Methodology and Data Used to Develop the California Private Passenger Auto Frequency and Severity Bands Manual

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Abstract

This paper reviews the methods and data used to produce the estimated frequency and severity rates that appear in the California Private Passenger Auto Frequency and Severity Bands Manual. The primary data source was an industry wide summary of exposures and claims by coverage by zip code. Six years of data from 1988 to 1993 were analyzed. Also utilized were data that summarized the zip code by zip code variations in vehicle value, model year, and deductible level purchased. A final data set was used to identify the non post office box zip codes in the state and identify the zip codes which comprise each CAARP territory. After frequency and severity rates were calculated for each zip code, they were credibility adjusted (if necessary) using the larger area defined by the CAARP territory as the complement of credibility. The resulting frequency and severity distributions, process for creating bands, and credibility adjustments are described in detail.

Purpose

The purpose in developing the California Private Passenger Auto Frequency and Severity Bands Manual was to estimate the average claim frequency and severity for the private passenger auto insurance coverages in each of California's zip codes. These estimates may be needed by insurers who choose to use territory rating factors in their auto rating plans. Section 2632.5(d) of Title 10 California Code of Regulations gives insurers the option of using rating factors that group zip codes into two sets of ten bands. One set of bands for claim frequency and one set for claim severity. To determine which zip codes should be grouped together it is necessary to accurately estimate the claim frequency and claim severity of each zip code. However, most insurers do not have sufficient data to credibly estimate the average claim frequency and severity in an area the size of a zip code. By summarizing the experience of all insured vehicles in each zip code, the Manual provides valuable data in producing the most accurate estimate of claim frequency and severity. This paper describes the methods and data used to develop the Manual. (Exhibit 1 contains the first couple of pages of the zip code section of the 200+ page document.)

Background

In 1988, California voters enacted Proposition 103. Among other things, this proposition required that auto insurance premiums be primarily determined by the safety record, mileage, and driving experience rating factors. The regulations (RH-338) that implements the rating factor portion of Proposition 103 seek to ensure that the territory factor has a smaller role in setting auto insurance premiums then under prior practices. Two approaches used to lessen territory's role were: 1) requiring that the territory relativities be developed last, after all the explanatory power of the other factors have been taken into consideration, and 2) by limiting how the territory factor can be defined. The regulations specify that territory must be limited to two factors: average claim frequency and average claim severity. Further, each of these two factors are limited to a maximum of ten rating bands. Each band is formed by grouping zip codes with a similar risk level (the regulations do permit using census tracts instead of zip codes, however insurers do not currently have this level of detailed data and significant credibility problems would be encountered with these very small areas).

Data

Three data sources were used in developing the Manual. The primary data comes from the Department's Statistical Analysis Bureau (SAB). Per Insurance Code Section 11628(a) the SAB annually collects summary data on the exposure, losses, and the number of claims by coverage by zip code for every private passenger auto insurer operating in California. The following coverages are identified in the raw data files:

- bodily injury (BI)
- property damage (PD)
- medical payments (MP)
- uninsured motorist (UM): BI
- uninsured motorist (UM): PD
- combined single limits (CSL): BI
- combined single limits (CSL): UM

- collision (CL)
- comprehensive (CM)

To create the six coverages in the Manual the following coverages were combined:

- BI and CSL: BI
- UM: BI, UM: PD, and CSL: UM

The data covered the years from 1988 to 1993. They reflect the experience of virtually all the private passenger auto insurers operating in the state. To calculate claim frequency and severity, it is necessary to know the number of *claims*, the amount of *losses*, and the number of vehicle years of *exposure*. The frequency rate is the number of claims divided by the number of years of exposure. The severity rate is loss divided by the number of claims.

Exposure is measured five ways in the raw data: written premium, written exposure (in vehicle months), earned premium, earned exposure, and earned premium capped. Earned exposure was converted to vehicle years for all calculations of frequency used in the Manual. For the liability coverages (BI, PD, MP, and UM) four measures of loss are provided: incurred loss, paid loss, paid allocated loss adjustment expense, and incurred loss capped. For determining the severity rates shown in the Manual, incurred loss capped was utilized. Capped incurred loss is the most desirable measurement to use for two reasons. The first is that allocated loss adjustment expense is not included. Allocated loss adjustment expenses vary from company to company depending on its philosophy and practices. Secondly, capped losses remove the influence of the different levels of insurance coverage (increased limits) purchased from zip code to zip code. The increased limits factor reflects the *amount* of insurance purchased. It is not subject to the weighting requirement of Proposition 103 and is a separate factor in insurers' premium calculation algorithms. Thus, reflecting its influence in territorial rating factors is not appropriate.

Removing the influence of the amount of insurance purchased on the losses for the physical damage coverages (CL and CM) is also desirable. However, this was not as easy. For the physical damage coverages the measurement of loss in the raw data was paid losses. The factors related to the amount of insurance purchased for the physical damage coverages include: the vehicle value, the model year of the vehicle, and the deductible level selected by the insured. Newer, more valuable vehicles with lower deductibles are likely to generate higher expected losses.

To measure the zip code by zip code variations in vehicle value, model year, and deductible a different data source was utilized. In early 1994 the Department issued a special data call to the top auto insurers representing about 80% of the California market. As part of this data call detailed data were collected on each vehicle a company insured on Dec. 31, 1993. This data included information on each vehicle's value, model year, and deductible. These data were used to create an index for each company for each zip code that reflected the deductible level, vehicle model year, and vehicle value of all the insured vehicles in the zip code. Creation of these indexes was a multi step process. First, each company's relativities were normalized to a uniform scale.

Next, indexes were aggregated, weighting each company by its market share. The data for the paid losses in the zip code were then adjusted using the index.

Creating the deductible/model year/value index involved the following steps:

1) Each company's rates for deductible level, vehicle value, and vehicle model year were normalized so that all companies were using an equivalent scale. All relativities were adjusted so that each company used the same vehicle value, model year, and deductible for the base rate. Any relativities that were additive were converted to multiplicative relativities. Finally, all base rates were adjusted to be 1.0. Because relativities varied depending on whether the coverage was collision or comprehensive, two indexes were created. One index for collision coverage and one for comprehensive.

2) For each company, for each zip code a composite variable was created that reflected the deductible level, vehicle value, and vehicle model year for the vehicles insured by the company.

3) The company specific indexes computed in step two were weighted based on each company's market share in the zip code and then combined to produce a single value for each zip code.

4) The zip code level indexes were combined (weighting each zip code by its exposures) to create an index for the 72 territories used by the California Assigned Risk Program (CAARP).

5) The final index for each zip code was determined by combining the unadjusted index for the zip code and the index for the CAARP territory in which the zip code resides. The credibility assigned to the unadjusted zip code index was determined by the proportion of exposures accounted for by the companies used to create the index. The complement of the credibility came from the CAARP territory index.

The third and final data source used in the development of the Manual was a file that mapped all the zip codes in California into a CAARP territory and identified zip codes that were only post office boxes. This file was developed from the 1995 zip code directory from the U.S. Postal Services. All zip codes that were identified as not exclusively a post office box were assigned to a CAARP territory. Throughout the analysis of the zip code frequency and severity rates, the CAARP territories are used as a reference point to serve as the complement of credibility when the data at the zip code level is not fully credible. The CAARP territories were good sources for these credibility adjustments because they are geographically contiguous areas, they divide the state into 72 territories (which is about the same number of territories currently used by most insurers), and are based on whole zip codes (i.e., no zip code is split with part in one CAARP territory and the other part in another CAARP territory).

Analysis

Estimating claim frequency and claim severity for each zip code and coverage, involved the

following steps:

1. The initial analysis started with two raw data files. One file contained the liability coverages, and the other contained the physical damage coverages. To enhance processing efficiency the raw data files were split into individual coverage files, and then collapsed into one file for each primary coverage. Each coverage specific file contained a summary of the experience in each zip code.

2. The coverage specific zip code files for the physical damage coverages were combined with the file containing the vehicle value, model year, and deductible indexes. The paid losses were divided by the index to produce an adjusted paid loss. This adjusted paid loss was used to compute the severity for the collision and comprehensive coverages.

3. Using data from the file mapping the zip codes into CAARP territories, the coverage specific *zip code* files were collapsed into coverage specific *CAARP* files. These new files contained a summary of private passenger auto experience in each CAARP territory.

4. Frequency and severities were calculated using the following formulas:

average claim frequency = number of claims / number of vehicle years of exposure [1]

for the liability coverages:
average claim severity = incurred losses capped / number of claims [2]

for the physical damage coverages:
average claim severity = adjusted paid losses / number of claims [3]

5. The credibility of the frequency and severity rates were calculated for each zip code. The frequency rate for a zip code was considered 100% credible if there were sufficient exposures to provide 95% probability of the rate being at least as accurate as the minimum difference between the closest two rating bands. This standard ensures that there is not much likelihood of an estimated rate being off by more than one rating band. To provide a single standard that would be applied to all zip codes, the statewide frequency rate was used to estimate the variance of the rate using the formula:

$$var = (p * q) / n \quad [4]$$

where p = the statewide rate; q = 1 - p; and n = the number of observations. The minimum difference between bands was estimated from previous work which assumed the ten bands were created by grouping roughly the same number of similar zip codes together in each band. The number required for full credibility was determined by solving the following equation for n:

$$2.0 * ((p * q) / n)^{1/2} = \text{min. dif.} \quad [5]$$

This yields:

$$n = (p * q * 2.0^2) / (\text{min. dif.})^2 \qquad [6]$$

The statewide frequency rate, minimum distance between bands, and the full credibility number for the six coverages were as follows:

Coverage	Statewide Frequency	Minimum Difference Between Bands	Number of Vehicle Years of Exposures for Full Credibility
Bodily Injury	0.01646	0.00127	39,914
Property Damage	0.04009	0.00184	45,678
Medical Payments	0.01529	0.00113	47,780
Uninsured Motorist	0.00710	0.00075	50,293
Collision	0.08427	0.00439	16,031
Comprehensive	0.06773	0.00516	9,500

The credibility of the frequency rates for zip codes with less than the number required for full credibility was computed using the formula:

$$\text{credibility level} = (\text{years of exposure} / n)^{½} \qquad [7]$$

To determine the credibility level of the severity rates the higher of two standards was selected. The first standard was 1,082 claims. This number has been a frequently used standard in the past. The second standard is based on the number of years of exposure needed for full frequency credibility, the standard deviation of the unadjusted zip code severities, and the statewide average severity rate. To calculate the second standard, the number of years of exposure needed for full frequency credibility (n) was converted to the number of claims (n_c) by multiplying it by the statewide frequency rate. Then the number of claims (m) required for full severity credibility was computed using the following formula[1]:

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[1] Note that L. H. Longley-Cook in "An Introduction to Credibility Theory" (a 1962 paper published by the Casualty Actuarial Society) recommends using formula [8] for pure premium credibility and the formula: $n_c * (CV^2)$, for severity credibility. However, these formulas assume the standard deviation is calculated from individual claims data *within* a zip code. In this analysis individual claims data is not available and the standard deviation within a zip code is estimated by the standard deviation of the average severity *between* the approximate 1,800 zip codes in California. Because this analysis is using losses capped at the basic limits, the standard deviation of severity will be lower than with uncapped losses. However, it could be that the estimated standard deviation is less than the actual standard deviation. In order to provide some adjustment for the possible under estimation, the more conservative formula [8] for pure premium is used.

$$m = n_c * (1 + CV^2) \quad [8]$$

where CV = the standard deviation of the unadjusted zip code severities divided by the statewide average severity. The average statewide severity rate, standard deviation of the unadjusted zip codes, and the number of claims required for full credibility for the six coverages were as follows:

Coverage	Statewide Severity	Standard Deviation	Number of Claims for Full Credibility
Bodily Injury	9,135	775	662
Property Damage	1,563	194	1,859
Medical Payments	1,033	69	729
Uninsured Motorist	4,720	952	371
Collision	1,412	171	1,371
Comprehensive	512	206	748

Thus, the severity credibility standard for bodily injury, medical payments, uninsured motorist, and comprehensive was set at 1,082 claims. The severity standard for property damage and collision was set at 1,859 claims and 1,371 claims respectively. The credibility of the severity rates for zip codes with less than the number required for full credibility was computed using the formula:

$$\text{credibility level} = (\text{number of claims} / m)^{1/2} \quad [9]$$

Once credibility was computed, the frequency and severity rates lacking 100% credibility were adjusted using the CAARP rate as the complement of credibility (all CAARP rates were 100% credible). The formula for the final credibility adjusted rate was as follows:

$$\text{credibility adjusted rate} = (\text{credibility level} * \text{zip rate}) + ((1 - \text{credibility level}) * \text{CAARP rate}) \quad [10]$$

6. Once a credibility adjusted frequency and severity rate was calculated for each zip code, the distribution of the number of individuals receiving specific rates was developed. This distribution was then divided into ten bands with each band containing approximately the same number of individual exposures. Finally, the experience in each band was totaled and frequency and severity rates were calculated.

