What We Know About Uninsured Motorists and How Well We Know What We Know

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December 1997, Revised April 2000 •
Discussion Paper 98–09–REV

RESOURCES FOR THE FUTURE

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Abstract

The problem posed by the uninsured motorist is of concern to the general public, policyholders, insurance companies, insurance regulators, and legislators. What is striking, however, is the fragmentary nature of the information that is available and the fact that it is scattered over so many sources. Even more striking is the fact that those sources often provide conflicting estimates, and the methods used in deriving those estimates are either never spelled out or, if they are, their reliability is unknown.

In view of the general concern with the problem of uninsured motorists, this paper attempts to present an overview of what we know about the uninsured motorists and how well we know what we know through the following measures: clarifying the subtleties of the definition of an uninsured motorist; discussing the more prominent methods used to estimate the number of uninsured motorists and the properties of the estimates generated by these methods; illustrating what is known about the profiles of uninsured motorists; and pointing briefly to factors that account for the existence of uninsured motorists.

Key Words: converting fixed to variable cost; efficient pricing of auto insurance; environmental benefit of Pay-at-the-Pump; uninsured motorists/vehicles; universal auto insurance; Pay-at-the-Pump insurance

JEL Classification Numbers: K4, L9, Q2, R4

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What We Know About Uninsured Motorists and How Well We Know What We Know

J. Daniel Khazzoom[1]

I. Background

During the automobile's early years, uninsured motorists did not pose a major problem. Typically, car owners were affluent individuals who had the means to pay for damages resulting from accidents found to be their fault. But as car ownership spread to individuals who had little or no property that could be used to pay for such damages, mandatory liability insurance emerged as one solution to the problem.[2] At present, liability insurance is mandatory in 45 states and the District of Columbia. Additionally, the governor of Alabama has recently signed a bill mandating liability insurance as of June 1, 2000 (Insurance Information Institute 1999a), which makes Alabama the forty-sixth state. The remaining four states – Mississippi, New Hampshire, Tennessee, and Wisconsin – have financial responsibility laws. [3]

The problem posed by the uninsured motorist is of concern to the general public, policyholders, insurance companies, insurance regulators, and legislators.[4] Over the years, several methods of dealing with this problem were proposed. Reviews of these efforts can be found in the Insurance Information Institute's Insurance Issues update (1999a) and the Insurance Research Council's Public

1 I wish to acknowledge the contribution of Steve Sugarman, UC Berkeley; Winston Harrington, Resources for the Future; Steve Carroll, RAND Corporation; Robert Lee Maril, Oklahoma State U.; Mohammed El Gasseir, Rumla, Inc.; Ben Gentile and Lyn Hunstad, CA Dept. of Insurance; Kelly Hill, National Conference of State Legislatures; Carol Howard and Diane Johnson, Vehicle Registration, North Carolina DMV; Sean Mooney, Guy Carpenter & Co; Cynthia Knox, Texas Dept of Public Safety; Len Marowitz, CA DMV; Mike Miller, Miller, Rapp, Herber, and Terry, Inc.; Diana Lee, National Association of Independent Insurers; Eric Nordman, National Association of Insurance Commissioners; Jennifer Gullette, NC Dept. of Insurance; William van der Meulen, NC Institute for Transportation Research and Education; Jeffrey O'Connell, University of Virginia; Susan Slivinski, Insurance Information Institute; Steve Robertson, State Farm Insurance, Co.; Skip Nielsen Utah DMV; Vana Hunter, Utah Insurance Commission; James Gurney and James Junius, VA DMV; Rebecca E. Nichols, VA Bureau of Insurance; Randall Wright, University of Pennsylvania.

2 For a brief history of mandatory liability insurance in the United States and Europe, see Hashmi (1965), pp. 1 ff. See also Insurance Service Office, Inc. (1992).

3 Financial responsibility laws establish minimum limits required for the driver to be able to pay for damages resulting from accidents in which the driver was found at fault or for major traffic violations committed by the driver, such as drunk driving or hit-and-run driving.

4 The Insurance Research Council reports that in 1997 approximately $2.4 billion was paid out for bodily injuries under uninsured motorist coverage (Insurance Research Council 1999).

Attitude Monitor (1997). Currently, state laws and the enforcement of those laws vary greatly from state to state.[5]

What is striking, however, is the fragmentary nature of the information that is available and the fact that it is scattered over so many sources. Even more striking is the fact that those sources often provide conflicting estimates, and the methods used in deriving those estimates are either never spelled out or, if they are, their reliability is unknown.

In view of the general concern with the problem of uninsured motorists, this paper attempts to present an overview of what we know about the uninsured motorists and how well we know what we know through the following measures: clarifying the subtleties of the definition of an uninsured motorist; discussing the more prominent methods used to estimate the number of uninsured motorists and the properties of the estimates generated by these methods; illustrating what is known about the profiles of uninsured motorists; and pointing briefly to factors that account for the existence of uninsured motorists. I hope that the availability of such an overview will be helpful to the work of researchers, regulators, policymakers, and the interested reader.

We begin with a brief discussion of the meaning of 'uninsured motorist' then discuss what we know about the percentage of uninsured motorists in the entire population of motorists. Since the available estimates differ somewhat according to the methods used in generating them, we spend time reviewing the main methods that have been used to estimate the percentage of uninsured motorists. We discuss the consistency of the estimates derived from different methods, as well as the consistency of the estimates derived from the same method. We discuss also the problem of selection bias and the truncated nature of much of the available information on the profile of uninsured motorists. Lastly, we analyze factors that might account for the existence of uninsured motorists.

II. What is an Uninsured Motorist?

The term uninsured motorist is somewhat confusing. Technically it is the vehicle, not the motorist, that is insured. Perhaps the choice of "motorist" instead of "vehicle" was intended to focus attention on the agent with whom the insurance responsibility lies. Simply put, an uninsured motorist means a motorist who owns an uninsured vehicle. However, there is more to it than just that. As we will see in a moment, there is no one-to-one correspondence between "uninsured motorist" and "uninsured

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[5] For a discussion of enforcement see Insurance Information Institute (1999a,b). For a discussion of the efficacy of various measures, see Insurance Research Council (1999), chapter 6. For a general discussion of mandatory insurance laws and their enforcement in various states, see National Association of Insurance Commissioners (1989a), p. 164 ff., and Fannie Weinstein (1991). For a summary of the insurance requirements and enforcement procedures, a listing of the agencies responsible for administering the compulsory laws, as well as the types of exempt vehicles, etc. in the United States and Canada, see National Highway Traffic Safety Administration (1990), section I. See also Attachment I, "Summary of Uninsured Motorists/Compulsory Auto Liability Report," in National Association of Insurance Commissioners (1989b) and "Enforcement of Compulsory Auto Liability Insurance Laws as of July 1997" in Insurance Information Institute (1997). For detailed tabulations of auto insurance laws by state, see American Insurance Association (1997).

vehicle." The first is a legal concept; the second (with rare exceptions) is a physical concept based on a number count of vehicles.

