STANDARDIZING THE WAY WE MEASURE THE UNINSURED MOTOR VEHICLE RATE

Submitted by:

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PREFACE

Nationwide enforcement of financial responsibility (FR) laws has become more and more important in recent times. However, evaluation of the effectiveness of enforcement has always been elusive, since the end result – the number of people brought into compliance through enforcement methods, has been extremely difficult to measure. The reasons for this are:

- The number of motorists not in compliance is dynamic and ever changing
- Tracking the number of non-compliant customers has limited effectiveness
- Data on customers with adequate "insurance" or financial responsibility is inaccurate
- Data maintenance on initiations and cancellations of insurance is untimely and inadequate
- Limitations on resources available to jurisdictions due to legislative constraints
- Inaccuracies in jurisdictions' databases on registrations
- Errors in programming leading to inaccurate assessment of data and results

The above constraints are enumerated to highlight that it would be ludicrous for any jurisdiction or entity to claim that an absolutely accurate measurement of insured vehicles or the number of uninsured vehicles or motorists is possible. On the contrary, these constraints are highlighted to make the reader aware that any measurement should be accepted with the full knowledge that the final result has these limitations.

The Uninsured Motorist Rate Working Group was established by the Financial Responsibility Committee of AAMVA, with the specific purpose of identifying the constraints and coming up with recommendations to measure the uninsured motorist/motor vehicle rate. It was also decided that since the laws are not identical in the different jurisdictions, it might be necessary to come up with more than one method of measuring the uninsured, so that jurisdictions with similar laws on financial responsibility can adopt similar methods.

The recommendations are by no means binding. Each jurisdiction may adopt its own method, or adopt one of these recommendations with a slight modification to suit the specific jurisdiction's unique requirement.

National Survey

It was important for the working group to gather important data and assess the needs of the various jurisdictions before embarking on this venture of calculating UMR. With this in mind, the working group prepared a survey to assess the following elements:

1. The number of vehicles in each jurisdiction by vehicle type in broad categories
2. The number of driver licenses issued in each jurisdiction
3. Types of FR laws in force in various jurisdictions
4. Current methods of calculating the UMR, wherever such measurement is done
5. Purpose for which jurisdictions calculate UMR
6. How FR laws are enforced in the different jurisdictions

The above data was broken into 23 simple questions and mailed to all jurisdictions. Responses were received from 35 jurisdictions and tabulated. **The survey clearly indicated a need for some uniformity in calculating the UMR, and that such calculation was essential to make evaluation of the enforcement of our laws more effective.**

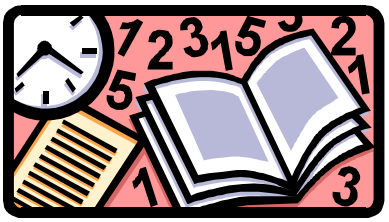
Uninsured Motor Vehicle Rate vs Uninsured Motorist Rate

The working group discussed at length whether the number of uninsured motor vehicles or the number of uninsured motorists must be measured. Many jurisdictions enforce FR on both vehicles and motorists. However, when the basic purpose of financial responsibility is analyzed, if every vehicle is insured, then the victims in an automobile crash will be duly compensated within

the limits of the law. The purpose of enforcing the laws on motorists is to improve their driving abilities when once they prove to be problem drivers.

Members of the insurance industry also confirmed that automobile insurance follows the vehicle and not the driver, and will be the primary coverage in case of crashes. A policy held by an individual who does not own a vehicle becomes primary, only when they rent a vehicle and deny the renter's coverage, or when they drive an uninsured vehicle. Further, it is easier to track vehicles without a valid registration or a tag for a match with insurance data, rather than tracking a driver license with an insurance policy. Many jurisdictions and companies do not obtain driver license numbers as data integral to a policy. Considering these, the group members decided that the measurement methods should focus on uninsured motor vehicles rather than motorists. **The UMR will therefore denote Uninsured Motor Vehicle Rate.** *(Reference: For more information and a more detailed explanation, please refer to "Estimating Uninsured Vehicle & Unregistered Vehicle Rates: Sensitivity to Data and Assumptions", by Lyn Hunstad, California Department of Insurance, published in July 1999.)*

Limitations to the Methods



As explained at the outset, the measurement of insured and uninsured vehicles has inherent constraints. This is due to the nature of registration data maintained throughout the nation. No two databases are alike, the terms applied to various types of vehicles are different, and their registration methodology is also different. Evolution of technology, particularly use of computers, has made it more demanding that every aspect of a vehicle such as type, make, model, weight, color, usage, applications, etc., be codified and appropriately changed whenever warranted. This has posed enormous problems for the administrators due to internal resource constraints. As a result, in many instances, different types of vehicles have been combined into a single code, thereby making clear identification difficult. These make enforcement more difficult. For example, if all passenger vehicles of all types, including taxis are codified in a single code, but taxis are exempt from financial responsibility laws, then obtaining an accurate number of vehicles requiring insurance will be extremely difficult. The same would apply to fleet vehicles.

