yolo	Yuba	Out of State	Out of Country
Alameda	Food	5		1		1	1	12			60					1	3	2					1	1			6	
Alameda	Unknown			3		6	4	6	1	1	33	1			1	2	4	1	1								7	
Alameda	Mall	2				2	20	9			153	1					1	6					1				5	
Alpine	Unknown				1			2			3	1					1										16	
Amador	Grocery	2		1		1	2	1	1		6	1						2					1				3	
Amador	Retail	6			1				1		1							2										
Amador	Entertainment	1				1					1																	
Butte	Mini Mall	5			1		1				1	1	2					1	1	14			1		1	1	1	
Butte	Food	3		1	1						1		1				1		3	6						5	3	
Butte	Mall/Grocery	1			1	2	1				1		1							3		1		2		2		
Calaveras	Retail	2					2				4	2					3	1					2		1		1	
Calaveras	Medical						1				1		1				1										1	
Calaveras	Mini Mall						1				2							1										
Colusa	Grocery/Food							1			1								2						1			
Colusa	Down Town																	1	2	1						1		
Contra Costa	Unknown	8		1	5	3	7	11		1	17	1				45	6	5	1			1	1	3	4	1	6	
Contra Costa	Medical	3		1	1	6	4	3			8		1			18								1			4	
Contra Costa	Mall/Grocery	1		1	2	4	2	4			3					4		1				1					2	
Del Norte	Retail						2	1								1											15	
Del Norte	Hospital	1					1																				15	
El Dorado	Strip Mall	23		1	1	2		1			6					1					1				3			
El Dorado	Unknown	4						2			3	1												1	1		4	
El Dorado	Mall	1				1	3	4			2		1				1				1	1		1			14	
Fresno	Down Town	4			3			3		2	4							1				182		2			1	
Fresno	Mall	3			2		2		3		6		1					1	1			8					1	
Fresno	Business	4		2	1	2		1			3		1					1				12						
Glenn	Food	3		1				1			1		3			1			2	9					1	1		
Glenn	Grocery	1														1	1			4					1			
Humboldt	Education	4		3	5		2	2	2		3				2		1	1		1							2	
Humboldt	Retail/Grocery	1			3	1		1			3					3	3				3							
Humboldt	Mall/Grocery	3			2						5		2			1	1										1	
Imperial	Unknown	1		5	5						1						3										6	64
Imperial	Retail			1		1		1																1				30
Inyo	Unknown	1		3	6	1				3		1												5			14	
Kern	Unknown			1	1	1		1	1		2						1					1		1				
Kern	Education						1		3				1					1						3	1		1	
Kern	Down Town			2	1	1	1											1				3		5				
Kings	Down Town				3				1		3											11					4	
Kings	Strip Mall	1		1	1			1				2										5					1	
Kings	Unknown			1																		4					27	
Lake	Unknown	1			2											1	4			1							1	
Lake	Retail																1								1		1	
Lake	Business	1														1	1						1				1	
Lassen	Recreation	1			1			1			1		1															
Lassen	Unknown	1															1										1	
Lassen	Grocery																			1							1	
Los Angeles	Business	7		141	34	6	1	7	3	8	8	2	1			1	1	1			1	1		58	2		66	
Los Angeles	Retail			73	30		3	7		6	8					1	4	1	2			1		48	3		30	
Los Angeles	Mall	3		63	25	2	1	5	2	1	5	1			1	2		4						38	1		15	2
Madera	Unknown				3		1	1		1	3							1				1	3				3	
Madera	Mini Mall	2		1	1																			2			2	
Madera	Retail					1										1		1				2			1			
Marin	Retail	3			1	6		3			5					2	52				1	1	1				2	
Marin	Mini Mall	1		2		2		3		1	1	1				5	7							1				
Marin	Park and Ride	3			1	6		2	1		2	1				2	14											
Mariposa	Strip Mall	1			1			1										2					1	1			2	
Mariposa	Mini Mall					1						1																
Mariposa	Unknown										1							1										
Mendocino	Grocery					1										1	1			1							2	
Mendocino	Mall				1	1											1								1	1	1	
Mendocino	Business					1		1			1						3											
Merced	Down Town		1				5	6			18							20		1			1	1			4	
Merced	Mall/Grocery					1		1			2							3										
Merced	Business/Medical	1					2											2				1						
Modoc	Down Town															1			1									
Modoc	Retail	1																									1	
Mono	Unknown	1		3	5	1		1		2	3	1				1	2					1		5			10	