In a simple world with an interlocking of car owner and car driver – meaning, the car can be driven only by its owner– and where every motorist owns one vehicle only, the number of uninsured motorists and the number of uninsured vehicles would be equal. In such a world, a fleet of one hundred vehicles of which ten are uninsured would mean that such a fleet had one hundred owners, ten of whom failed to insure their vehicles. The percentage of uninsured motorists and uninsured vehicles would both be equal to ten.

When car owners own more than one vehicle, this simple one-to-one correspondence no longer holds, even when the interlocking of car owner and car driver continues to hold. Suppose there are fifty car owners each owning two vehicles – one insured, the other not. In this example, there are fifty out of fifty car owners who failed to insure their vehicles, yielding 100% uninsured motorists. But there are only 50 uninsured vehicles out of one hundred, yielding 50% uninsured vehicles.

Beyond these simple examples, things can get more complicated. Determining who else (other than car owners) should be included in the group of uninsured motorists depends on a variety of circumstances, such as location.

Consider a case in California, for example. A motorist who owns an insured vehicle drives a neighbor's uninsured car. If the uninsured car is not available to her for regular and frequent use, then she is considered insured when driving that car, even though the car is uninsured. If, on the other hand, the uninsured car is available to her for regular and frequent use, then she is considered an uninsured motorist when driving that car. Suppose, however, she has two cars, one of which is insured and the other not. She drives her neighbor's uninsured vehicle. As before, her neighbor's car is not available to her for regular and frequent use. Nonetheless, she is now legally considered an uninsured motorist when driving that car, because she has not insured all of her vehicles. The purpose of this rule is to discourage motorists with more than one vehicle from insuring only one and expecting to be covered with respect to the others (DMV 1991). This means that in the final count, the number of uninsured motorists as a percentage of all motorists will depend on the status of each individual case. Note that throughout, the percentage of uninsured vehicles remains unchanged; only the status of who is and who is not an uninsured motorist changes.

In a state like North Carolina, determining who is an uninsured motorist is much simpler: anyone who drives an uninsured vehicle is cited as uninsured motorist (and her license is suspended).[6] Nonetheless, major discrepancies arise between the percentage of uninsured motorists and the percentage of uninsured vehicles. An individual drives his friend's car, which happens to be an uninsured vehicle. He is stopped by the highway patrol while driving that vehicle and cited as an uninsured motorist. There are now two uninsured motorists in the state's records: the owner of the uninsured vehicle and the driver stopped by the patrol. Yet there is only one uninsured vehicle.

[6] Communication with Betsy Privet, Collision Reports Division, North Carolina's Division of Motor Vehicle.

In some circumstances, there is uncertainty with respect to the status of a vehicle, as well. But this happens rarely. Consider a motorist who owns an insured vehicle. She paid the insurance premium fully and in advance. But suppose that in the meantime, the insurer became insolvent. When that happens, most states will change the status of that vehicle from insured to uninsured, even though its insurance premium was fully paid (American Insurance Association 1997).

These considerations add a level of complexity to the calculation and interpretation of the percentage of uninsured motorists. One of the methods we will examine later, the Insurance Research Council (IRC)'s method, is focused on the uninsured motorist rather than the uninsured vehicle, and seemingly takes into account the complexity of determining who the uninsured motorist is. But there are problems with this method, which we will discuss later on. A second method we discuss and illustrate using California's case as an example is focused on uninsured vehicles. It estimates the number of uninsured vehicles as the difference between the number of registered vehicles and the number of insured vehicles. But whatever the case may be, we keep in mind that state estimates are strictly speaking not comparable, because of differences concerning what constitutes an uninsured motorist, regardless of how refined the individual state's estimates might be.

III. Methods of Estimating the Proportion of Uninsured Motorists and Uninsured Vehicles.

There is no consensus on the percentage of uninsured motorists in the fifty states. Much depends on the method used to estimate that percent. We will report some of the available estimates while discussing the various methods used, and summarize our findings at the end of the section. At this point we note that regardless of the method used, we do not know what level of uncertainty to attach to any of the available estimates. In some cases (such as database matching, as discussed below), this is because we have not had a long experience with the method. In others (such as IRC's method, as discussed below), it is because IRC is silent on almost everything about the method and its results. And still in the case of other estimates (which we do not discuss much in the text but briefly allude to in section III.5 below), the method of estimation is not even spelled out.

Estimates of the percentage of uninsured motorists are based primarily on one or more of the following procedures:

1. 1.Matching DMV's drivers' registration database against their insurers' database to identify vehicles that have been registered but not insured. In some instances, as in the case of Utah, the search for a match is augmented by the inclusion of a third database – that of the licensed drivers. In other instances, as in the case of California, the database match is adjusted to take into account vehicles operated without being registered.
2. Random sampling of registered vehicles.
3. Comparison of the frequency of claims paid under uninsured motorist insurance with the bodily injury claims paid under liability insurance.
4. Sampling surveys of the insurance status of automobiles owned by households.

Occasionally, other ancillary procedures have been used by state agencies to supplement one or more of the above procedures. One example is the California DMV's use of field data from the California

Highway Police (for motorists stopped and found without proof of insurance) in conjunction with court dismissal data to estimate the percentage of uninsured motorists among active drivers (DMV 1991). There are problems of self-selection bias with this and other ancillary approaches (as there are with the four methods listed above). In this case, for example, the calculation is based on a truncated sample.[7] The resulting statistic is an estimate of the percentage of uninsured motorists in a subset of the population of active drivers stopped for a violation, not of the population of all active drivers[8].

We turn to a brief illustration of the applications of each of these four methods.