Mr. Hunstad, in his article referred above, provides a statistical method to calculate the number of registered vehicles in a jurisdiction. His method, however, requires someone with sound knowledge of statistics, and the ability of the jurisdiction to generate the types of raw data required in her methods. Further, there are many assumptions, each of which would have an error factor due to the estimation of several key data elements, such as: a) vehicles with more than one invalid data field, b) vehicles registered out of jurisdiction but not captured within the jurisdiction's database, c) assuming movements of vehicles in and out of a jurisdiction follows a uniform distribution, d) estimating double counting of vehicles with more than one registration in one year, etc. The more elements estimated, the higher would be the error factor.

The group also decided that it is important to keep the focus of the group to finding the **most reasonable solution to a difficult problem**, rather than get unduly focused on excessive technicalities, which could make each problem area an end in and of itself.

In keeping with the objectives of reasonableness, the group decided that vehicles would be identified into those that would be included for the measurement of the UMR, and those that would be excluded. It was also decided that a survey would be conducted to obtain additional data from various jurisdictions that would be relevant for the conclusion of the study.

Types of Motor Vehicles Included for UMR Calculation

For the purposes of calculating the Uninsured Motor Vehicle Rate, the definition of "Motor Vehicles" will **include:**

1) Privately owned passenger vehicles to **include**: Cars, Pick-ups, Sports Utility Vehicles and Mini-vans
2) Non-fleet business vehicles

The definition of "Motor Vehicles" for UMR calculations will **exclude:**

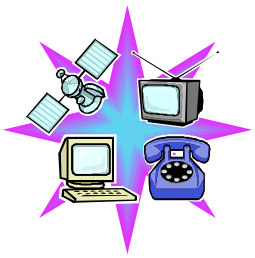
1) Semi-Trucks
2) RVs and Motor Homes
3) Motorcycles
4) Trailers
5) Government vehicles
6) Buses
7) Passenger Vehicles for hire (taxis, limousines, etc.)

Note: There are instances when an insurer fails to pay damages and injuries on an **insured vehicle due to a violation of the insurance policy terms**. Such vehicles will be considered as insured and **will not be included as an uninsured vehicle.**

The survey results indicated that a majority of registered vehicles in any jurisdiction comprises of the types of vehicles in the "included" category above. Further, the cost and expense of purchasing and maintaining the types of vehicles excluded above are so high that a vast majority of the owners maintain insurance on those vehicles and such owners are not the problems for victims in any jurisdiction. Their liability is so high that generally they maintain required insurance. Since the purpose of measurement of UMR is to identify irresponsible owners and drivers and make them financially responsible, this is restricted to the types of vehicles/owners most often found to cause problems to victims.

Based on current practices and ease of calculation, four methods to calculate UMR have been identified and are described below. These are: 1) Database Method; 2) Random Sampling Method; 3) Law Enforcement Method; and 4) Crash Statistics Method.

METHOD ONE: THE DATABASE METHOD OF CALCULATING UMR



Note: This method is applicable only to those jurisdictions that maintain an insurance database and the industry's book of business.

Base Formula: Stage 1

$$100\% \text{ minus } \left\{ \frac{\text{VEHICLES INSURED PER INSURANCE DATABASE*}}{\text{VEHICLES REQUIRING INSURANCE PER REGISTRATIONS**}} \right\}$$

* Vehicles insured will be based on matching vins with current registration
** Registrations includes only current registrations on the day UMR calculated
Vehicles per definition stated earlier.