Frequency and Severity Distributions

Exhibit 2 contains a series of twelve charts which show the distribution of the frequency and severity rates for each of the six coverages. The horizonal or X-axis shows the number of zip

des with a rate lower than the rate indicated by the curve. The vertical or Y-axis shows the te.

ll of the distributions had a certain similarity to them. Always the distributions tended to be ore extreme at the ends. On one side of the distribution, the curve accelerates downward, while ı the other side the curve accelerates upward. For the liability coverages, the severity stributions tended to be more symmetrical at each end of the distribution. The frequency stributions tended to be much more extreme at the high end of the scale and flatter at the low ıd of the scale. These frequency distributions show that only a very few zip codes had very high tes.

he basic shape of the frequency and severity distributions for collision claims were quite similar. owever, with comprehensive claims, the relative shapes of the frequency and severity istributions were somewhat reversed from what was observed with the liability coverages. The ollision *severity* distribution tended to have more extreme rates on the high segment of the istribution.

and Rates

xhibit 3 contains two charts showing the distribution of the band frequency rates and the band everity rates. The frequency distribution chart shows the relatively higher frequency rates for the overages involving physical damage (i.e., PD, CM, and CL). This chart also shows the greater ariability between bands for the UM and BI coverages. The ratio between the high band rate and ıe low band rate is 4.8 and 3.3 for UM and BI respectively.

he severity distribution chart shows the higher claim severities associated with BI claims and the ow claim severities associated with the CM claims. Generally, there is not as much variability in he severity rates among the bands as was the case with the frequency rates. All of the overages, except CM, have a 1.3 to 2.0 ratio between the high band rate and the low band rate. or CM the ratio is 3.4.

he bands group roughly the same number of individual exposures into each band. In the Manual he average rate for each band is shown. The averages shown in the Manual reflect the average xperience of all the *vehicles* in the specific bands (not the average of the rates associated with ach zip code in the band).

redibility Levels of Unadjusted Rates

xhibit 4 contains a table and two charts summarizing the credibility level of the unadjusted zip ode data. The credibility is calculated as a percent and rounded to the nearest ten percent. The able shows the percent of zip codes that had credibility levels ranging from 0% to 100%.

n general, there was a roughly similar level of credibility for frequency and severity. However, the frequency rates tended to have a slightly higher level of credibility than the severity rates. There were approximately 60 (3%) new zip codes created in recent years that either had very little

or no data. For these new zip codes, rates were determined by the CAARP territory of which the zip code was a member. As these new zip codes develop more experience, their rates will be set by data solely from the zip code.

Because the credibility measurement for severity required at least 1,082 *claims* for 100% credibility, relatively fewer zip codes met this standard. The highest levels of severity credibility were achieved by the physical damage coverages. For these coverages about half the zip codes were 100% credible. Property damage liability coverage achieved a similar but slightly lower severity credibility level (36% were 100% credible). BI and MP had a similar levels of severity credibility. About 50% of the zip codes for these coverages had a credibility level of 50% or higher. UM had the lowest level of severity credibility with just 43% of the zip codes with a credibility level of 50% of higher.

Distribution of the VYD Index

Exhibit 5 contains two charts showing the distribution of the vehicle value, year, and deductible (VYD) index. One chart shows the collision index. The other shows the comprehensive index. Both of theses distributions exhibit the characteristic of a relatively flat middle with more extreme values associated with a few observations at the ends of the distribution. This is similar to the frequency and severity distributions discussed earlier.

Areas for Future Research

Assessment of Trends

The present analysis of the zip code experience did not evaluate the data for the presence or absence of trends. The main purpose for developing the frequency and severity estimates are to facilitate the development of the rating factors for estimating the risk of loss during some future time. As such, it seems legitimate to take into account the influence of a trend in rates (if one exists) in making that estimate. Specifically, it would be desirable to estimate the *future* frequency and severity rates as opposed to summarizing the historical experience. A key problem in estimating trends is determining the difference between a random fluctuation and a genuine trend. As more years of data become available, the ability to recognize trends will increase. If the estimation of trends is included as a part of the frequency and severity estimation methodology, criteria will need to be developed for how the trends will be modeled, the minimum number of data points needed for modeling, and the significance needed for identification of a trend. It would also be desirable to evaluate the impact of including trend identification in the methodology compared to using a strictly historical approach. Do the band rates and their corresponding relativities differ? How many zip codes are different, by what amount? How many zip codes are placed in a different band?

Outliers

With small areas, such as zip codes, a one year time period could be influenced by events or situations that are not representative of the long term risk in the area. This appears to be more of a potential problem with severity estimates and is the primary reason that a more difficult standard was set for achieving complete credibility for severity. A few very large claims could cause a

spike in the severity for one year. Some particularly dangerous construction activity could possibly cause the frequency of claims to dramatically increase for a short time period. When an average is computed over a long enough time period, the effect of these "non-representative" time periods is minimized. However, there could be situations where the inclusion of an outlier data point does substantially change the rate in a particular zip code. Future analyses could explore the impact of different strategies for identifying and dealing with "non-representative" data points. If trends are included in the methodology, the issue of properly dealing with outliers becomes even more important due to the impact that an outlier can have on the estimation of the trend.

Rate Stability

Most analysts would agree on the desirability of stable rates. Future research could explore the impact of requiring some level of rate stability between successive time periods (e.g., the rate between two successive three-year time periods should not differ by more that some specific percentage). When a zip code fails to meet the criteria the problem arises as to determining which time period is the more accurate of the two. Also, one must determine to what extent (if any) the less accurate data should be considered in the development of the final estimate of the rate.

As part of the present analysis, rate stabilities were briefly examined. For liability coverages the 1988 to 1990 period was compared with the 1991 to 1992 period. For physical damage coverages the two time periods were 1988 to 1990 and 1991 to 1993. Most of the large differences were due to one time period having very little experience upon which the estimated rate was based, while the other time period was fully credible. The final rate for the total time period tended to be very close to the fully credible rate.

Alternate Credibility Adjustment Procedures

The present analysis set a standard of 9,500 to 50,293 vehicle years for frequency estimates to be fully credible and 1,082 to 1,859 claims for severity estimates to be fully credible. Ideally, the distribution of losses could be examined to measure severity's credibility, however, the current data is only available in a summary form (i.e., total losses and total claims for the zip code). One way around this limitation is to require some type of measurement of the dispersion of losses at the time the data is originally collected (e.g., standard deviation or variance of the losses). The loss variance for the entire zip code could be estimated by combining the variances from the individual companies, weighting by each company's share of the total exposures.

Other alternate approaches to determining credibility include:

- considering a rate fully credible using a standard different (and probably lower) than that used in this analysis;
- using another reference point for the complement of credibility besides the CAARP territory in which the zip is located. For example a county wide or region wide reference point could be used; and
- if a particular zip code is not fully credible on its own, combine it with an adjacent zip code (or codes) until full credibility is reached instead of using a rate that complements the credibility. This approach could be modified to weight nearby zip codes by their proximity to the target zip code.

Exhibit 1

First Two Pages of
the California Frequency and Severity Bands Manual

California Private Passenger Auto Frequency and Severity Bands Manual

Bodily Injury:

	CAARP	Frequency:		Severity:		Unadjusted Data:			Credibility:	
						Years of	Number	Capped		
Zip Code	Area	Band	Rate	Band	Rate	Exposure	of Claims	Losses	Freq	Sevr
90001	39	10	0.03419	8	9,402	11,562	402	3,738,301	54%	61%
90002	39	10	0.03349	8	9,392	10,423	349	3,232,991	51%	57%
90003	39	10	0.03913	9	9,630	11,738	515	4,975,514	54%	69%
90004	36	10	0.04370	10	10,125	35,755	1,568	15,875,921	95%	100%
90005	36	10	0.04727	10	11,707	12,175	638	7,756,692	55%	77%
90006	38	10	0.04449	10	9,712	9,369	536	5,160,632	48%	70%
90007	39	10	0.03649	9	9,528	8,178	328	3,115,944	45%	55%
90008	38	10	0.03003	10	10,274	36,666	1,097	11,270,383	96%	100%
90010	36	10	0.04443	10	10,557	2,937	158	1,755,052	27%	38%
90011	39	10	0.04142	9	9,489	9,684	480	4,537,605	49%	67%
90012	37	10	0.03700	7	9,034	8,604	365	3,243,523	46%	58%
90013	39	10	0.03517	9	9,451	1,496	63	573,551	19%	24%
90014	39	10	0.03527	10	9,813	1,371	59	627,755	19%	23%
90015	39	10	0.04032	10	9,872	3,020	176	1,818,245	28%	40%
90016	38	10	0.03154	10	10,231	34,551	1,087	11,121,469	93%	100%
90017	37	10	0.03647	9	9,600	2,813	135	1,385,208	27%	35%
90018	39	10	0.03724	9	9,602	22,283	858	8,242,972	75%	89%
90019	38	10	0.03621	10	9,977	43,444	1,573	15,693,585	100%	100%
90020	36	10	0.04831	10	10,200	15,908	837	8,535,846	63%	88%
90021	39	10	0.03406	9	9,692	1,713	62	626,514	21%	24%
90022	40	10	0.02490	6	8,991	39,809	991	8,892,582	100%	96%
90023	40	10	0.02786	9	9,660	14,618	408	4,012,570	61%	61%
90024	30	10	0.03147	10	10,054	81,920	2,578	25,919,866	100%	100%
90025	35	10	0.03050	10	9,962	93,736	2,859	28,482,116	100%	100%
90026	37	10	0.03792	8	9,253	40,426	1,533	14,185,295	100%	100%
90027	32	10	0.03768	10	9,876	53,932	2,032	20,067,905	100%	100%
90028	36	10	0.04334	9	9,638	12,074	547	5,143,247	55%	71%
90029	36	10	0.04919	10	9,856	12,336	688	6,717,603	56%	80%
90031	37	10	0.03178	8	9,344	19,713	622	5,833,237	70%	76%
90032	37	10	0.02666	7	9,100	37,471	992	9,021,321	97%	96%
90033	39	10	0.03367	7	9,145	11,418	386	3,421,448	53%	60%
90034	35	10	0.03009	10	9,714	97,775	2,942	28,578,751	100%	100%
90035	30	10	0.03718	10	10,425	63,575	2,364	24,645,245	100%	100%
90036	30	10	0.04017	10	10,385	52,222	2,098	21,787,691	100%	100%
90037	39	10	0.03746	10	9,908	11,769	480	4,839,317	54%	67%
90038	36	10	0.04384	10	10,365	10,014	468	4,886,518	50%	66%
90039	32	10	0.03038	10	9,922	43,783	1,330	13,196,731	100%	100%
90040	40	10	0.02565	8	9,356	11,082	263	2,453,972	53%	49%
90041	32	10	0.02656	8	9,196	54,553	1,449	13,325,581	100%	100%
90042	37	10	0.02931	7	9,179	64,280	1,884	17,292,815	100%	100%
90043	38	10	0.03210	10	10,374	49,438	1,587	16,464,032	100%	100%
90044	39	10	0.03392	10	9,829	29,781	1,012	9,955,709	86%	97%
90045	42	9	0.02220	9	9,416	118,492	2,630	24,763,345	100%	100%
90046	36	10	0.03880	10	10,152	68,680	2,665	27,054,879	100%	100%
90047	38	10	0.03115	10	9,709	46,483	1,448	14,058,692	100%	100%
90048	30	10	0.03797	10	10,397	43,536	1,653	17,186,840	100%	100%
90049	30	10	0.02855	10	9,945	118,908	3,395	33,763,301	100%	100%
90056	42	10	0.02548	10	10,120	27,013	706	7,197,838	82%	81%
90057	37	10	0.04247	10	9,980	7,473	417	4,350,519	43%	62%
90058	39	10	0.03426	8	9,375	1,893	70	618,067	22%	25%
90059	39	10	0.03308	8	9,266	10,950	358	3,239,146	52%	58%
90061	39	10	0.03033	10	9,807	10,277	280	2,812,088	51%	51%

Bodily Injury:

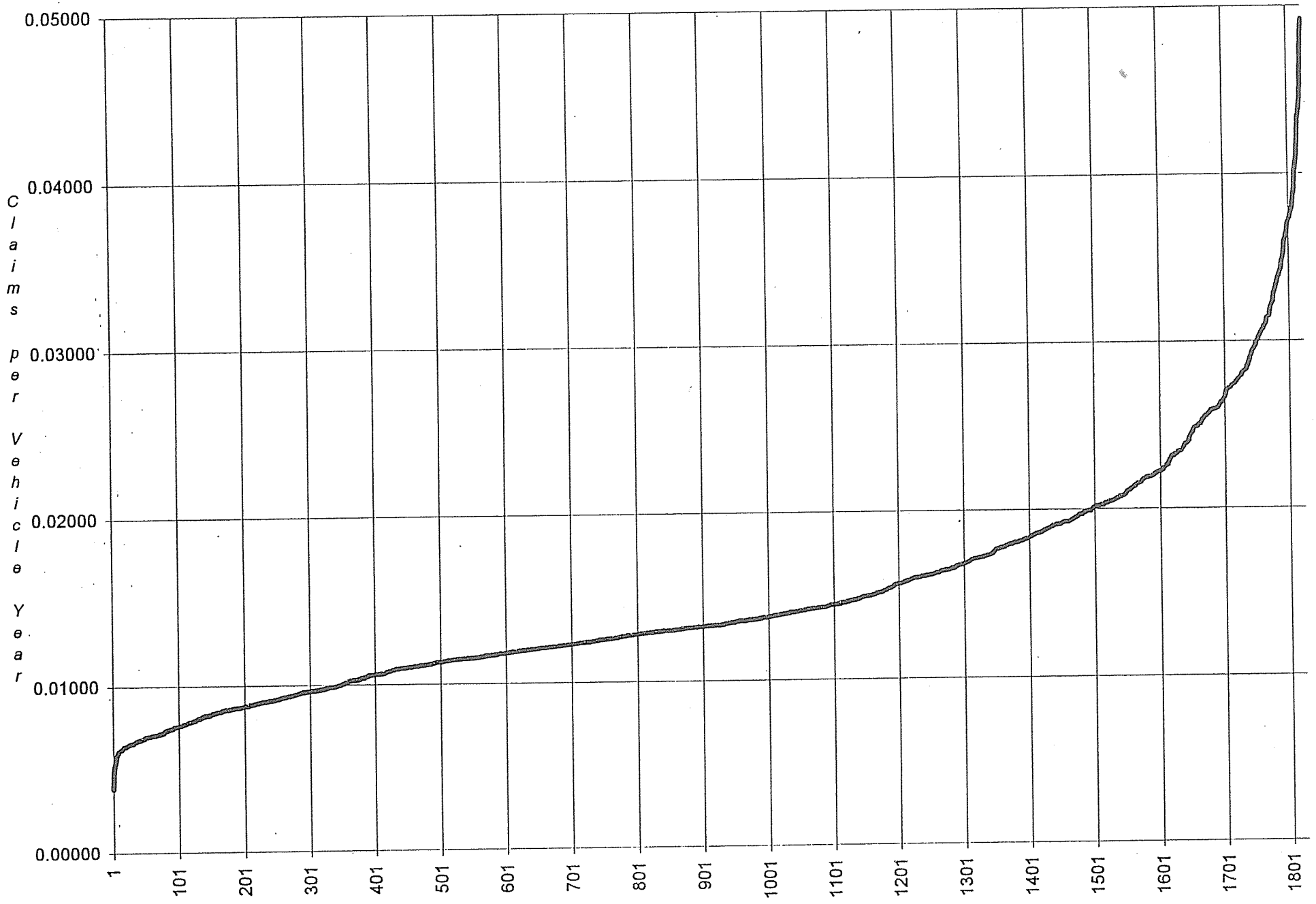
		CAARP Frequency:		Severity:		Unadjusted Data: Years of	Number	Capped	Credibility:	
Zip Code	Area	Band	Rate	Band	Rate	Exposure	of Claims	Losses	Freq	Sevr
90062	39	10	0.03488	10	9,718	13,721	492	4,818,461	59%	67%
90063	39	10	0.02792	7	9,175	21,135	546	4,923,431	73%	71%
90064	30	10	0.02734	10	9,857	74,056	2,025	19,959,472	100%	100%
90065	37	10	0.02739	7	9,048	57,249	1,568	14,187,720	100%	100%
90066	35	9	0.02396	10	9,760	131,178	3,143	30,675,387	100%	100%
90067	35	10	0.03145	10	11,804	13,627	476	6,079,351	58%	66%
90068	36	10	0.03291	10	10,017	49,259	1,621	16,237,120	100%	100%
90069	36	10	0.03608	10	10,192	44,626	1,610	16,409,814	100%	100%
90071	37	10	0.03324	9	9,604	995	38	425,277	16%	19%
90077	30	10	0.02826	10	9,981	28,618	809	8,056,371	85%	86%
90201	40	10	0.02857	9	9,626	37,737	1,079	10,386,694	97%	100%
90202	40	10	0.02778	8	9,382				0%	0%
90210	30	10	0.03340	10	11,158	56,582	1,890	21,087,827	100%	100%
90211	30	10	0.03609	10	10,446	16,569	670	7,056,858	64%	79%
90212	30	10	0.03452	10	10,455	26,077	939	9,840,084	81%	93%
90220	39	10	0.02748	10	9,945	38,348	1,049	10,438,128	98%	98%
90221	39	10	0.02986	7	9,028	22,090	632	5,601,554	74%	76%
90222	39	10	0.02771	9	9,643	11,706	267	2,596,713	54%	50%
90230	35	10	0.02496	10	9,871	98,848	2,467	24,352,683	100%	100%
90232	35	10	0.02599	10	10,157	21,415	552	5,663,427	73%	71%
90240	46	9	0.02356	8	9,297	69,240	1,631	15,163,185	100%	100%
90241	46	9	0.02276	9	9,492	101,998	2,321	22,031,584	100%	100%
90242	46	9	0.02329	9	9,635	82,939	1,932	18,615,345	100%	100%
90245	42	8	0.01971	9	9,656	57,491	1,133	10,940,536	100%	100%
90247	44	9	0.02292	8	9,390	76,906	1,763	16,554,655	100%	100%
90248	44	9	0.02200	9	9,436	22,361	495	4,650,266	75%	68%
90249	44	9	0.02316	10	9,832	52,938	1,226	12,054,042	100%	100%
90250	42	10	0.02590	10	10,323	131,674	3,411	35,210,498	100%	100%
90254	44	9	0.02155	9	9,634	72,344	1,559	15,019,891	100%	100%
90255	40	10	0.03232	7	9,042	33,814	1,106	10,000,946	92%	100%
90260	44	10	0.02490	10	10,161	51,276	1,277	12,976,151	100%	100%
90262	40	10	0.02945	9	9,665	30,167	896	8,684,620	87%	91%
90265	30	9	0.02332	10	10,055	60,285	1,406	14,137,501	100%	100%
90266	42	8	0.01980	9	9,503	140,729	2,787	26,485,220	100%	100%
90270	40	10	0.02623	8	9,413	9,969	246	2,323,996	50%	48%
90272	30	9	0.02259	10	10,254	82,555	1,865	19,123,608	100%	100%
90274	43	8	0.01912	9	9,517	273,786	5,234	49,809,582	100%	100%
90275	43	8	0.01952	8	9,338				0%	0%
90277	44	9	0.02113	9	9,442	129,998	2,747	25,936,775	100%	100%
90278	44	8	0.01968	8	9,324	123,384	2,428	22,638,225	100%	100%
90280	40	10	0.02875	8	9,382	66,401	1,909	17,909,900	100%	100%
90290	30	9	0.02345	10	9,996	18,683	397	3,935,301	68%	61%
90291	35	10	0.02524	10	9,945	65,652	1,657	16,478,293	100%	100%
90292	35	10	0.02711	10	9,722	49,315	1,337	12,998,759	100%	100%
90293	35	9	0.02348	9	9,644	40,582	953	9,174,837	100%	94%
90301	38	10	0.03387	9	9,674	27,111	926	8,940,692	82%	93%
90302	38	10	0.03069	9	9,616	27,605	837	8,014,469	83%	88%
90303	38	10	0.03143	8	9,211	20,991	651	5,864,034	73%	78%
90304	38	10	0.03235	10	10,147	15,729	507	5,199,149	63%	68%
90305	38	10	0.02915	10	9,706	29,091	831	8,041,355	85%	88%
90401	35	10	0.02721	10	9,952	13,551	375	3,745,752	58%	59%
90402	30	9	0.02460	10	10,468	45,037	1,108	11,598,592	100%	100%

Exhibit 2

Frequency and Severity Distributions for
Bodily Injury
Property Damage
Medical Payment
Uninsured Motorist
Collision
Comprehensive

Bodily Injury Frequency

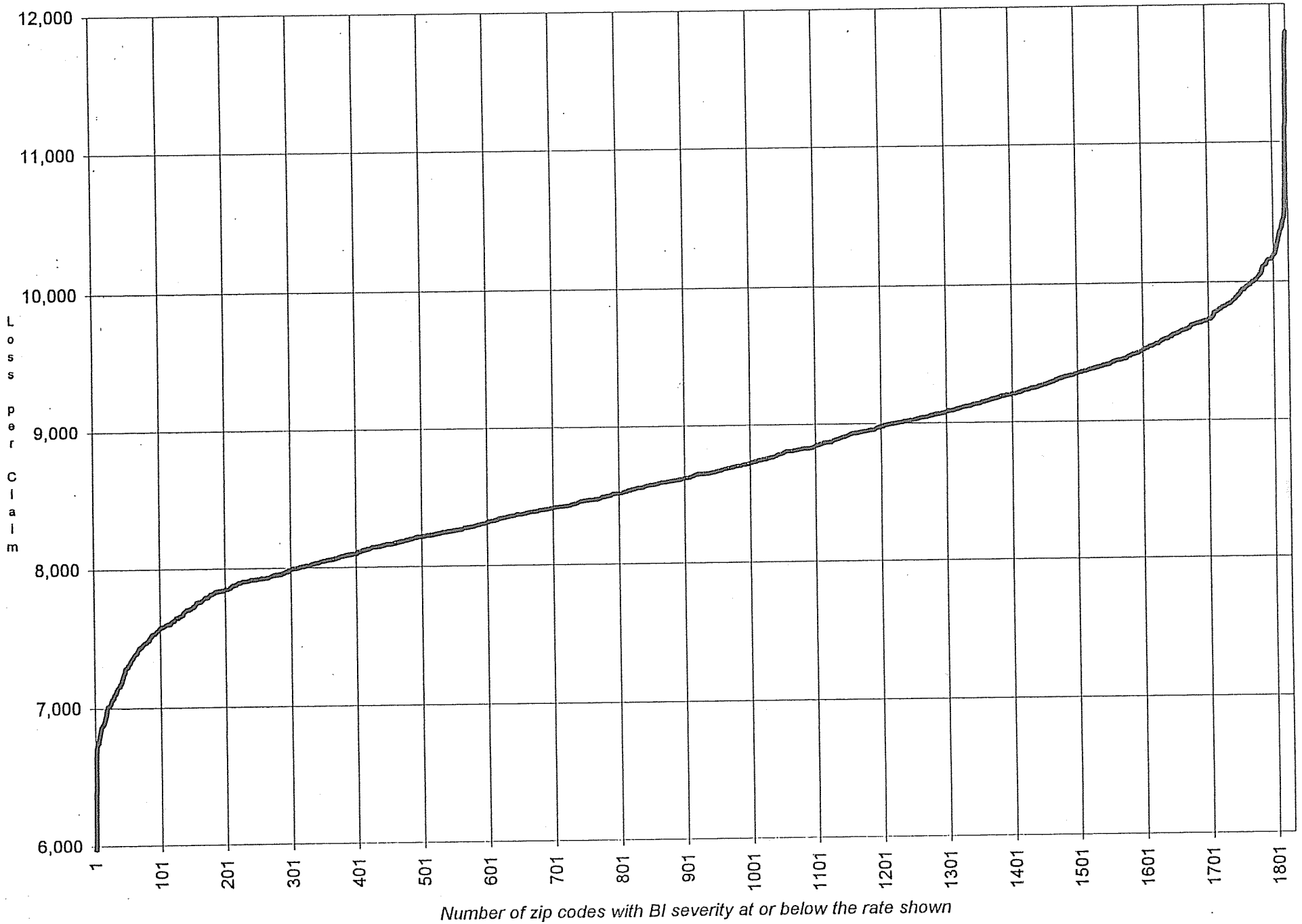
(1988 - 1993)



ALL_SUM1.XLS:BI Freq:4/18/96

Bodily Injury Claims Severity

(1988 - 1993)