A. Matching of Databases

The number of states that use automated database matching is not exactly known. In 1997 the Insurance Information Institute (III) claimed that six states use database matching: Arizona, Connecticut, Louisiana, Nevada, North Carolina and Texas (III 1997). However, Virginia[9] and Utah[10], which were not among the six listed states, were known to have already been on this system. On the other hand, North Carolina, which was included in III's list, was not on this system, and is not expected to be on it before October 2000. [11] Similarly III lists Texas among the six states, but according to the American Association of Motor Vehicle Administrators, Texas is pending legislation for database matching. More recently, III reported that ten states have regulations setting up database matching of vehicle registration with insurance company records of auto insurance. These are Arizona, Colorado, Connecticut, Florida, Louisiana, Nevada, New Jersey, New York, North Carolina, and Utah (III 1999a). This still leaves out Virginia which by now has been on database matching for over three years, but includes North Carolina, which is not scheduled to start database matching for another year.

The frequency of cross checking by states known to use the database matching varies. In Utah, for example, where the legislature passed a law in 1994 to implement a database-matching experiment,[12] the cross-checking is done monthly,[13] and a new percentage of uninsured motorists is calculated

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[7] A truncated sample is one in which the knowledge of the independent variable, such as the age or income of the uninsured motorist, is available only when the dependent variable, the uninsured motorist, is observed (Judge et al. 1985).

[8] For a listing of several ancillary methods, see Marowitz (1990) and the references therein.

[9] Communication with Rebecca Nichols, Property and Casualty Division, DMV, VA.

[10] Hunter (1997).

[11] Presently, the insurance companies report to DMV (on tape or on paper) all policy cancellations. They are expected to begin reporting electronically to DMV the cancelled as well as the newly written policies beginning in October 2000. By that time, DMV will have the required database to make crosschecking possible. Communication of September 8, 1999 with Diane Johnson, Assistant Director, Vehicle Registration, DMV, NC.

[12] The experiment was intended to end on July 1, 1998, but has been extended to July 1, 2000 (Utah Driver License Division 1999).

[13] According to Richard Kestrel of Utah's Insurite, a company that manages Utah's database matching, Utah is the only state which requires the insurance companies to report monthly on the status of all policies in their

every month. (Also, notices are then sent to individuals whose records show they were without insurance for three consecutive months.) On the other hand, in California, where there is no law requiring the state to do database matching, database matching was only undertaken once.

Table III.1 sketches the steps involved in estimating the percentage of uninsured vehicles using California's Department of Insurance (CDI) estimates for 1996 as an illustration. CDI estimates that 28% of the vehicles in California in 1996 were uninsured. For an extensive exposition of the methodology and a description and evaluation of the sources used in arriving at CDI's estimate, see Hunstad (1999).

A few comments on Table III.1: Like other state agencies that rely on database systems to estimate the percentage of uninsured motorists, CDI's point of departure is DMV's database. But unlike other states, in which estimates of the uninsured vehicles leave out the unregistered vehicles, CDI includes in its calculations an allowance for cars operated without registration.[14] CDI's estimate of the number of existing unregistered vehicles is based on an extensive survey and evaluation of the available estimates of unregistered vehicles (e.g., Hunstad 1999). CDI's allowance for unregistered vehicles is shown in row 2 of the table: 7.8% for unregistered vehicles and 11.7% for unregistered trucks.[15]

Stochastic simulations performed by CDI show that while the point estimate of uninsured vehicles is 28%, 95% of the estimates fall between 26% and 31%.

Sensitivity analysis and regression analysis of the simulation results indicate that the percentage of unregistered vehicles in the fleet is one of the two most influential variables in determining the estimated percentage of uninsured vehicles.[16]

B. Random Sampling of Registered Vehicles

Random sampling or alternatively stratified random sampling of motorists has the advantage of simplicity and cost-effectiveness. It also has the attractive feature that its estimate of the true proportion of uninsured vehicles in the population of all vehicles is unbiased. And although the true proportion of uninsured motorists in the state is uncertain unless the sample size is increased to

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portfolio to the state or agency acting on behalf of the state for database matching. In other states with database matching, insurance companies report only the changes in their policy portfolio, such as cancellation, reinstatement, etc. Communication with Richard Kasteler, Director, Insurite, Utah.

[14] Utah supplements the comparison of DMV's and insurers' databases with the database of drivers' licenses. Some of those who drive uninsured unregistered vehicles may be identified through the drivers' licenses database. (Discussion with Skip Nielsen, Drivers' License Record Chief, Utah's DMV). Utah uses the drivers licenses' database also to enhance the ability of the state to match DMV's records with the insurers' records, since it is not uncommon for some individuals to register their vehicles under the name of their unincorporated businesses rather than their own names.

[15] DMV reports the number of commercially registered vehicles. According to CDI's analysis of DMV's data, trucks accounted for 94.4% of the commercially registered vehicles. The rest includes taxis, ambulances, etc. (Hunstad 1999a).

[16] The other variable is the percentage of business use of commercially registered vehicles.

include every motorist, the true proportion of uninsured motorists can be bracketed within a range that reflects a level of probability with which we feel comfortable.

Additionally, to carry out random sampling of the motorists, highway and city-street sites should be selected in such a way that they reflect the diversity of the driving population throughout the state, and drivers should be stopped randomly at the site to check on their compliance with the insurance laws. As Marowitz observed, the scheme should be so designed to make it impossible for drivers to avoid being stopped (as often happens at sobriety checkpoints) by exiting the highway or the city street once they notice the roadside stop ahead (DMV 1991).

The Insurance Information Institute reports that Delaware, Idaho, Illinois, Maryland, Minnesota, Missouri, New Mexico, Oregon, Rhode Island, South Carolina, Virginia,[17] and the District of Columbia use random sampling (III 1999a; National Highway Traffic Safety Administration 1999). But we were unable to uncover any jurisdiction whose sample design conforms to the requirements briefly listed in the preceding paragraph.