Example: Vehicles insured: 5,000,000 Vehicles with valid registration: 6,000,000
UMR: 100% - (5,000,000/6,000,000) = 100% - 83.33% = 16.67%

Stage 2: Improved accuracy: This will be a second level of sophistication for jurisdictions which maintain data on the number of vehicles claimed to be insured by customers who are not posted on the insurance database, but subsequently verified as insured by insurance carriers.

$$\text{(Stage 1 result) minus } \left\{ \frac{\text{VEHICLES VERIFIED AS INSURED}}{\text{VEHICLES REQUIRING INSURANCE}} \right\}$$

Example: Vehicles verified as insured: 300,000 Registered vehicles: 6,000,000
UMR: 16.67% - (300,000/6,000,000) = 16.67% - 5% = 11.67%

Stage 3: Improved accuracy: This will be a third level of sophistication for jurisdictions that can identify the **NET** percent of electronic transactions submitted by carriers for vehicles with valid insurance, which could not be updated on the database due to technical errors in coding, etc.

$$\text{(Stage 2 result) minus } \left\{ \frac{\text{INSURED MV REJECTED DUE TO CODING ERROR}}{\text{VEHICLES REQUIRING INSURANCE}} \right\}$$

Example: Vehicles rejected for coding errors: 200,000 Registered vehicles: 6,000,000

UMR: 11.67% - (200,000/6,000,000) = 11.67% - 3.33% = 8.34%

METHOD TWO: THE RANDOM SAMPLING METHOD

In any sampling method, the most important element is to select the right sample size. It is also important to understand the universe and to ensure that it is homogenous. Sample size selected from a specific area of a jurisdiction, or a specific demographic will not be accurate when extrapolated for the entire jurisdiction. A random sample should reflect the characteristics of the entire jurisdiction and distributed as normal distribution. Sample size is NOT directly proportional to the population we are dealing with. Also, the three concepts pivotal to scientific sampling are: confidence level, precision and error rate.

Confidence level is the degree to which we are justified in believing that the estimate based on a sample drawn at random will fall within a specified range, usually expressed as a percentage. For example, a 95% confidence level means that there are 95 chances out of a hundred that the sample results will not vary from the true characteristics of the whole population by more than a certain specified amount. 5 chances out a hundred they will. The confidence level for a sample can never be 100%.

Precision is the range within which the estimation of the population characteristics will fall at the stipulated confidence level, and is usually expressed as a plus-or-minus percentage.
Once the confidence level, say 95%, and precision of 2% is determined, the estimate obtained from the sample may permit us to say that we are 95% confident that the UMR is 15% ± 2%, or falls within a range of 13% to 17%.

Error rate is an estimate of the maximum number of errors occurring in the sample. For our purpose, we shall assume that it will be **5%.**

Once the confidence level and precision have been determined, the sample size can be determined. (There is a third factor, variability, which can be measured. However, measurement of variability would be irrelevant to our purpose and quantifying the various parameters determining variability for this exercise would make it impossible to measure.) To improve the effectiveness, and keep it cost-beneficial, it is recommended that this exercise be completed once a quarter. Further, each jurisdiction could be divided into four quadrants, and vehicle owners selected from each quadrant. This would make the sample homogenous. The sample size would be almost identical, if the population size in each quadrant is similar. In jurisdictions with fewer than 1 million population, it is sufficient to measure the jurisdiction as a single homogenous area and not divide into four quadrants.

It is important to ensure that when the quadrants are determined there are no unique demographic factors within a quadrant that would skew the result. For example, in a quadrant populated predominantly with low-income neighborhoods, one small segment has a high population of very high-income families. In such cases, some consideration must be given to "rezoning" the quadrant to avoid misleading results. Now let us select the method for sample size. **The sample size indicates the minimum, and can be increased.**

Random Sample Method (Contd.)

The formula to establish sample size has two parts. The first is used to obtain the sample for an infinite population. The second adjusts the size to the population being considered.

The first formula:

$$n_{(e)} = \frac{Z^*(p)(1-p)}{A^*}$$

Note: * indicates to the power of 2

Where: $n_{(e)}$ = First estimate of sample size

Z = Standard Deviation Factor (from table enclosed)

p = Error rate (Assumed at 5%)

A = Desired precision (evaluator decides)

The second formula: uses the first estimate of sample size and adjusts it to fit the population:

$$n_{(f)} = \frac{n_{(e)}}{1 + (n_{(e)} / N)}$$

Where: $n_{(f)}$ = Final Sample size

$n_{(e)}$ = First estimate of sample size (from formula 1)

N = Population

Example: For a universe of 1,000 (N), with a desired confidence level of 95%, a precision rate of ± 2% (A), and error not more than 5% (p), the sample size will be calculated thus:

First Formula

$$n_{(e)} = \frac{1.96^* (.05)(.95)}{0.02^*} = \frac{3.8416 \times .05 \times .95}{.0004} = 456$$

Second Formula

$$n_{(f)} = \frac{456}{1 + (456/1{,}000)} = \frac{456}{1.456} = 313$$

(Note: * indicates to the power of 2) Final Sample size: 313

Once the sample size has been decided, the following steps must be taken to estimate the UMR. The sample population should be only vehicle owners with valid registration selected randomly.