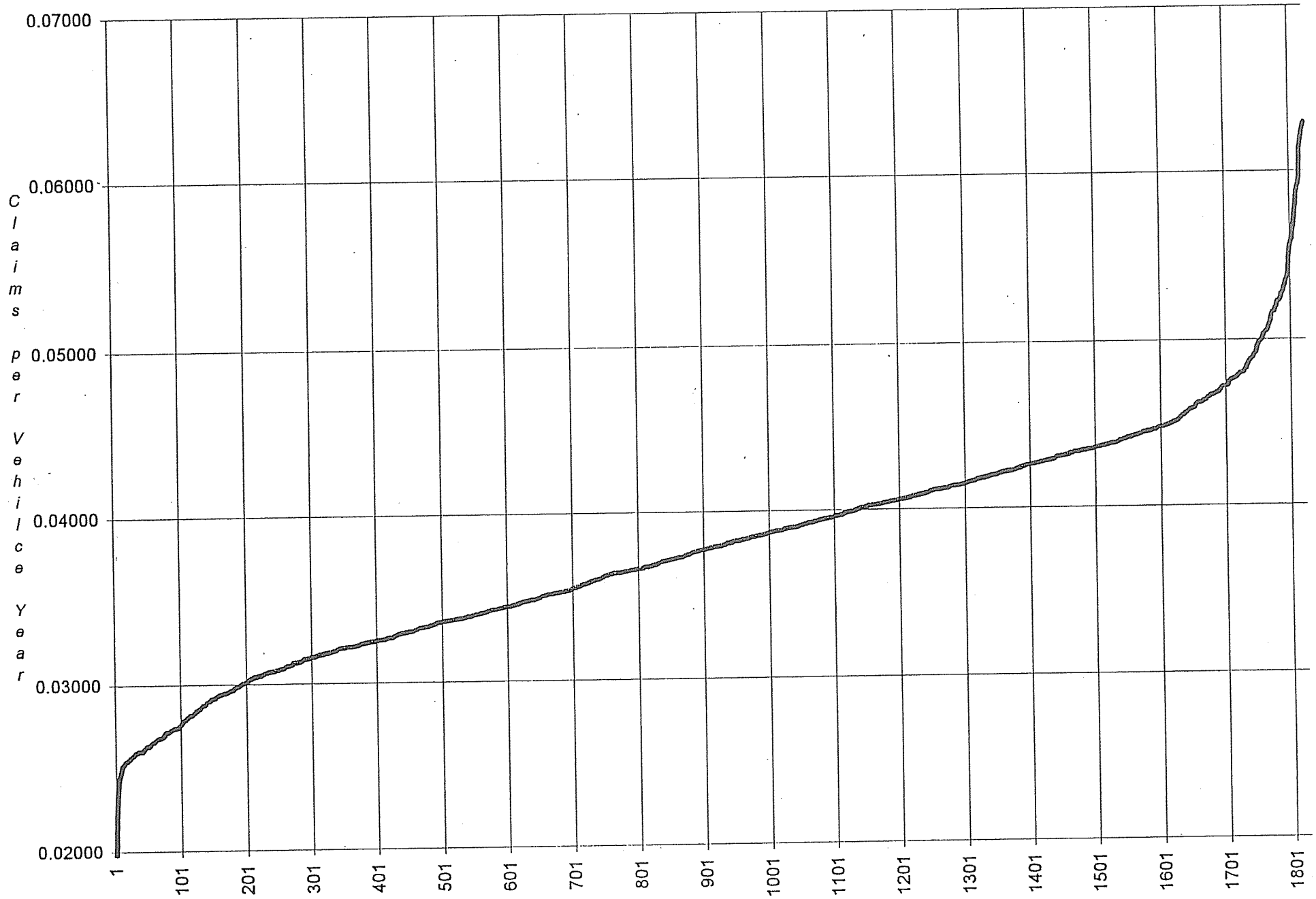


ALL_SUM1.XLS:BI Sevr:4/18/96

Number of zip codes with BI severity at or below the rate shown

ALL_SUM1.XLS:BI Sevr:4/18/96

(1988 - 1993)

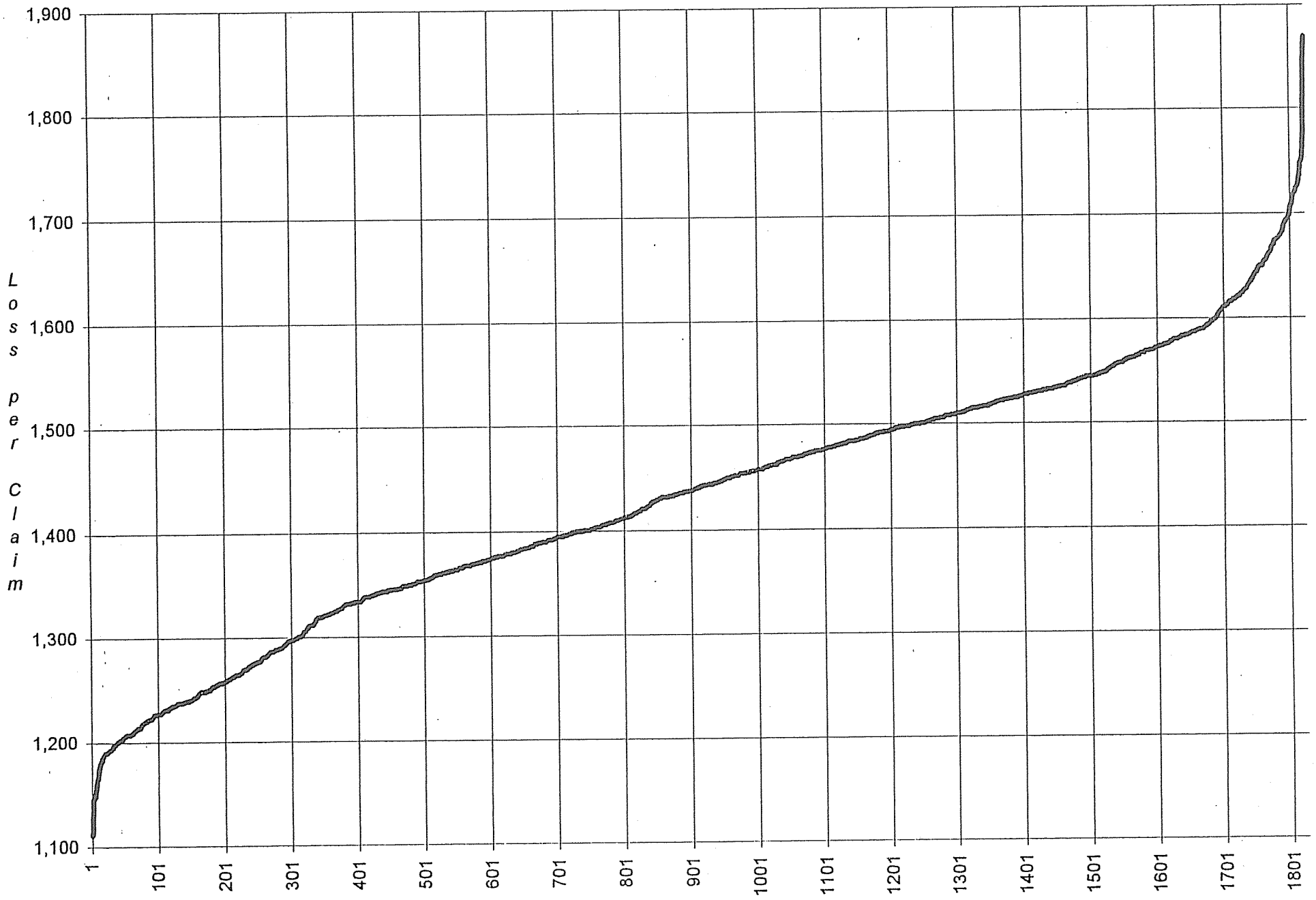


Number of zip codes with PD frequency at or below the rate shown

ALL_SUM1.XLS:PD Freq:4/18/96

Property Damage Claims Severity

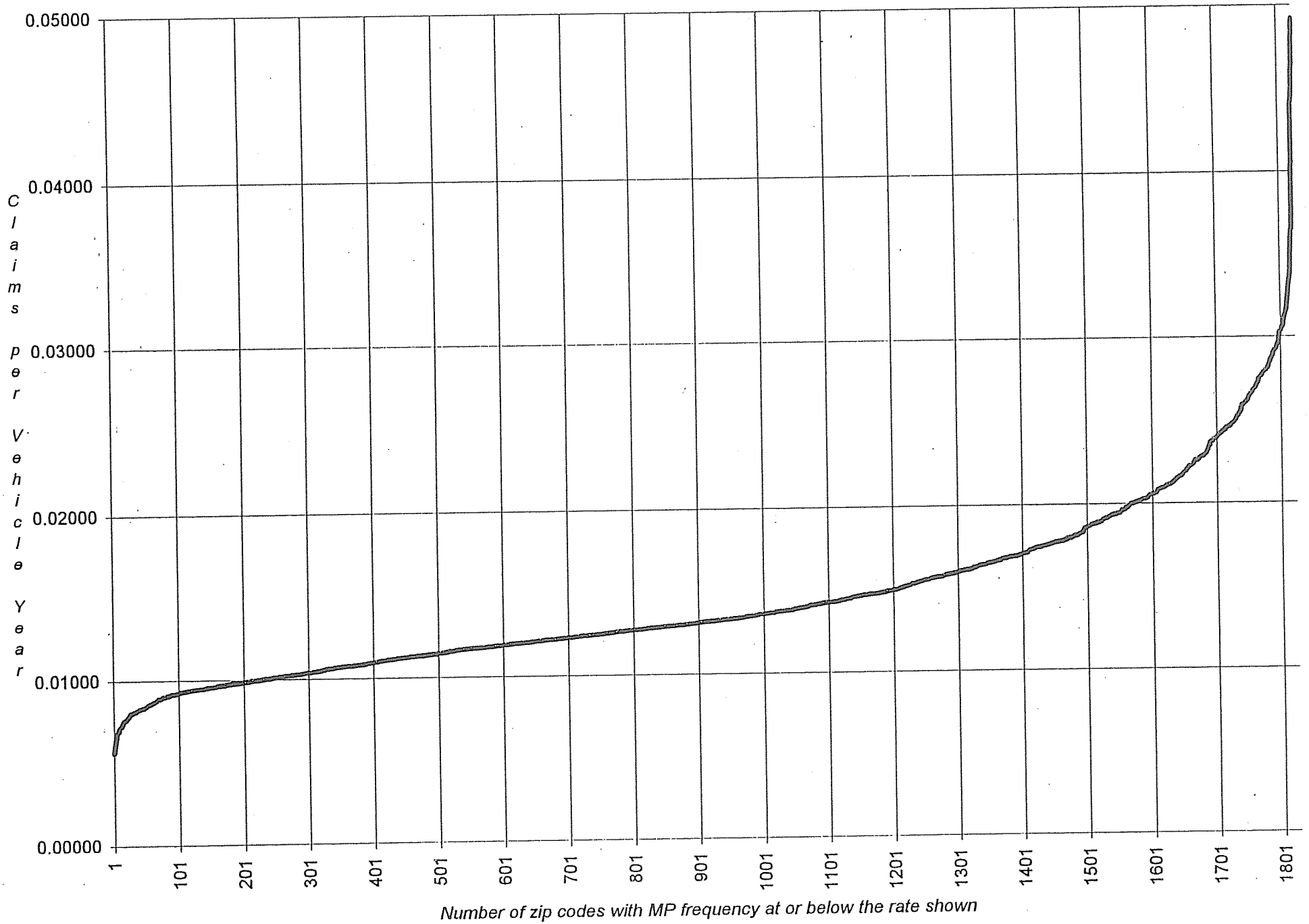
(1988 - 1993)