Some states randomly sample registered vehicles. This method, however, yields estimates that are conditional; they are relevant only to a subset of the population of motorists, not the whole population of motorists. DMV picks out a random sample of registered vehicles, and the state asks the insurance company listed in DMV's record to verify the insurance status of that vehicle. The insurer checks its records and reports back to the state its findings. When the insurer reports that a certain vehicle is no longer insured, the state follows up with the owner to determine, among other things, if the owner switched carriers in the meantime. Once this determination is complete, one can use the total number of vehicles found to be uninsured to calculate the proportion of uninsured vehicles in the sample. This proportion provides the basis for bracketing the percentage of uninsured vehicles in the fleet of registered vehicles. In practice, the attempt to determine the insurance status of the vehicle may never come to a satisfactory conclusion. Often, state inquiries sent to vehicle owners are left unanswered, so when the state estimates the proportion of uninsured vehicles from the sample while the insurance status of some of the vehicles is uncertain, the results are biased.

[17] Virginia initiated a random sampling of registered vehicles in 1986 to check on the validity of motorists' self-certification, but discontinued the practice in 1996 (Communication with James Junius, Manager Insurance Monitoring Division, DMV, VA) Since then, Virginia has been using an automated database matching system.

Table III.1 Estimation of the Percent Uninsured Vehicles in California, 1996*

	Automobiles	*Trucks*
1. Total number of registered vehicles	1,702,220	4,311,840
2. Fraction of vehicles operating without registration**	0.078	0.117
3. Total number of operating vehicles (Row 1 x (1 + Row 2))	18,403,853	4,816,325
4. Estimated Percent of Vehicles dedicated to Personal Use***	92.9%	66.9%
5. Number of Vehicles dedicated to Personal Use (Row 3 x Row 4)	17,097,179	3,222,121
	Total Vehicles: 20,319,320	
6. Number of Insured Vehicles****	14,619,880	
7. Percent of Insured Vehicles (Row 6 ÷ Row 5)	72.0 %	
8. Percent of Uninsured Vehicles (100% – Row 7)	28.0 %	

* Source: DMV's database

** Source: California Energy Commission's enhanced Version of DMV's Vehicle Registration database; National Highway Traffic Safety Administration's Fatal Accident Reporting System; California Highway Police's Files of Violation Records

*** Source: California Energy Commission's Vehicle Model

**** Source: Insurance companies' liability database, which includes Personal Passenger Automobile and Car Assigned Risk Program, and an adjustment to reflect the database 99.6% coverage of the total premium in 1996

Note: The numbers in the table may differ from CDI's figures due to rounding.

In conclusion, the proportion of uninsured vehicles calculated from random samples of registered vehicles is an estimation of the proportion of uninsured vehicles only in the population of registered vehicles. This, of course, presumes that the insurance status of the vehicles in the sample is known unambiguously. Similarly, to the extent that the factors that lead motorists not to insure or to register their vehicles overlap substantially (poverty, unemployment, age, etc.), one would expect the percentage of uninsured vehicles to be higher in the population of unregistered than in the population of registered vehicles. Since random sampling of registered vehicles leaves out the unregistered, the proportion of uninsured vehicles calculated from these samples must underestimate the true proportion of uninsured vehicles in the entire population. And the larger the share of unregistered vehicles in the total, the greater is the extent of this underestimate. Unfortunately, we are in the dark on the validity of the magnitudes involved.

C. Comparison of the Frequencies of Claims Paid Under Uninsured Motorist Insurance and Bodily Injury Liability Insurance

This method is used by the IRC, formerly the All Industry Research Advisory Council (AIRAC), to generate estimates of the percentage of uninsured motorists in the fifty states and Washington, D.C. To date, IRC's estimates are the most comprehensive available. Their most recent estimates, published in August 1999, covered the period 1989-1995 for the fifty states and the District of Columbia (for Texas the estimates covered the period 1989-1994) (IRC 1999). In 1989, AIRAC published uninsured-motorist estimates, which covered the period 1976-1986 for the fifty states. For the District of Columbia they covered a shorter period, 1976-1980. (AIRAC 1989).

In the following sections we refer to the method used by AIRAC and its successor as IRC's method.

IRC uses two variables to calculate the proportion of uninsured motorists: (1) Uninsured Motorists Claim (UMC), which represents the number of uninsured motorists claims for injuries caused to the insured (or their family members and people riding with them) by uninsured motorists; (2) Bodily Injury Liability Claim (BILC), which represents the number of injuries caused by insured motorists. IRC calculates the ratio of UMC to BILC and reports the result as the proportion of uninsured motorists in the population.

Implicitly, IRC's calculation makes two basic assumptions. (There are other implicit assumptions, as we will see shortly). One is that the propensity to get involved in accidents is the same for insured and uninsured motorists. Two, the percentage of accidents that involve an insured and an uninsured motorist, where the uninsured motorist is at fault, is the same as the percentage of insured motorists. IRC gives no empirical evidence to support the plausibility of these assumptions. It does not make any a priori argument either to buttress them.

To illustrate the calculations using IRC's method, we use a numerical example from AIRAC's study (AIRAC 1989). Assume there are 9,000 individuals, each owning one insured vehicle. All 9,000 have bodily injury and uninsured motorist insurance coverage. There are also 1,000 individuals each owning one uninsured vehicle. In this simple example, we assume an interlocking of car owner and car driver and rule out the ownership of more than one vehicle. Under those simplifying assumptions, 10% of the population of motorists are uninsured. Calculating the proportion of uninsured motorists using IRC's method involves two steps:

> 1. Assume both the insured and uninsured motorists have an at-fault injury accident rate of 5%. Then there will be 450 such accidents caused by the group of insured motorists (i.e. BILC = 450) and 50 such accidents caused by the group of uninsured motorists.
>
> 2. Assume that 90% of the 50 accidents caused by uninsured motorists are with insured motorists (i.e. apply the same proportion as the percentage of insured motorists in the total). So there will be 45 uninsured-motorist claims filed by the insured motorists (i.e. UMC = 45).

With BILC=450 and UMC = 45, the ratio UMC/BILC = .10, which can be seen to be the same as the proportion of uninsured motorists in the population of all motorists.

In this simplified world, IRC's ratio (UMC/BILC) recovers the true proportion of uninsured motorists in the total population of motorists.

Note, step 2 (but not the assumption built into it) can be dropped, and the results of step 1 can be used directly to recover the ratio of uninsured motorists in the population of motorists. From step 1, calculate the ratio (U/I), where U denotes the number of accidents caused by uninsured motorists and I the number of accidents caused by insured motorists. Treat this ratio as an estimate of the ratio of uninsured to insured motorist. It is then straightforward to recover the proportion of uninsured motorists in the population of motorists from this ratio[18].