Monterey	Unknown	5	1		3	4	1	4	5	1	21	12	1			1	1							4	1		17	
Monterey	Mini Mall	2				2						6				1											6	
Monterey	Business				1	2	1				1	4						1		1						1	4	
Napa	Grocery				1			4					1			35	1										2	
Napa	Strip Mall	1			1	1					2					10	5											
Napa	Entertainment	1				2		2			1					5	3										3	

County	Business	Total	Alameda	Alpine	Amador	Butte	Calaveras	Colusa	Contra Costa	Del Norte	El Dorado	Fresno	Glenn	Humboldt	Imperial	Inyo	Kern	Kings	Lake	Lassen	Los Angeles	Madera	Marin	Mariposa	Mendocino	Merced	Modoc	Mono	Monterey	Napa	Nevada	Orange	Placer	Plumas	Riverside
Nevada	Unknown	80	4			2			1		1	1					1				2		4						1	2	19	1	13	3	1
Nevada	Strip Mall	31							1		1									1	1		2		1						5		12		
Orange	Mall	1351	4						1			1			2		2				298							2				974			32
Orange	Business	1334	4			1			3	1	1	1			1		3		1		372								1		1	886			58
Orange	Unknown	1280	1						3						2						152		2			1		1	1	1		948			30
Placer	Strip Mall	138	1			1					3										4		2								1	1	68		
Placer	Strip Mall/Education	107									3	1		3							2								1	1	8	1	48		
Placer	Grocery	75	1						2		2										2										1		42		
Riverside	Mall	676	2						3		1	1			2						58		1			1				1		27	1		475
Riverside	Retail	488	3						2			1		1							31											20			371
Riverside	Mini Mall	349	1						1					1	2		1				10											11			248
Sacramento	Unknown	1538	15	0	2	5	2	5	18	0	26	6	0	1	0	0	0	2	2	1	26	0	2	0	1	1	0	0	4	0	10	12	75	2	7
Sacramento	Mini Mall	380	5			1		1	6		6	1		1							7					1			1		3		6		
Sacramento	Retail	172	3		1				2		6										5								1	1			6		1
San Benito	Food	79	5																1		2								6						1
San Benito	Strip Mall	49	3						1												1								3						3
San Benito	Unknown	11										6					1												1						
San Bernardino	Unknown	891	2												2		2				96											23			36
San Bernardino	Strip Mall	436							1												181											30			56
San Bernardino	Mini Mall	305	3						1						1		1				27								1			1			27
San Diego	Mini Mall	1915	8						4		1	5		1	18		4		1		68	2	1		1			1	1	1		35		1	35
San Diego	Business	386	3									1			3		1				33		3			1					1	31	1		20
San Diego	Mall	653	1						1			2			3		1				26					1			2			1			18
San Francisco	Education	714	41			1			25		1	2		1							17		25		3				4	2	1	6	1		1
San Francisco	Parking	436	21						36			3		1	1						19		36		3					4	1	5	3		1
San Francisco	Unknown	222	11						13			1									4		13							1		3			1
San Joaquin	Business	150	5						3		2	2					1				5			1		2						1	1		1
San Joaquin	Education	186	8			1	3		1												3					3			3			1			
San Joaquin	Retail	167	6		1		3		1			1									6				1							1	1		
San Luis Obispo	Unknown	131	4		1				8			13		1	1		6	2			28	2						1	4	1		6			3
San Luis Obispo	Parking	18							1												4														
San Luis Obispo	Down Town	33	1									2					3	1			1		2									1			
San Mateo	Strip Mall	611	37		2				19		1	3									12		1						1	1	1	1			5
San Mateo	Unknown	389	28						6					1			1		1		6		1								3	3			
San Mateo	Business	254	23						11			1									6		1										1		1
Santa Barbara	Mall	407	3						1					1		1	2				23											2		1	1
Santa Barbara	Grocery	242	3						1			1			3		1			1	18		1									1			
Santa Barbara	Medical	185	1														1	1			6											3			1
Santa Clara	Mall	512	11						4			2									11					1			6			2			
Santa Clara	Business	480	18						8			1					1				6		3		1	1			1			3	3		3
Santa Clara	Retail	486	37						6			1					1	1			6	2				1			3			3			1
Santa Cruz	Business	171	3						4								1				3		3						3			3			1
Santa Cruz	Mall/Grocery	161							5																				4				3		
Santa Cruz	Retail	143	1			1			1			1		1															1			2			