Step 1: Mail a notice to the sample population, requesting insurance verification.
Step 2: Verify if any of the mail was returned undeliverable.

Step 3: Replace those undelivered with new ones to complete sample size. Repeat process until complete and there is nothing undelivered.
Step 4: Send all responses with insurance information to carriers for verification.
Step 5: Non-responses should be counted as uninsured.
Step 6: Total of all denied policies and non-responses are the **total uninsured**.

Final Formula:

$$\frac{\textbf{Total Uninsured in random sample}}{\textbf{Sample Size}} \textbf{ X 100 = UMR\%}$$

Example: Sample size is 500.
Received finally, 460 responses with insurance information.
Carriers verified and confirmed 448, denied 12.
Total uninsured = 40 (non-responses) + 12 denied by carriers = 52
UMR = 52/500 = 10.4%

Note: When a jurisdiction is divided into quadrants, the formula could be applied for the results from all quadrants as one calculation, or UMR calculated individually for each quadrant, as decided by the jurisdiction. If calculated individually, the average of the four UMR % would be the jurisdiction's UMR. It is unnecessary to calculate the weighted average since sample sizes would mostly be similar, even though not identical.

Factors Required to Achieve Given Confidence Levels

(Confidence Levels in percentages converted to standard deviation units, based on the normal distribution curve.)

Confidence Level	Factor	Confidence Level	Factor
99.9	3.2905	75.0	1.1503
99.7	3.0000	70.0	1.0364
99.5	2.8070	68.3	1.0000
99.0	2.5758	60.0	0.8416
98.0	2.3263	50.0	0.6745
95.5	2.0000	40.0	0.5244
95.0	1.9600	30.0	0.3853
90.0	1.6449	20.0	0.2534
85.0	1.4395	10.0	0.1257
80.0	1.2816		

(**Note**: All information, examples, explanations, and the above table are from *"The Practice of Modern Internal Auditing"* by Lawrence B. Sawyer, CIA. While this book is prescribed for auditing purposes, the techniques have been adapted for this study.)

METHOD THREE: THE LAW ENFORCEMENT METHOD

This is perhaps the simplest method and not the most accurate. However, this could give an estimate, within a wider range, of the seriousness of the UMR problem.

Law Enforcement Officers routinely cite drivers of motor vehicles for driving without insurance. This finally leads to convictions or dismissals. However, the driver record may have other convictions as well. Hence the following formula is applied:

$$\text{UMR\%} = \frac{\text{Number of driver records with convictions for lack of insurance}}{\text{Number of driver records with all convictions}} \times 100$$

Example:

Convictions in driver records for lack of insurance in 1999 = 20,000
All convictions of all types in driver records in 1999 = 500,000
UMR = (20,000/500,000) x 100 = 4%

(It must be pointed out that it is generally recognized that violators have repeat violations and safe drivers have few or no convictions. Hence the result obtained by this method may be a slightly inflated number and not necessarily as accurate as the other three methods.)

METHOD FOUR: THE CRASH STATISTICS METHOD

This method simply uses the number of motor vehicles identified as uninsured in crashes during the crash investigation. Considering that this sample is a specific segment of the universe and not a random selection, the results may not be quite as accurate as the database method or the random sampling method. The UMR is calculated under this method as under:

$$\text{UMR\%} = \frac{\text{Number of Vehicles Uninsured in Crashes}}{\text{Number of Vehicles Involved in Crashes}} \times 100$$

If total vehicles involved in crashes is not available, multiply number of accidents by 1.84. 1.84 is the factor recommended by NHTSA as a nationwide average vehicle per accident.

Example: Uninsured vehicles in 2000 crashes = 200 Total vehicles in crashes = 4,000

UMR% = (200/4000) x 100 = 5% or (200/2000*1.84) x 100 = 5.43%

CONCLUSION

This report has been prepared to assist jurisdictions, in a most cost-beneficial manner, measure the seriousness of financial responsibility violations in the jurisdiction. These methods could provide uniformity between like jurisdictions, as expressed in the survey, and also provide a mechanism for legislators in the various jurisdictions when addressing issues for pertinent legislation. These methods are by no means the only methods, nor are they expected to yield absolutely accurate results. However, they are excellent indicators of the possible violations and will help provide focus for efficient enforcement of the financial responsibility laws in each jurisdiction.

Additional information regarding the various projects of the Financial Responsibility Committee of AAMVA can be obtained by visiting the AAMVA Web Site at "AAMVA.org" You can find the Financial Responsibility Information under Driver Services.