Table III.2, an adaptation of Appendices I and II in IRC's Uninsured Motorists (IRC 1999), ranks the fifty states and the District of Columbia by the percentage of uninsured motorists in 1995. The table shows also the states that presently have financial responsibility (but not mandatory insurance) laws.

IRC's report is silent on a host of things that matter. The following four sections comment on IRC's method and on Table III.2.

1. Ruling out Ownership of More than One Vehicle and the Assumption of Interlocking of Car Owner and Car Driver

The reasoning behind IRC's method rests on a simple example, as we saw, which rules out multiple ownership of vehicles (some that may be insured and some that may not), and relies on the assumption of interlocking of car owner and car driver. And yet we know that both of these assumptions are violated in the real world, as IRC's own survey results show (AIRAC 1989; IRC 1999). Given that the model is based on a simplistic world, it is not clear how applicable IRC's results would be to the real world.

2. Unknown Nature and Representativeness of the Data from which the Proportion of Uninsured Motorists is Calculated.

IRC reports annual ratios calculated from data collected by three separate agencies: the National Association of Independent Insurers, the Insurance Service Office, and the National Independent Statistical Service. For the ratios to be unbiased estimates, one would want to know that the sample used to calculate these ratios is representative. For the estimates to be useful in any inferential work one also needs to know the variance of the estimates and the size of the sample used in calculating these estimates. None of this information is provided by IRC.

3. Upward Bias of IRC's Calculated Ratios.

IRC's calculations are likely to overstate the percentage of uninsured motorists in many states, and we do not know the range of the overestimate. IRC seem to have put little thought into investigating this bias, and the study does not provide the information needed to make an assessment of the overestimate.

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[18] Suppose (U/I) = k, then the estimator of the proportion of uninsured motorists in the total is: $(U / (U+I)) = (U / (U + U/k)) = k U / (U (1+k)) = k / (1+k)$. In IRC's illustrative example cited above, $k = 50/450$ from which it follows $k / (1+k) = 0.1$.

Reasons for the bias include:

1. Accident proneness of the uninsured motorists.

IRC's implicit assumption that the uninsured motorists have the same accident proneness as the insured motorists is problematic. There is evidence that suggests that, at least in some states, uninsured motorists tend to be disproportionately involved in accidents, often at a higher percentage than any known estimate of their proportion in the population of drivers. In the example we worked out above, if the propensity of uninsured motorists to get involved in an at-fault injury accident is at a rate of 7% (as opposed to the postulated 5% for the insured motorist), then we get a ratio of UMC/BILC = .14 instead of 0.10, which is a 40% overestimate of the true proportion of uninsured motorists in the population. We get no message from IRC's report about the likelihood of this happening and no glimpse of the magnitudes involved when it does happen.

2. The disparity in the nature and disposition of uninsured motorist claims and bodily-injury claims.

In discussions with members of the insurance industry, several members pointed out that, on the whole, insurance companies tend to be less forceful and more liberal in dealing with uninsured motorist claimants than they are in dealing with other claimants, including bodily injury claimants. The reason is that in the case of an uninsured motorist claimant, the company is dealing with its own client or policyholder, one whom the company cares about and does not want to lose. In the case of other claimants, the company is negotiating with someone it has no business relationship with. If that is indeed the case, this would imply that fewer uninsured motorist claims are likely to be rejected than they would be otherwise. This tends to inflate the number of uninsured claims and bias upward the ratio of UMC to BILC, leading to an overstatement of the proportion of uninsured motorists in the population. Unfortunately, we do not know the extent of this bias.[19] Moreover, we do not expect it to be uniform in all states.

In some regions, major frauds are suspected in the number of uninsured motorist claims[20]. A more lenient treatment of uninsured motorist claims may have encouraged this tendency, exacerbating further the upward bias in the estimate of the percent uninsured motorists.

The upward bias in the ratio of UCM to BILC may also be due to an institutionalization of the favorable treatment of uninsured motorist claimants. AIRAC cites two states, Colorado and Michigan, with 30.3% and 16.1% uninsured motorists in 1985, respectively (and 34.3% and 11.4%, respectively, in 1995) (AIRAC 1989). Both states have no-fault insurance. In both states, uninsured motorist claimants injured by uninsured (or hit-and-run) motorists are not required to demonstrate that their injury is serious – whether or not it surpasses the no-fault threshold, for example – in order to collect

[19] Unfortunately, there are no studies on the percentage of uninsured motorist claims denied and the percentage of bodily injury claims denied to help shed some light on the significance of this tendency.

[20] In Philadelphia, for example, the number of uninsured-motorist claims per hundred thousand vehicles is 1,200, which is twenty times as high as the corresponding number in Pittsburgh. The disparity in the implicit number of uninsured vehicles leads one to suspect fraud in Philadelphia and in other major cities as well. (American Petroleum Institute 1994).

benefits. Bodily injury claimants, on the other hand, must demonstrate the injury is serious to qualify. AIRAC does caution its readers not to take the ratios calculated for these states literally, because of the pronounced upward bias introduced by the differential treatment of uninsured motorist and bodily-injury claimants. We do not know how many other estimates of uninsured motorists suffer from a similar but less noticeable bias.

Hunstad points to another source that magnifies the upward bias in the ratio of UMC to BILC. Hunstad observes that the insured drivers might be motivated to settle directly with the injured person if they are concerned about increased insurance premiums and if the injuries are relatively minor (Hunstad 1999b). The fact that bodily injury losses tend to involve mostly small amounts implies that most of these injuries tend to be minor. Hence, one would expect that a significant proportion of insured drivers would probably settle directly with the injured party. Hunstad cites the results of a 1998 survey by the Independent Insurance Agents of America, which supports this expectation. On the other hand, when an uninsured motorist causes the accident, a direct settlement by the parties involved is less likely. One major reason is that many motorists who drive with no insurance have no assets to protect and do not worry about increased insurance premium. Taken together, these two points suggest that the ratio of UMC to BILC overstates the percentage of uninsured motorists.

3. The inclusion of claims in UMC that are not organically related to the uninsured motorist issue.

This includes claims for injuries caused by the driver of a stolen vehicle and injuries caused by a hit-and-run driver.[21] Both of these two categories have no organic tie to the problem of uninsured motorists. They both inflate the ratio of UMC to BILC and bias upward the estimate of the proportion of uninsured motorists in the population.