ALL_SUM1.XLS:PD Sevr:4/18/96

Medical Payments Claims Frequency

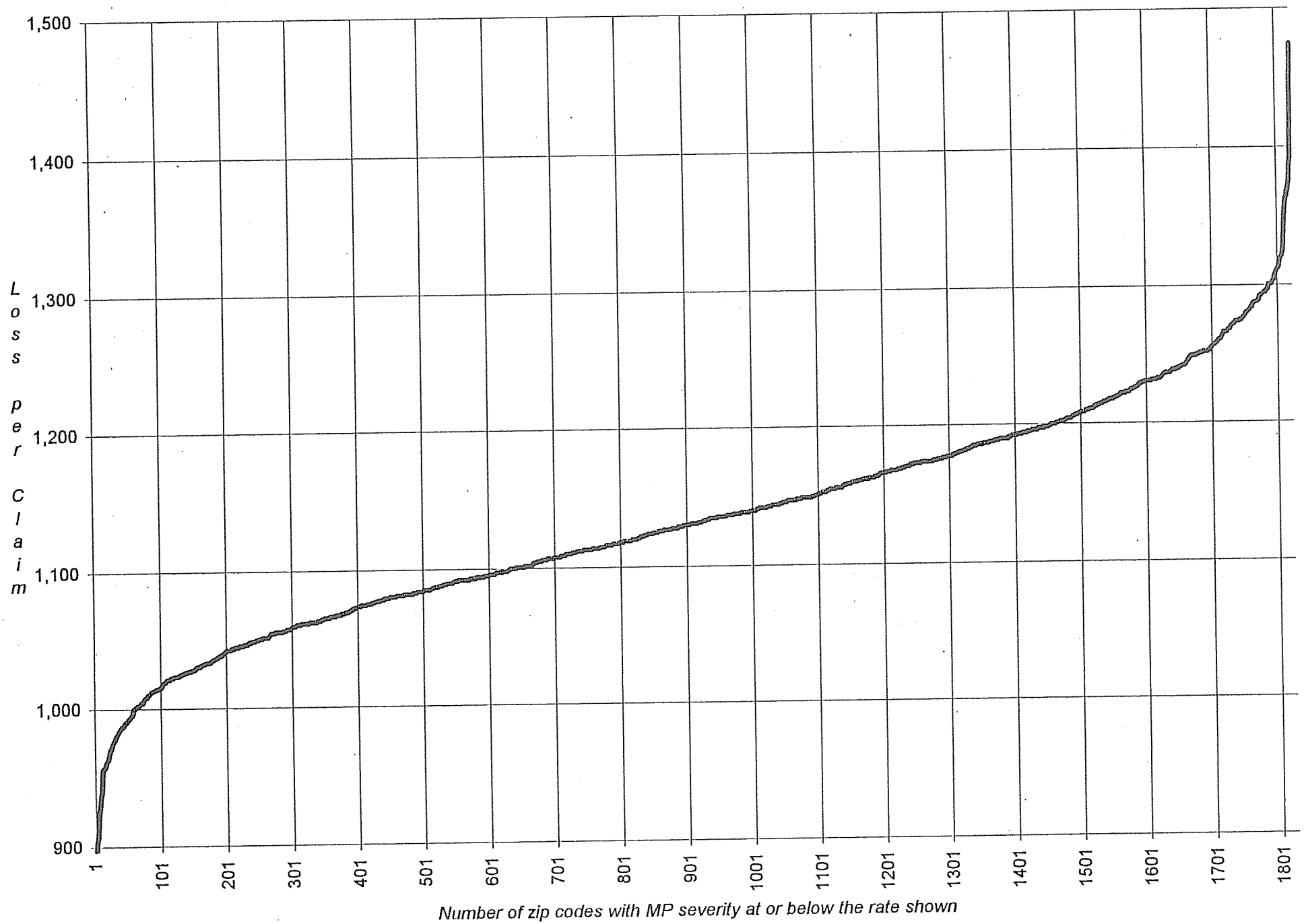
(1988 - 1993)



ALL_SUM1.XLS:MP Freq:4/18/96

Medical Payments Claims Severity

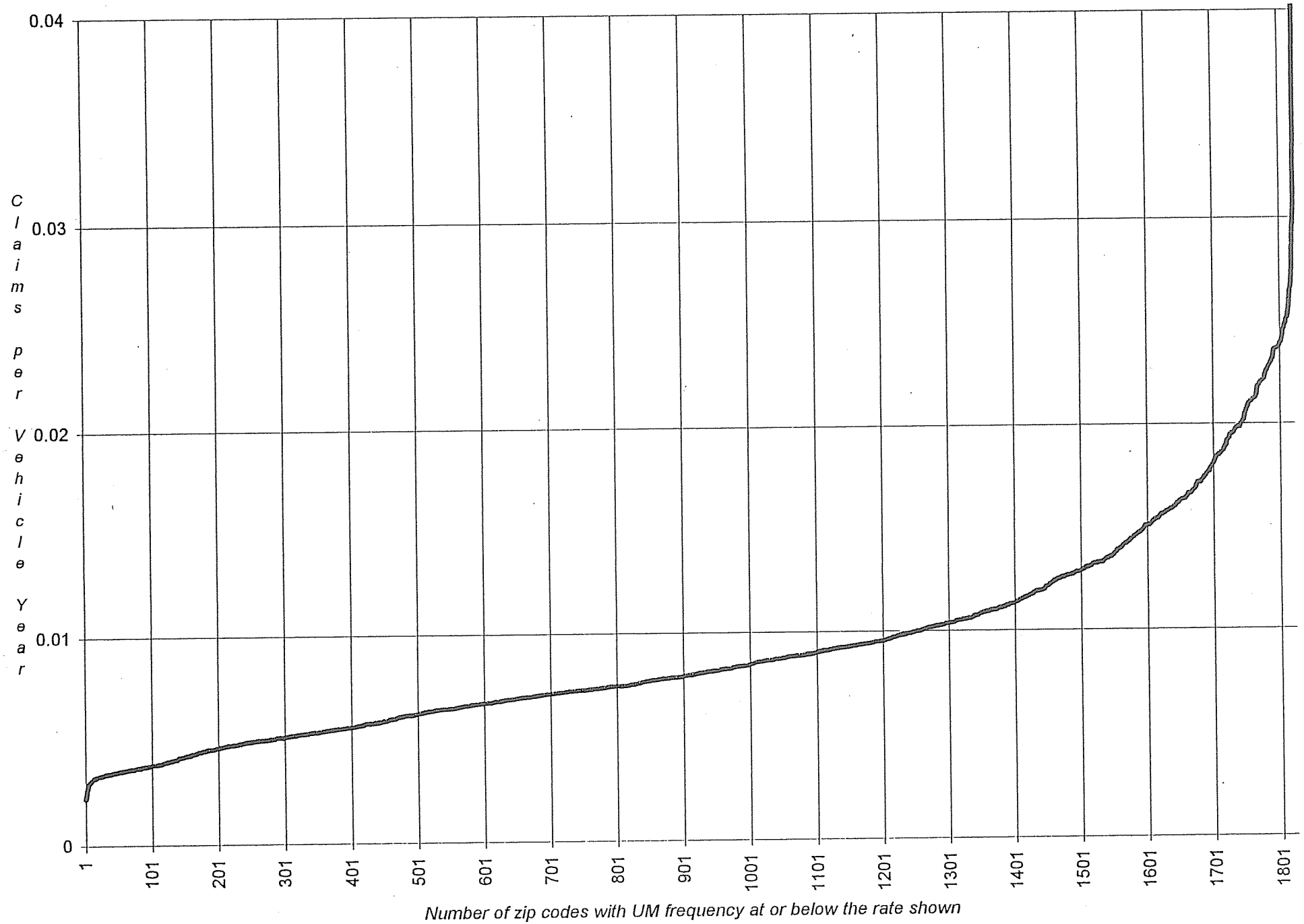
(1988 - 1993)



ALL_SLIM1.XLS:MP Sevr:4/18/96

Uninsured Motorist Frequency

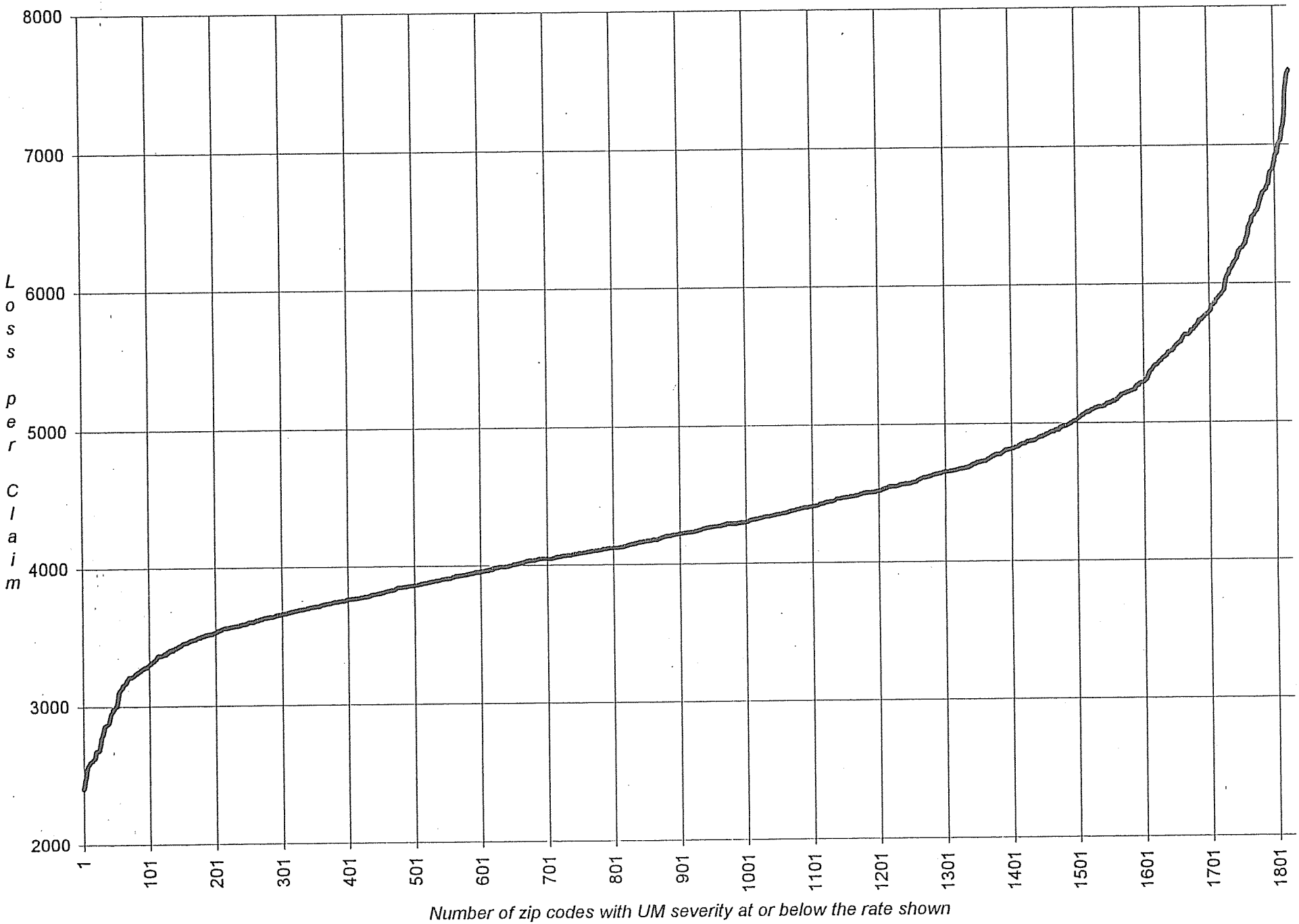
(1988 - 1993)



ALL SUM1.XLS:UM Freq:4/23/96

Uninsured Motorist Claim Severity

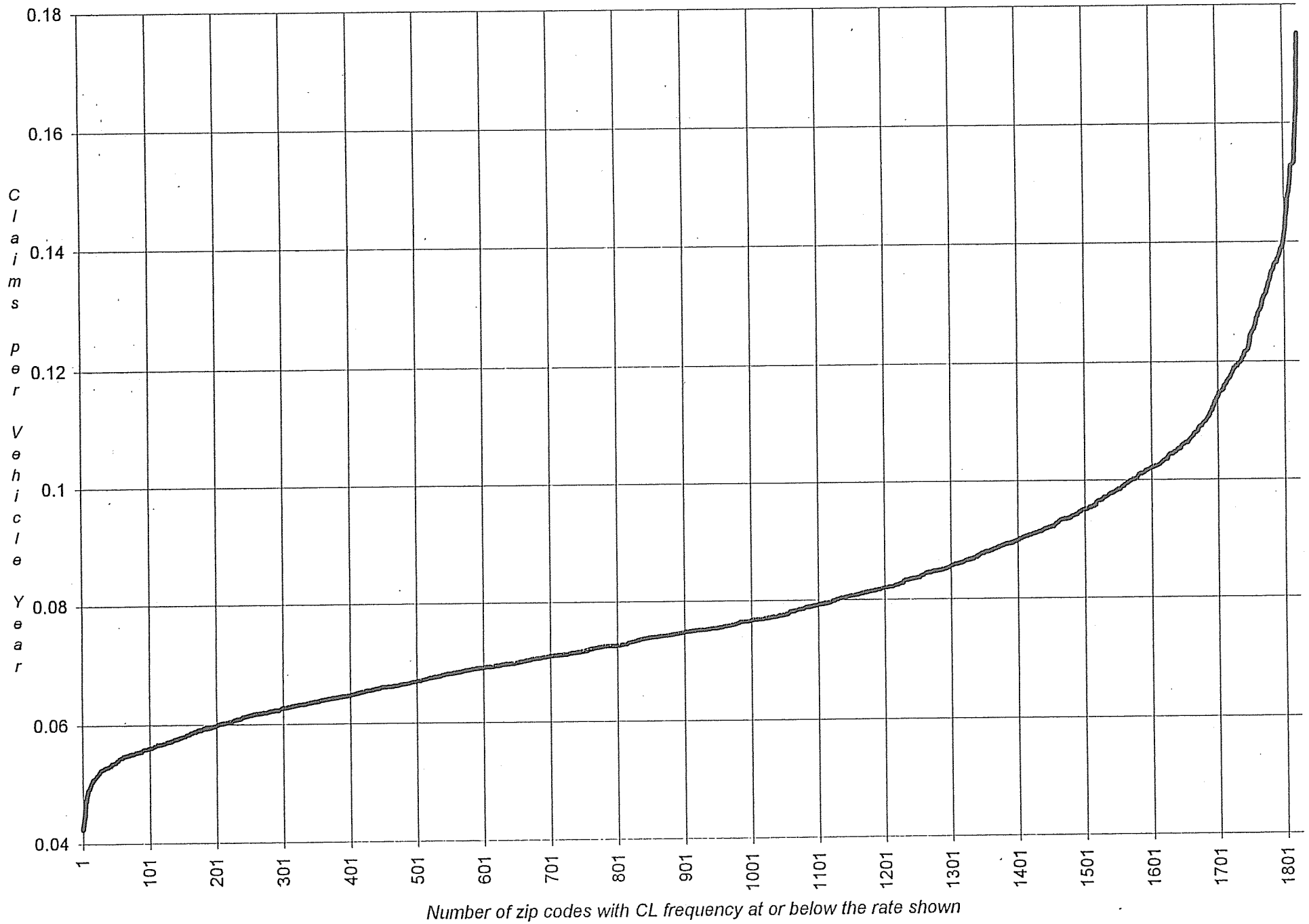
(1988 - 1993)