Shasta	Retail	425	7			3	1		4		1	4	1	1	1						11								1			3	4		2
Shasta	Strip Mall	55				1						1									4														
Shasta	Food	33									1										1														
Sierra	Highway	20									1										2												2		
Sierra	Unknown	1																																	
Siskiyou	Unknown	138	2			4				2												2										2	2		
Siskiyou	Education	35							1												2			2									1		
Solano	Education	147	5						9					1							1		1								1	1	2		2
Solano	Unknown	138	1					1	1										1		2		1							3			1		
Solano	Retail/Grocery	85	1			1			3												1	1	1							2					
Sonoma	Strip Mall/Grocery	241	2						1					1							2		12						2	2					
Sonoma	Retail	158	1						1					2							3		4		2					1		2			
Sonoma	Retail/Business	149	1						1			1						1	1		3		4		2					1		3			1
Stanislaus	Mall	270	6						5			4									4					12				1		1	2		
Stanislaus	Retail	158	2				4		3			2		1			1				3	1				4			2			2	1		
Stanislaus	Mall/Grocery	138	1				1		1								1				2	1				23				1					
Sutter	Strip Mall	56				4		1					1								2										1		2		1
Sutter	Food	17																			2												2		
Sutter	Mall	17																																	
Tehama	Retail	141	3			2				1			1							1	2			1										1	
Tehama	Grocery	25				3					1		2																						
Trinity	Down Town	18	1											2			1				1								2	1			1		
Tulare	Medical	130										18					3	14			8							1		1		1			1
Tulare	Education	160										3					1	11			3					1					1	3	1		
Tulare	Unknown	34															1	3			1														1
Tuolumne	Retail	83	5				3		3			3									7	1		3		3									
Tuolumne	Recreation	8	1																							1									
Ventura	Mall	556	2						1		1										53								1			11			1
Ventura	Unknown	280															1				28									1		4			1
Ventura	Retail	175															3	1		1	33											4			1
Yolo	Business	187	1			1		1	2			2		1				1			4								1		1	3	3		
Yolo	Education	106	2						2		2										5									1		3	1		
Yolo	Retail	72						3	1						1						3											1	3		
Yuba	Unknown	158				2		1			1						1		1		5									1	1	1	8		
Total		20953	422	0	1	54	17	12	241	4	69	85	5	20	30	1	47	38	9	5	1592	12	110	7	14	58	0	6	60	52	55	3064	306	3	1454

County	Business	Sacramento	San Benito	San Bernardino	San Diego	San Francisco	San Joaquin	San Mateo	San Luis Obispo	Santa Barbara	Santa Clara	Santa Cruz	Shasta	Sierra	Siskiyou	Solano	Sonoma	Stanislaus	Sutter	Tehama	Trinity	Tulare	Tuolumne	Ventura	Yolo	Yuba	Out of State	Out of Country
Nevada	Unknown	4					2	5			5	3	2				1		1							3	31	
Nevada	Strip Mall	2				1			1		3		1			1	1							1		2	5	
Orange	Mall	4		33	31		1	2		3	6	1										2		3			28	
Orange	Business	3		38	23	1	1	6	3	3	5	2					1					3		5	1		29	1
Orange	Unknown	2		21	19			5		2	5	1					1			1				7			25	1
Placer	Strip Mall	35		2			2	1			3	1				1		1	1	1				2	1			
Placer	Strip Mall/Education	31			1						2					2			1					1	3		1	
Placer	Grocery	18			1	1		1			1								1				1		1		1	
Riverside	Mall	1		62	28		1	6		2	3					1								3	1		34	
Riverside	Retail			21	18			3	1		2					1	1							3		1	12	
Riverside	Mini Mall			58	3			2			1													1			11	
Sacramento	Unknown	1835	0	7	10	11	42	17	2	1	20	2	2	0	0	23	6	5	5	2	8	3	1	5	40	3	20	
Sacramento	Mini Mall	252				3	5	3			7	1			1	2	1	6	1						7	1	6	
Sacramento	Retail	123		3	1		2	2			3					4	1	1	1	1					4	1	4	
San Benito	Food	1	3			1		1			57	1															2	
San Benito	Strip Mall	1	2					1			34	2												1				
San Benito	Unknown		3		1																						3	
San Bernardino	Unknown	3		657	12		1	3	4	1							1							6			35	
San Bernardino	Strip Mall			293	4	1	1	2	2		3													3			8	