[21] Often the hit-and-run driver is actually a motorist driving an insured vehicle.

Table III.2 State Rank Based on Ratio of UMC to BILC in 1995*

State	***Rank***	*Ratio*
Colorado ***	1	0.343
New Mexico	2	0.320
California	3	0.319
Alabama	4	0.262
South Carolina	5	0.254
Mississippi ****	6	0.247
District of Columbia	7	0.227
Florida	8	0.197
Texas **	9	0.191
Alaska	10	0.179
Tennessee ****	11	0.173
Maryland	12	0.166
Oklahoma	13	0.165
Nevada	14	0.163
Washington	15	0.161
Arizona	16	0.151
Georgia	17	0.137
Ohio	18	0.134
Missouri	19	0.133
Arkansas	20	0.133
Oregon	21	0.126
New Jersey	22	0.123
Illinois	23	0.121
Virginia	24	0.118
Minnesota	25	0.118
Michigan ***	26	0.114
Indiana	27	0.113
Rhode Island	28	0.112
Kentucky	29	0.108
Wisconsin ****	30	0.107
Delaware	31	0.106
Iowa	32	0.100
New York	33	0.095
Utah	34	0.093
Montana	35	0.092
Pennsylvania	36	0.091
Connecticut	37	0.091
New Hampshire ****	38	0.090
Vermont	39	0.087
Kansas	40	0.086

Hawaii	41	0.084
Louisiana	42	0.084
North Dakota	43	0.077
Idaho	44	0.076
West Virginia	45	0.072
Nebraska	46	0.069
Massachusetts	47	0.064
Wyoming	48	0.061
North Carolina	49	0.056
South Dakota	50	0.055
Maine	51	0.038

* Source: Adapted from Insurance Research Council (1999).

** Texas's estimate is from 1994.

*** Uninsured motorists claimants are not required to demonstrate their injury is serious, such as when the injury surpasses the no-fault threshold in order to collect benefits, while bodily-injury claimants must demonstrate the injury is serious.

**** Financial Responsibility only.

4. Instability of the Estimates.

A feature of IRC's method is the volatility of some of its results. For example, AIRAC's estimates for Minnesota show that in 1984, 15.8% of Minnesota's motorists were uninsured. That percentage jumps to 19.5% in 1985, and then drops to 15.3% in 1986 (AIRAC 1989). These gyrations are hard to understand. We get no clue from AIRAC as to why this happens.

A similar problem occurs with some of IRC's updated calculations when compared to the earlier calculations. The ratios for Texas, Virginia, and North Carolina are plotted in Figure III.1. The ratios for 1981-1986 come from AIRAC (1989). The ratios for 1989-1995 come from IRC (1999). The updated series for North Carolina appear to be consistent with the older series; this is not the case with Texas and Virginia. In Texas, there is a 56% increase in the proportion of uninsured motorists between 1986 and 1989. There is a 28% jump in the same period for Virginia. It is difficult to believe that such sudden breaks did indeed take place. Similar remarks apply to the erratic behavior of Virginia's ratio between 1989-1991.

D. Sampling Surveys of the Insurance Status of Automobiles Owned by Households.

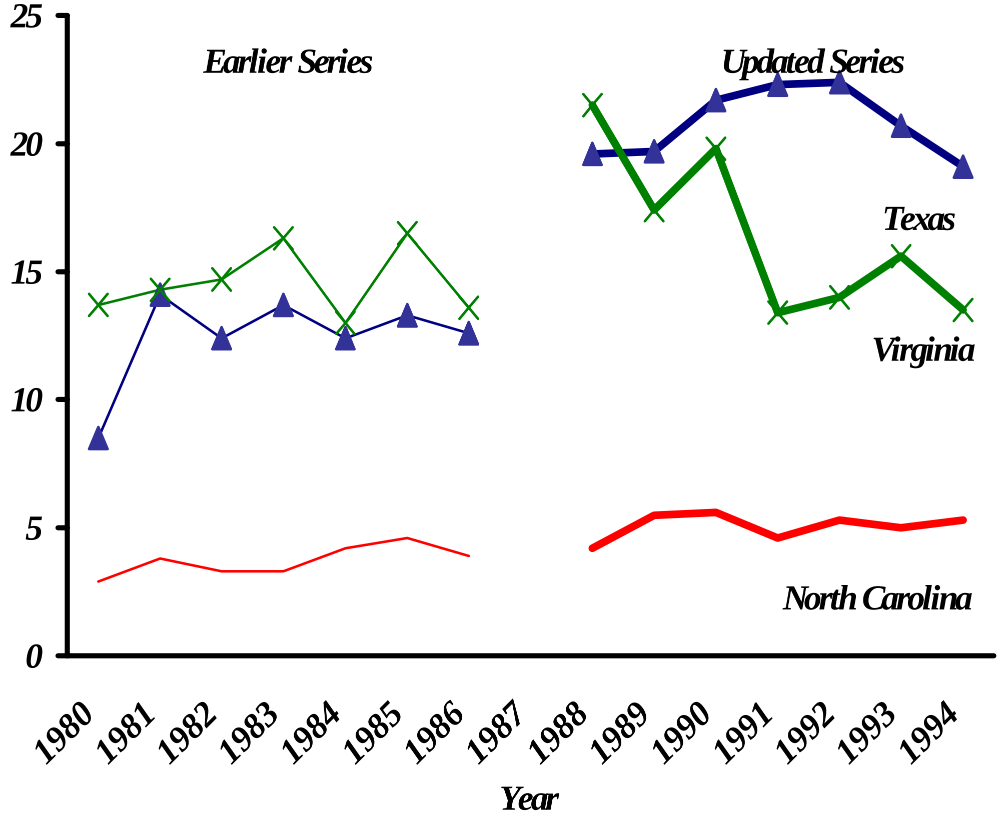
AIRAC, and subsequently IRC, conducted annual surveys in 1980-1994 and 1995-1996 to explore issues that affect the property and casualty insurance industry in the United States. The sample size of these surveys ranged from 1,000 to 2,000 households (IRC 1991,1995, 1996, 1997). The responses to these surveys, except for 1992 and 1993,[22] contain information on, among other things, the number of

[22] Discussion with Beth Sprinkel, Insurance Research Council

licensed vehicles owned by households, the number of such vehicles carrying no insurance, and the demographic profiles of the households that own the uninsured vehicles. The survey results are published in a series called Public Attitude Monitor (PAM).