ALL SUM1.XLS:UM Sevr:4/23/96

Collision Frequency

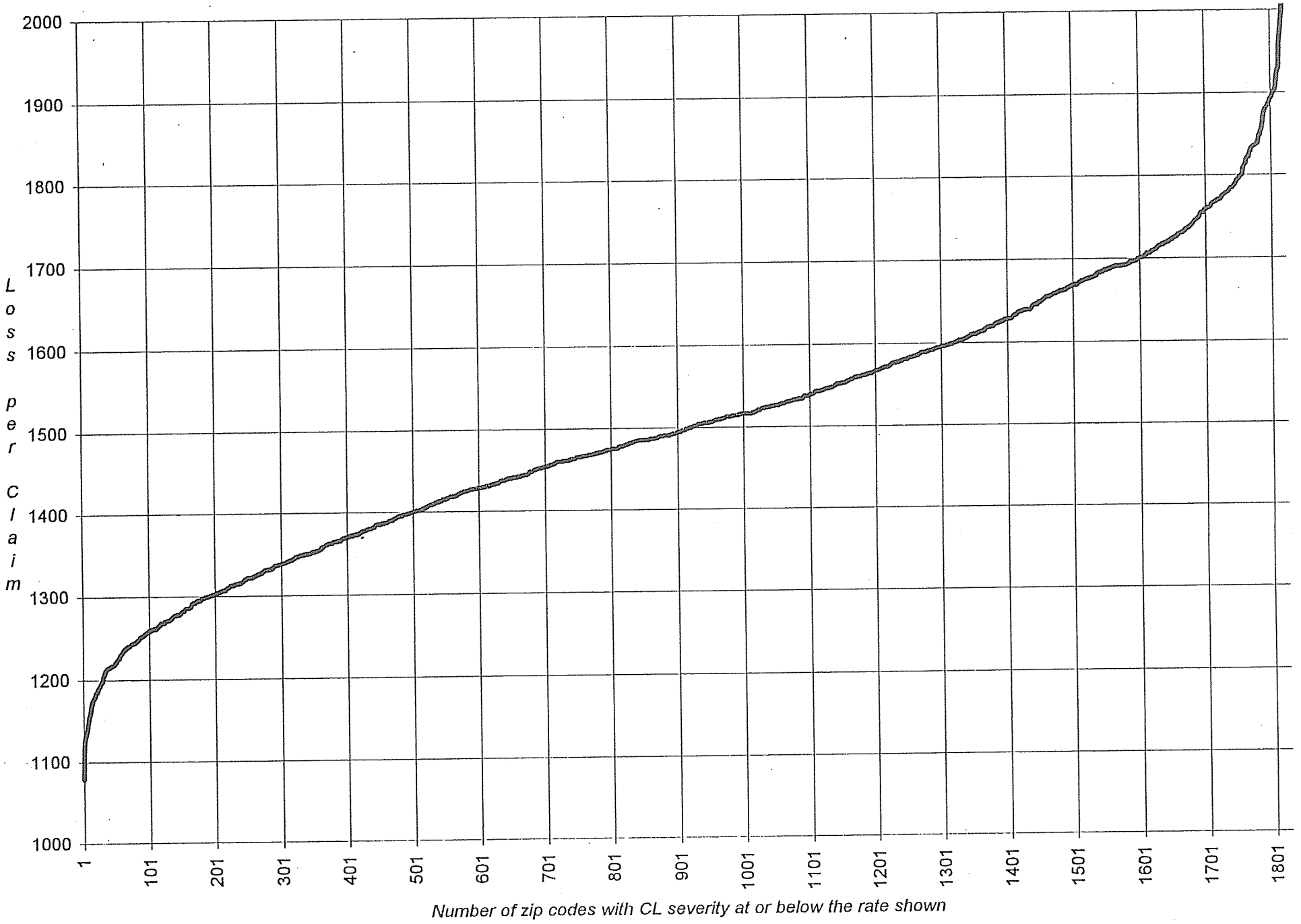
(1988 - 1993)



ALL SUM1.XLS:CL Freq:4/23/96

Collision Claims Severity

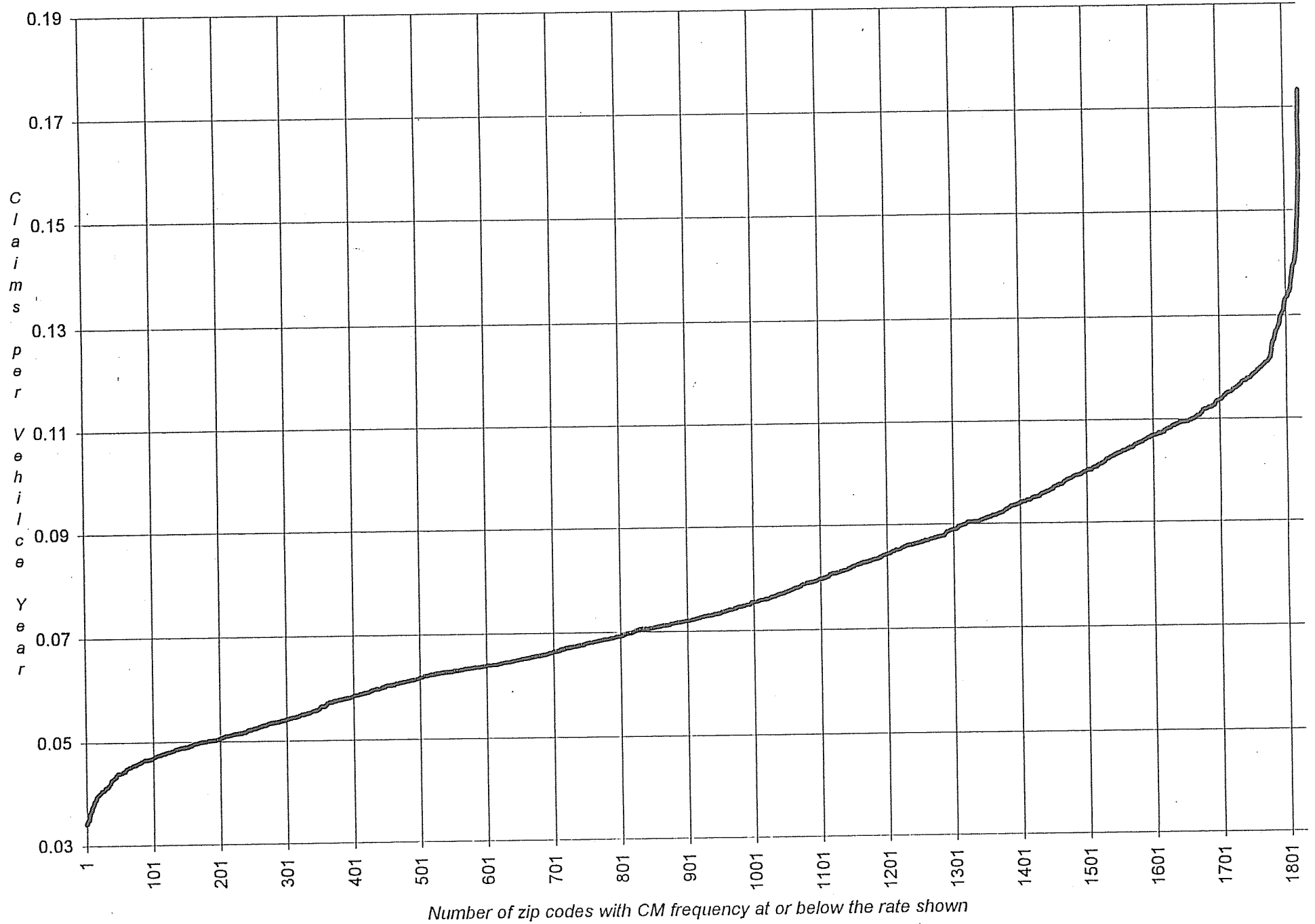
(1988 - 1993)



ALL_SUM1.XLS:CL Sevr:4/23/96

Comprehensive Frequency

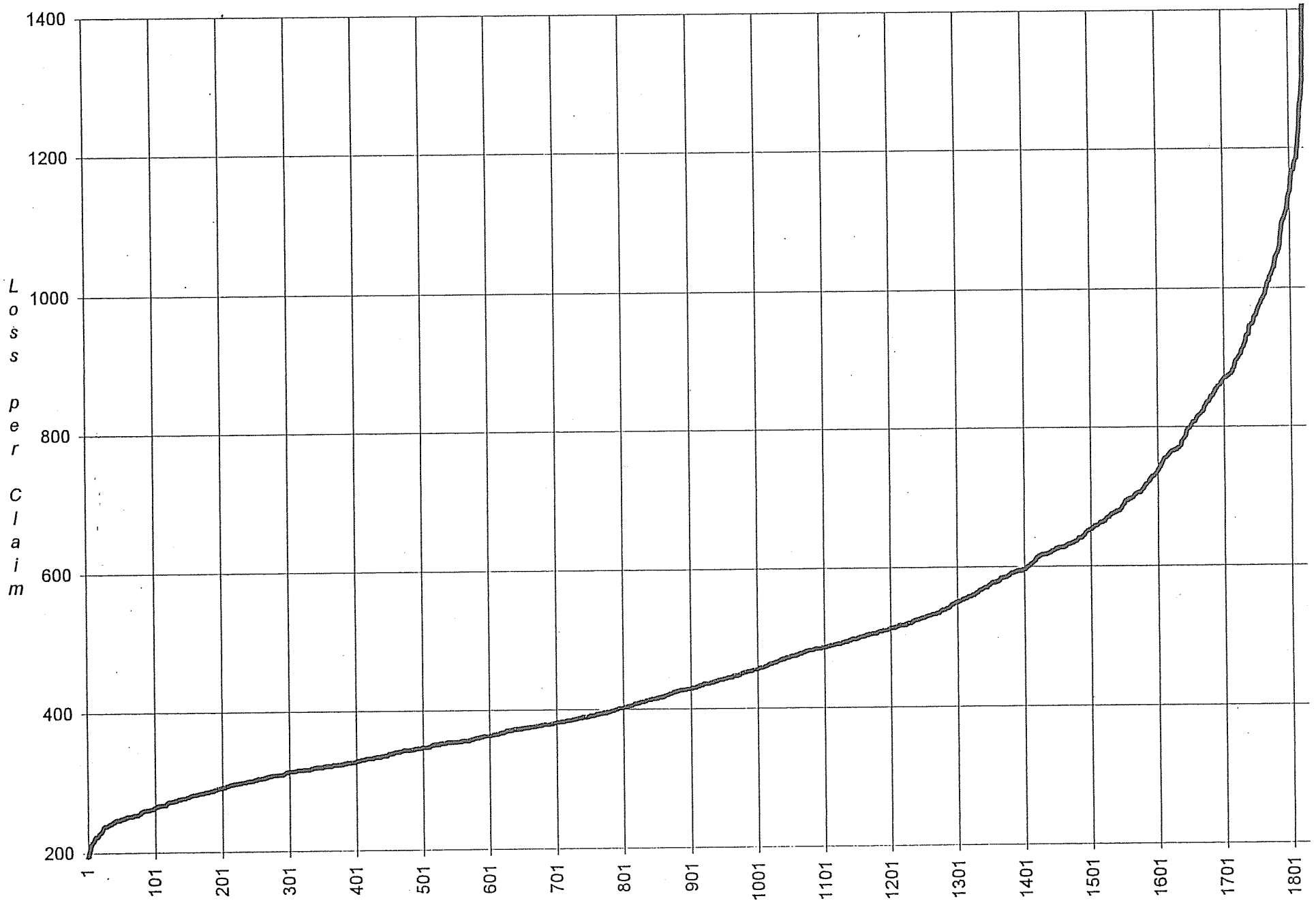
(1988 - 1993)