San Bernardino	Mini Mall			218	4				1	2	1													5			34	
San Diego	Mini Mall	4		20	1583	1	1	5	3	6	7		1			1	1							4	2		46	9
San Diego	Business	1		5	738	1		6	2	1	2	2						2				6		6	1		24	2
San Diego	Mall	2		7	568	1	1	2	1		3	1												18	1		21	1
San Francisco	Education	6		2	5	216	3	104	1	2	18	2	1		1	10	7	4		2				1	2		15	
San Francisco	Parking	3		1	3	343	2	81		1	22	3	1			11	6	1						3	3		23	
San Francisco	Unknown	3				112		37		1	11	1	1			5	3							1			9	
San Joaquin	Business	18					580	2	3							2		8				1					1	
San Joaquin	Education	6		1	1		35	6	1	1	3							37					2					
San Joaquin	Retail	5		2		2	119	2			5						1	6					1				4	
San Luis Obispo	Unknown		1	3	3	2	1	6	318	21	1	1				1		3				8		13			3	
San Luis Obispo	Parking			1					45	3	1									1				2				
San Luis Obispo	Down Town			1		1		1	34	3								1				3					2	
San Mateo	Strip Mall	4		2	3	42		405		1	52	2	1			8	2	2					2	1			15	
San Mateo	Unknown	4			1	20		175	1		46	3				1	1			1			1	2	2		5	
San Mateo	Business	4		2	3	41	5	52		2	47		1			1	5								1		13	
Santa Barbara	Mall			4	3	1		5	33	238	3	1	1			2	2			1		1		17	1		11	
Santa Barbara	Grocery			2	1			2	12	181	2					2	1							14			6	
Santa Barbara	Medical				1				18	72	1													2			3	
Santa Clara	Mall	3		2	4	2	1	19	1		421	6				2	4	1				2		3			6	
Santa Clara	Business		1		2	18	5	40		1	216	18					2	2				2			1		5	
Santa Clara	Retail	1	1		1	1	3	6			313	9				1	1	3							1		4	
Santa Cruz	Business	1	1	1		2	1	1	2	1	11	125					2							2	1	1	2	
Santa Cruz	Mall/Grocery	1			2		2	2			15	127													1		6	
Santa Cruz	Retail	2	1	1	2		1	1			11	113										2			1			
Shasta	Retail	4		2	2	1	1	5	2	1	8		294		6				1	46	1		1	1	2		16	
Shasta	Strip Mall	1						1					64		1		1			1							3	
Shasta	Food							1			1	1	23							1				2				
Sierra	Highway							1			1			11			1							1			4	
Sierra	Unknown	1																									2	
Siskiyou	Unknown	2				2					4		18		102	2									2		2	
Siskiyou	Education	2			1			1					2		35												2	
Solano	Education	5				2		2			3		1			102	1	1				1			6		3	
Solano	Unknown	3			2	2		2			4	1	1			61	1		1						34	1	1	
Solano	Retail/Grocery				1	1	1	1			1					72	1	1	1					1	2			
Sonoma	Strip Mall/Grocery	7				2		8			2	2			2	2	188											
Sonoma	Retail				1	4	1	2		1	1	1					120	1						1	1		1	
Sonoma	Retail/Business	1			1	1	1	1				1					124										1	
Stanislaus	Mall	7		2	1		18	1			8						1	208		1		1	1					
Stanislaus	Retail	5				1	16	3		1	2	1						37					4	1	1			
Stanislaus	Mall/Grocery	1			1	2	5	1								2		90						1		1	2	
Sutter	Strip Mall	3			1		3			1		1	2				1	1	65						1	18	1	
Sutter	Food																	1	5							3	1	
Sutter	Mall																		14							3	1	
Tehama	Retail	6					1	2		1	2		11							183	1						3	
Tehama	Grocery	1					1	1			1									15							1	
Trinity	Down Town	2		1		1					2		18			1				1	78			1	1		1	
Tulare	Medical			2	1		2	1	2							1		2				143						
Tulare	Education	1		1			1	1								1						133					3	
Tulare	Unknown							1														47						
Tuolumne	Retail	1		1		3	4	2			6	1						4					28	1	1		4	
Tuolumne	Recreation	1					4									1												
Ventura	Mall			6			1	2		17	1					1	1							487			4	
Ventura	Unknown			5	1			2	1	1		1	1		1									131			4	
Ventura	Retail	1		1	2	3		3		5							1							128			2	
Yolo	Business	184				2	6	3			4	1				6									47	1	2	
Yolo	Education	28		1	1	1	2	3		1	2		2		1	4	2		3						35		1	
Yolo	Retail	6						2		1	1					2		1	1						40	1	2	
Yuba	Unknown	7			1	1	2	2	1		1		2			3		3	23						4	84	4	
Total		1812	13	1488	3261	784	983	1183	503	533	1504	435	421	11	141	342	439	430	120	180	86	336	43	801	268	120	538	15