Because of the stigma (and the illegality) attached to the ownership of uninsured vehicles, we expect

Figure III.1 All Industry Research Advisory Council and Insurance Research Council Estimates of Percent Uninsured Motorists



all PAM samples to be truncated samples. We expect the estimate of the percentage ownership of uninsured vehicles calculated from these samples to be biased downward. Also, by comparison with the results derived from IRC's ratio of UMC to BILC, they are likely to be much smaller (and that is generally the case). Table III.3 is an adaptation of results reported by AIRAC (1989) and IRC (1991, 1995, 1996, 1997 and 1999).

The table shows the percentage of households admitting ownership of one or more uninsured vehicles. Because of the fact that some households own a mix of insured and uninsured vehicles, the percentage of households owning uninsured vehicles tends to be higher than the percentage of uninsured vehicles (not shown).

The table shows that the percentage of sampled households owning uninsured vehicles has been in a downward trend through 1986. It stabilized in 1988 and 1989 at 8%. The declining percentages may be a reflection of increased awareness among owners of uninsured vehicles that violating mandatory insurance laws is socially unacceptable. To combat this bias, IRC used a different approach in the 1995 survey from the one used historically. Instead of asking the subjects whether they owned any uninsured vehicles, IRC first asked the subjects if they had any licensed vehicles. When the answer was in the affirmative, the subjects were then asked how satisfied they were with their insurance company. The result was a modest increase in the 1995 estimate of the percentage of households reporting ownership of uninsured vehicles – from 8% to 9%. This was followed by a doubling of the estimate to 17% in 1996, a halving to 9% in 1997, and back to an approximate doubling to 16% in 1998.

Table III.3 Percent of Households Reporting Ownership of Uninsured Vehicles in PAM Surveys.

Year	*Percentage of Households with Uninsured Vehicles*	*Year*	*Percentage of Households with Uninsured Vehicles*
1980	13%	1988	8%
1981	10%	1989	8%
1982	12%	1990	5%
1983	12%	1991	8%
1984	11%	1995	9%
1985	8%	1996	17%
1986	7%	1997	9%
1987	9%	1998	16%

Sources: For 1980-1989, the source is AIRAC (1989); for 1990-1991, IRC (1991); for 1995, IRC (1995); for 1996, IRC (1996), IRC (1997), and IRC (1999).

It is not clear what to make of these gyrations in the estimates. How much of the change is due to sampling variability and how much is due to the change in the way the question was posed? If 1995's results are any indication, the change in the method of posing the question may not have had a substantial effect on the propensity of the respondents to reveal their ownership of uninsured vehicles. Is it the case then that there was a major increase in the proportion of households owning uninsured vehicles in 1996? If so, why? What are the factors that caused such an increase? Why was it followed by a precipitous decline in 1997? And what caused it to double back in 1998? Could one reasonably expect the population of uninsured motorists to change so radically from one year to the next? IRC's work does not shed light on these questions.

E. Concluding Remarks

Numerous estimates of uninsured motorists, other than those we discussed in section III.1 – III.2 have been floating around for some time. Many are part of working documents of various organizations. Mostly, these estimates are fragmentary, and with very few exceptions, the methods used in deriving them are never spelled out. Generally, these estimates conflict with each other and with estimates from sources we discussed above. For example, the National Association of Insurance Commissioners reports 33% uninsured motorists in Rhode Island and 60% in New Mexico in the 1980's (NAIC 1989b). The corresponding percentages reported by the All Industry Research Advisory Council are 18% and 21%, respectively (AIRAC 1989). The Insurance Information Institute, on the other hand, put New Mexico's percentage at 50% for the same period (III 1997).

Even when the methods are documented and appear to be the same, the results often diverge. In the case of California, for example, DMV and California's Department of Insurance (CDI) report the same method of estimating the percentage of uninsured motorists. But the picture projected by the estimates of these two agencies is quite different. DMV reports a pronounced downward trend in the proportion of uninsured motorists in 1988-1990; CDI reports an upward trend for the same period.[23]

Our discussion of the available estimates and the methods used in generating these estimates is not exhaustive. Perhaps no discussion of this subject can be exhaustive. But whatever the case may be, it is clear that none of the available estimates are satisfactory.

What about the future? Of the four methods we discussed in this section, it appears the most promising is the database matching method. Hopefully it will be possible to derive these estimates on an ongoing basis, as is currently done in Utah, and adjust these estimates well enough to take into account the fleet of unregistered vehicles presently left out in database matching.

IV. Characteristics of Uninsured Motorists

AIRAC's data indicate that uninsured motorists are found in highest numbers in metropolitan areas of the states, and that the city tends to have a higher concentration of uninsured motorists than the remainder of the metropolitan area (AIRAC 1989). These results are confirmed by the results of state studies (e.g., Marowitz 1990). AIRAC's data also indicate that, in general, the rural states in the Northeast and North Central regions of the United States have a relatively small population of uninsured motorists (AIRAC 1989). IRC's more recent findings corroborate with these results. (IRC 1999).

It would be interesting to learn about the profile of the uninsured motorists. Unfortunately, most of what we know comes to us from truncated samples, such as samples for which knowledge of the independent variable (the profile of the uninsured motorist) is available only when the dependent variable (the uninsured motorist) is observed. In our case, the uninsured motorist's profile can be revealed only if the owner of the uninsured vehicle chooses to identify herself as such. Otherwise the results are biased. This is clearly a problem in sample surveys since some uninsured motorists may prefer not to identify themselves as such. The same is true when the information comes from DMV accident records or highway patrols' citations. We observe the profile of those uninsured motorists who were involved in an accident or those who were cited, not of the general population of uninsured motorists.

[23] DMV's estimates are 28.4%, 22.5%, 19.6% for 1988, 1989 and 1990, respectively. CDI's estimates for the same period are 25.6%, 26.2%, 27.8% (Marowitz 1990; CDI 1997).

Sometimes we can skirt the truncated sample problem by expressing the parameters we are interested in in terms of conditional probabilities. The hope is that this would yield an indirect expression that enables us to estimate parameters of interest without biasing our results. We did try this avenue. But as it turned out, the effort did not yield the hoped-for results. We report our results in the Appendix.

In the absence of a solution to this problem, we may just have to rely on the available data, at least for the time being, keeping in mind the limitations of any conclusions or results we derive based on these data.