ALL_SUM1.XLS:CM Freq:4/23/96

Comprehensive Claim Severity

(1988 - 1993)

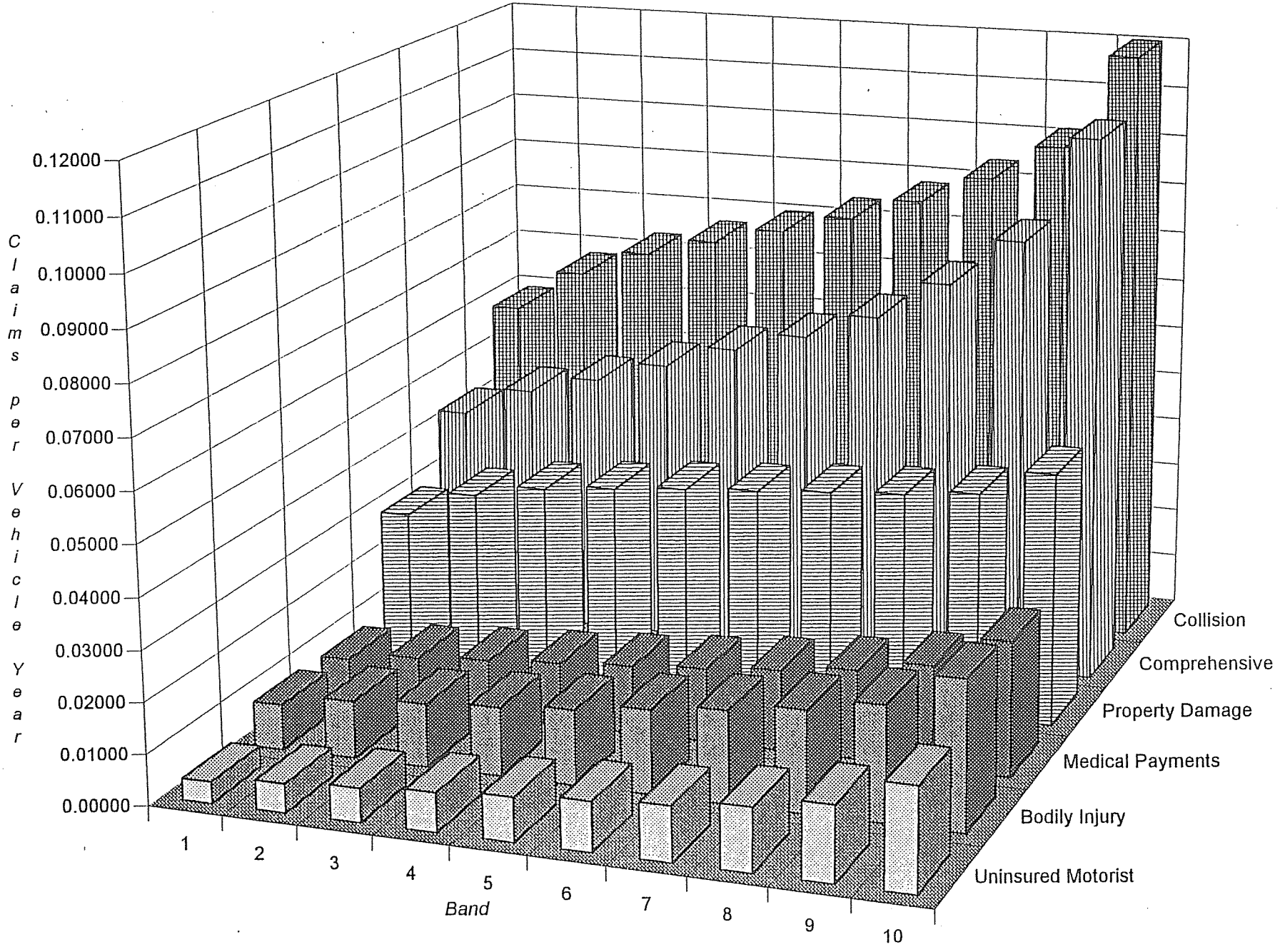


ALL SUM1.XLS:CM Sevr:4/23/96

Exhibit 3

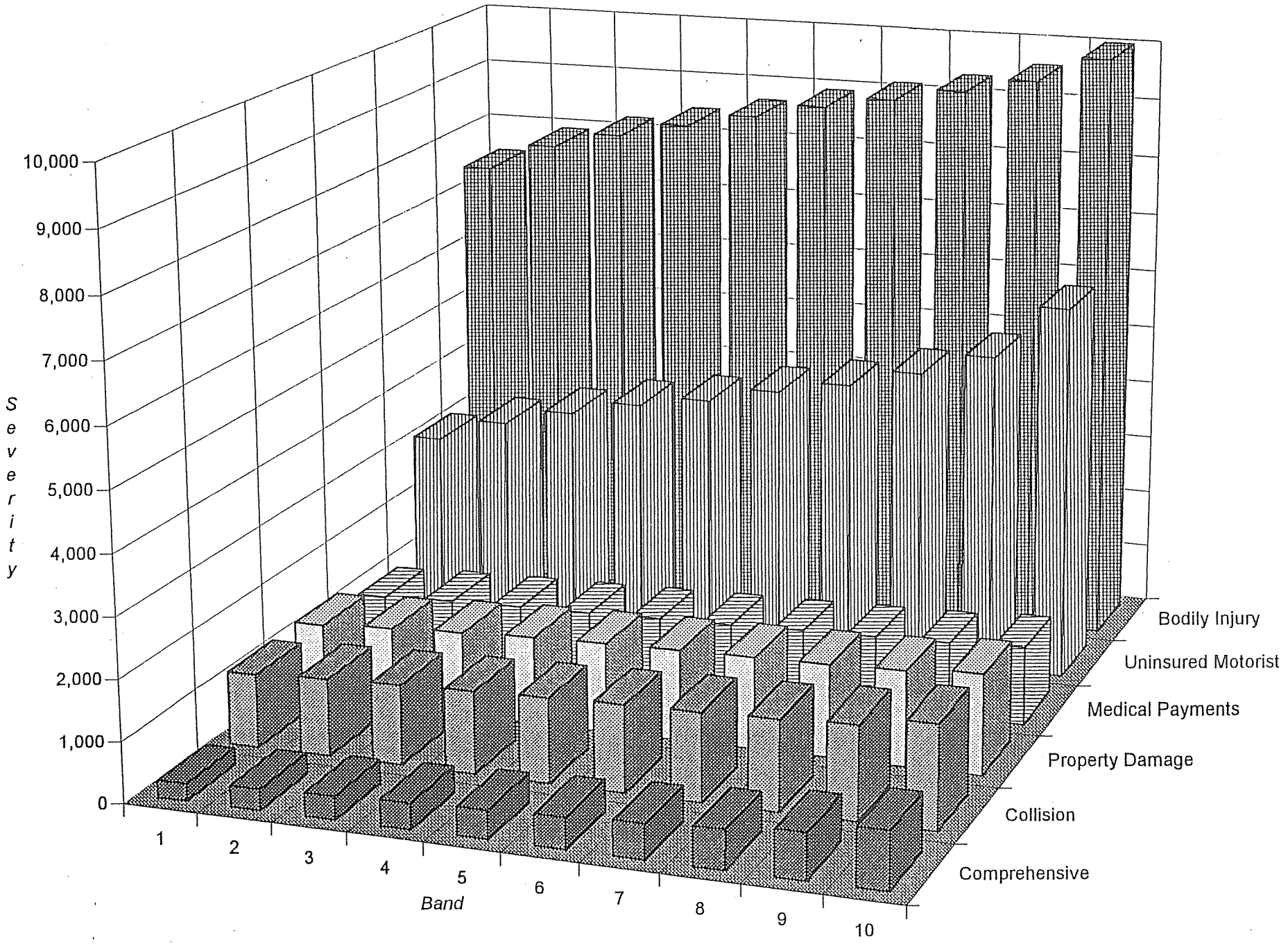
Band Rates

Band Frequency Rates



ALL_SUM2.XLS:Band FR:4/24/96

Band Severity Rates



ALL_SUM2.XLS:Band SV:4/24/96

Exhibit 4

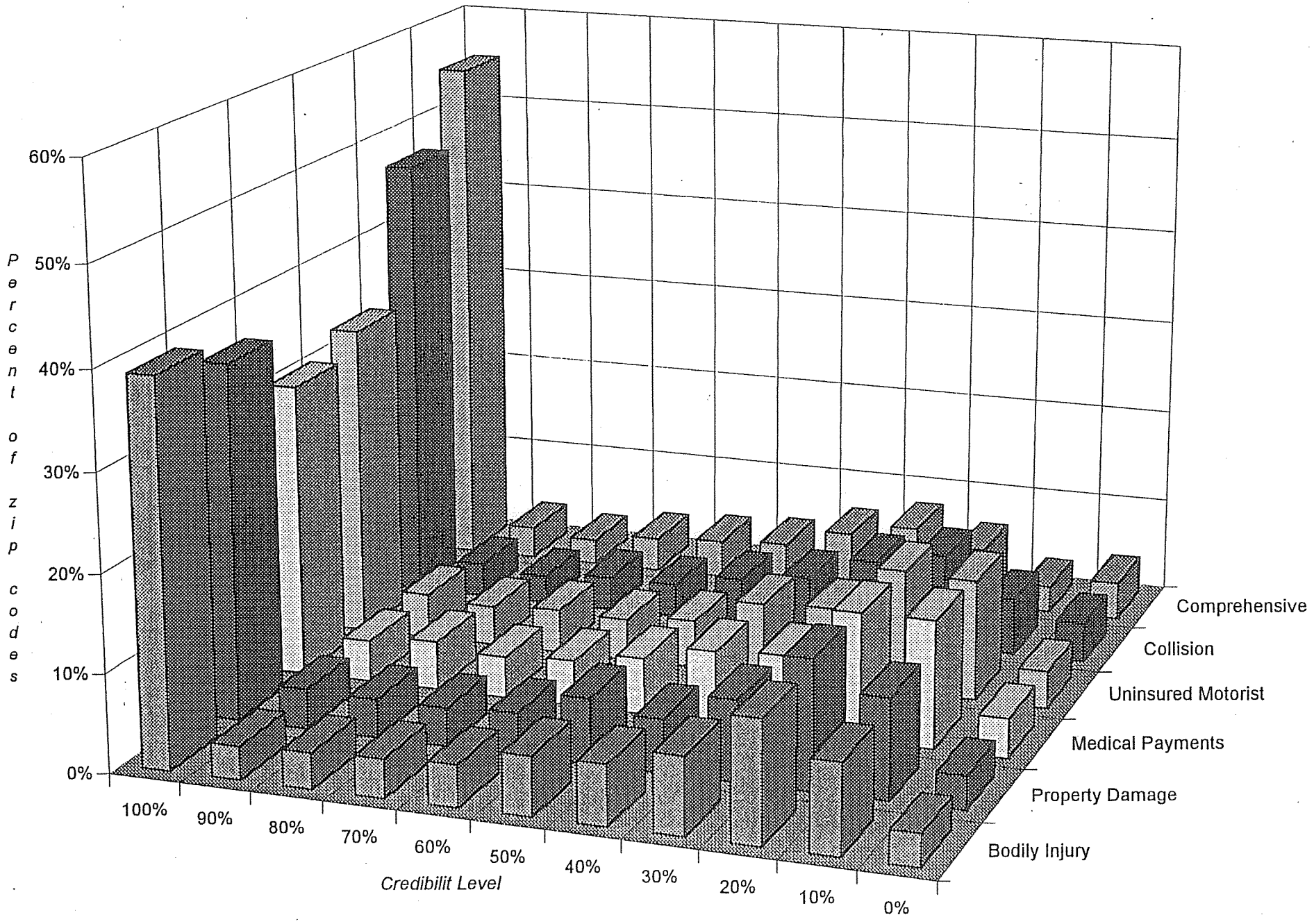
Credibility Levels of Unadjusted Data

Credibility Level of Zip Code Data

Credibility	Bodily Injury		Property Damage		Medical Payments		Uninsured Motorist		Collision		Comprehensive	
Level*	*Frequency*	*Severity*	*Frequency*	*Severity*	*Frequency*	*Severity*	*Frequency*	*Severity*	*Frequency*	*Severity*	*Frequency*	*Severity*
0%	3%	6%	4%	4%	4%	6%	4%	10%	4%	4%	4%	4%
10%	9%	19%	10%	13%	13%	20%	13%	22%	6%	7%	3%	4%
20%	12%	12%	13%	13%	13%	12%	13%	12%	10%	12%	6%	8%
30%	8%	7%	8%	9%	8%	7%	8%	7%	8%	7%	8%	8%
40%	6%	6%	5%	6%	7%	6%	8%	6%	6%	6%	6%	6%
50%	6%	5%	7%	5%	6%	6%	5%	6%	5%	4%	4%	5%
60%	4%	4%	4%	5%	5%	6%	4%	4%	4%	4%	4%	3%
70%	4%	4%	4%	3%	4%	4%	5%	6%	4%	3%	4%	4%
80%	4%	4%	4%	3%	5%	5%	4%	7%	3%	3%	3%	4%
90%	3%	4%	4%	4%	4%	5%	5%	6%	4%	3%	3%	3%
100%	39%	30%	37%	36%	30%	21%	33%	14%	47%	46%	55%	50%

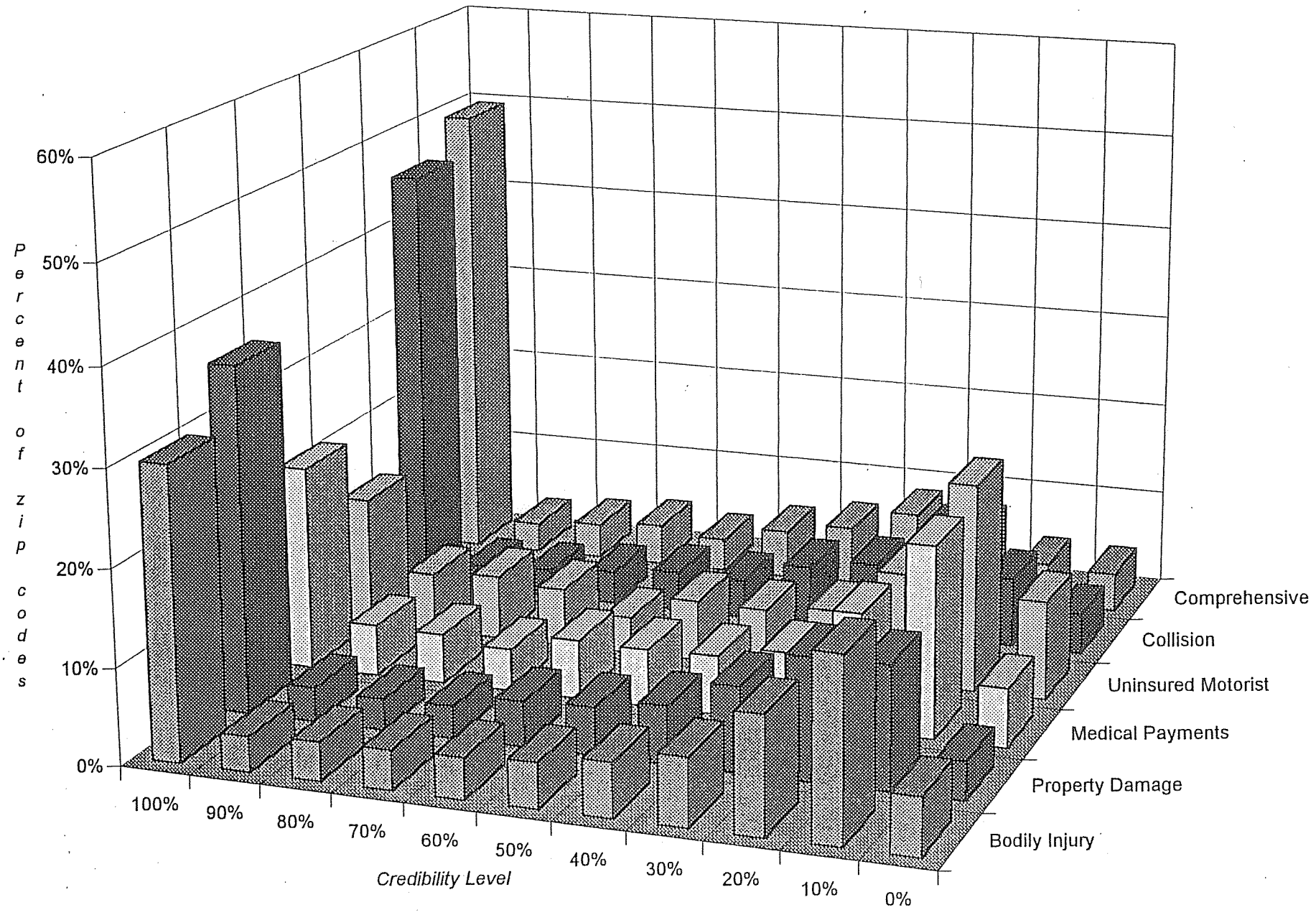
*rounded to the nearest 10%

Frequency Credibility Levels



CRED_LVL.XLS:Freq:4/24/96

Severity Credibility Levels

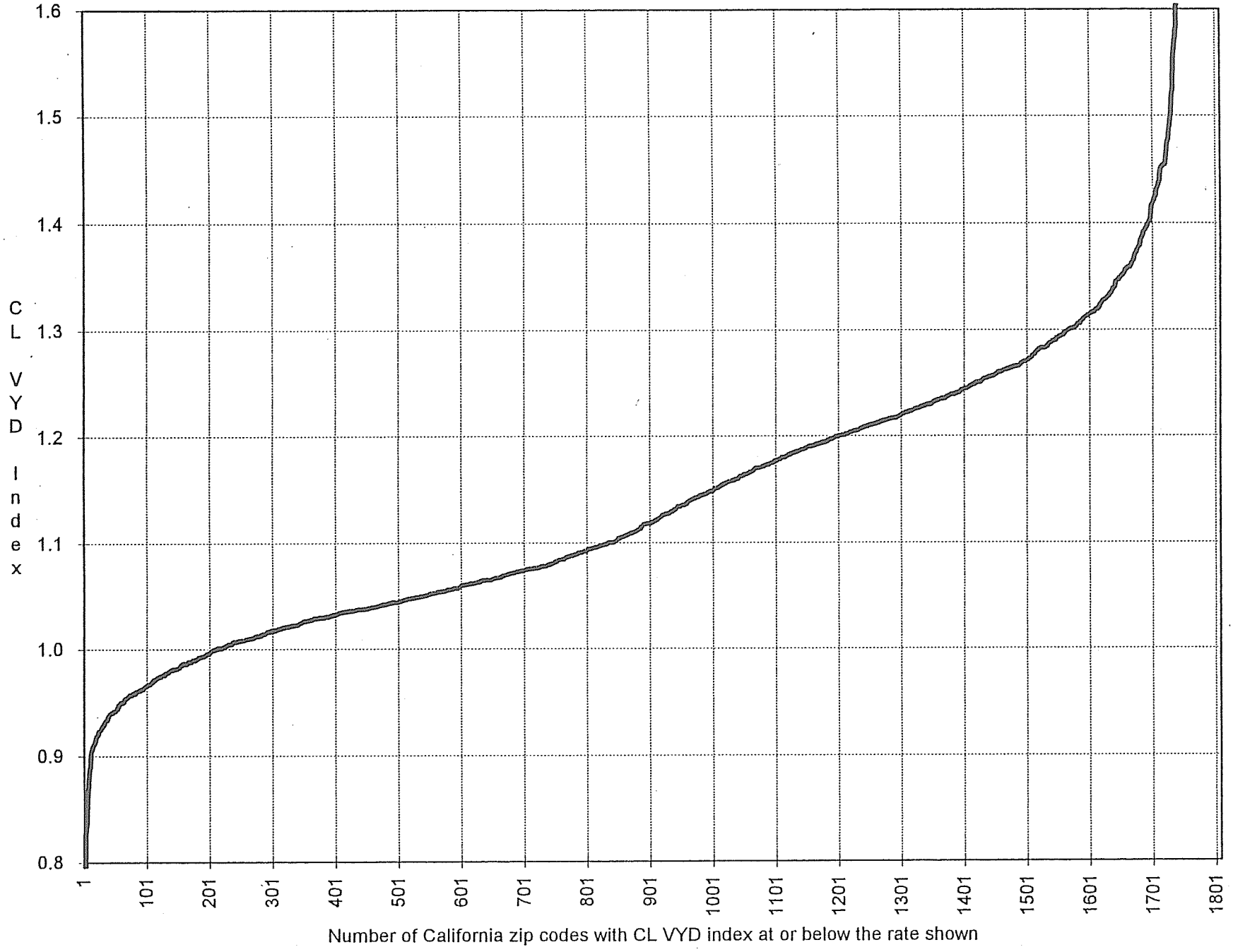


CRED_LVL.XLS:Sevr:4/24/96

Exhibit 5

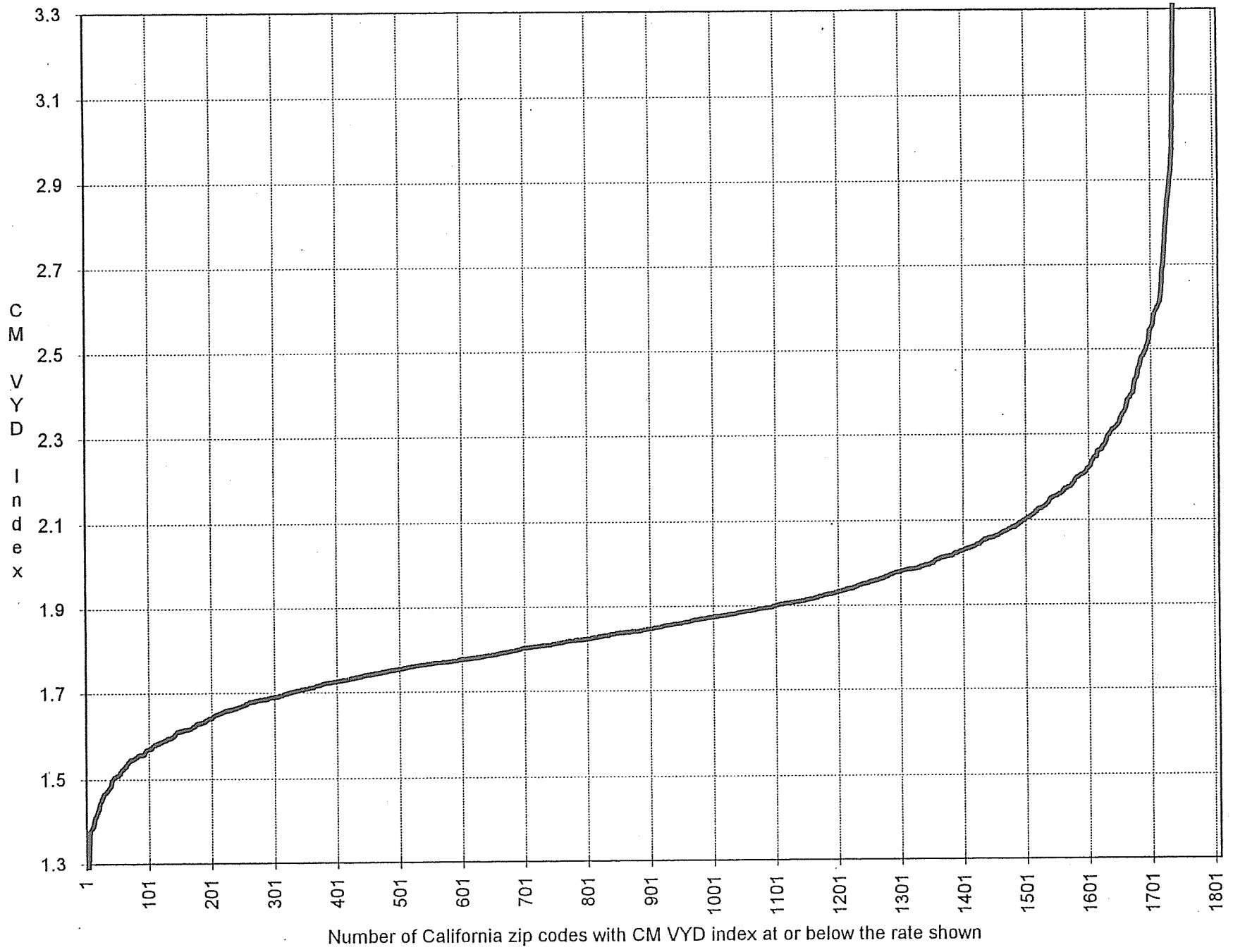
Distribution of the VYD Index

Collision Value/Year/Deductible Index



CLCM$5C.XLS: CL Index: 11/15/95

Comprehensive Value/Year/Deductible Index



CLCM$5C.XLS: CM Index: 11/15/95