A. Profile of the Uninsured Motorist

The characteristics that AIRAC's survey showed for those who reported owning one or more uninsured vehicles are listed in the first five rows of Table IV.1 below. However, as is the case with many other survey results, the characteristics reported in AIRAC's study are constrained by the type of questions AIRAC asked in its survey. Other uninsured motorist characteristics that emerged from studies other than AIRAC's are listed in the remainder of the Table.

The structure of the response reported in PAM (1996) is somewhat different from that shown in AIRAC (1989). Similarly, the information reported in PAM (1996) and in IRC (1999) is not as detailed as in AIRAC (1989). Nonetheless, the picture that emerges from these more recent studies is consistent with the broad outlines reported in the first five rows of Table IV.1.

Table IV.1 Profile of Uninsured Motorists

Age: Young	Motorists between 18-29 own 28% of registered vehicles and account for 52% of uninsured vehicles. Motorists 45 and over own 39% of registered vehicles and account for 13% of uninsured vehicles.
Education: Low	Motorists with less than a high school education own 17% of registered vehicles and account for 33% of uninsured vehicles. College grad or post grads own 23% of registered vehicles and account for 11% of uninsured vehicles.
Residence: Rent	Motorists renting residence own 26% of registered vehicles and account for 50% of uninsured vehicles. Motorists owning residence own 68% of registered vehicles, and account for 40% of uninsured vehicles.
Job Status: Unemployed/ Part-time	Unemployed Motorists own 17% of registered vehicles, and account for 33% of uninsured vehicles. Retired motorists own 14% of registered vehicles, and account for 5% of uninsured vehicles.
Personal Income: Low	Motorists with less than $7500 own 23% of registered vehicles and account for 40% of uninsured vehicles. Motorists with $20,000 or more own 34% of registered vehicles and account for 16% of uninsured vehicles.
Gender: Mostly Male	One estimate from California showed 70% of uninsured motorists are male.
Car Age: Old	One example from Texas showed 58% drive cars more than 10 years old.
Ethnicity: Minority	Percentage varies by state; minorities dominant in some states, such as California and Texas.
Driving Record: Evidence of Accident Proneness	In 1990, California's percentage of uninsured motorists was less than 28%; yet CHP data for 1988-89* show that 55.1-60.9% of fatal accidents, 44.6% of bodily injury accidents, and 34.1% of traffic citations involved uninsured motorists.

* Reported in Marowitz (1991), pp. 11, 15, 19.

Source: Compiled from AIRAC (1989); PAM (1996); Maril (1994); Kuan & Peck (1981); Stromberger (1991); Marowitz (1990).

A few observations follow on the estimates shown in Table IV.1 for gender and driving record, followed by a general comment:

1. Gender

There is a general agreement in almost all sources that male drivers make up the majority of the uninsured motorists.[24] But there is no agreement on the magnitudes involved. Table IV.1 reports that male drivers make up 70% of uninsured motorists. This is based on Kuan and Peck's estimates, which were derived from a large sample of 125,341 drivers whose licenses were suspended or revoked due to an accident in which they were found to be financially irresponsible. (Kuan and Peck 1981). We keep in mind though that these estimates suffer from self-selection bias, and hence may exaggerate the share of male drivers in the population of uninsured motorists. PAM's study (1996), which is subject to truncated-sample limitations, reports that the percentage of drivers who own one or more uninsured vehicles is 18% for males and 16% for females.

2. Driving Record

The insurance industry has argued in several forums that uninsured motorists tend to be involved in accidents more frequently than insured motorists and that these accidents tend to be more costly than accidents in which the insured motorists are involved (Wirth 1991; Kron 1991; Drawert 1991). The results we report in Table 1V.1 on driving records of uninsured motorists seem to confirm the industry's claim, at least for California. These results were extracted from Marowitz (1990) and Kuan and Peck (1981). These authors found that, compared to the average driver in California, the uninsured driver has a worse accident record and a much worse traffic conviction record, including major violations. Kuan and Peck point out that these results are strikingly similar to results obtained in a study undertaken earlier by California's DMV using 1967 data.[25]

[24] Maril's survey of 400 households in Maricopa County, Arizona, shows the opposite: females' ownership of uninsured vehicles is higher than males' among white non-Hispanics, Hispanics, and other minority groups included in his survey (Maril 1994). These results, however, are based on a very small group of respondents,38 households. Additionally, since Maril does not report the percentage breakdown of his sample by gender, it is not clear whether or not the higher ownership of uninsured vehicles by females is a reflection of the fact that females happen to make up the majority of the individuals included in his sample.

[25] Using data from the files of the Accident Records Bureau of the Texas Department of Public Safety, I calculated the percentage of uninsured motorists involved in fatal and non-fatal traffic accidents in Texas for 1987-1996. My purpose was to compare these percentages with that of uninsured motorists in Texas and determine the extent to which uninsured motorists in Texas tend to be disproportionately involved in accidents, as is the case in California. But due to the nature of the accident data maintained by Texas' Department of Public Safety, the calculation results could not confirm or refute conclusively the hypothesis that uninsured motorists in Texas tend to be as accident prone as in California.

Maril's study suggests the opposite. Maril reports that uninsured motorists tend to worry a great deal about not being insured. Hence they develop strategies both to avoid accidents and avoid being caught by the police (Maril 1994). However we cannot attach much weight to Maril's findings, because there were very few respondents to this part of his study.

There are other fragmentary references in the literature that depict uninsured motorists as safer drivers than insured motorists. But these are more in the nature of hearsay, rather than documented evidence based on empirical work. For example, in a testimony before the Texas Department of Insurance, Amy Johnson of the Office of Public Insurance Counsel argued that uninsured motorists are safe drivers because "State Rep. Renato Cuellar told us that he believed uninsured drivers in the Valley are the most careful drivers in the state..." (Johnson 1991).

To the extent that young male motorists indeed make up a substantial fraction of the uninsured motorists, as IRC's and Kuan and Peck's results suggest, it should not be surprising to find that uninsured motorists tend to be more involved in accidents than the rest of the population. In 1996, for example, the proportion of motorists in their early twenties who were involved in fatal accidents was more than twice as large as their share in the population (National Highway Traffic Safety Administration 1996).

3. General

Qualitatively, the results in Table IV.1 are consistent with a priori expectations. Moreover, we can find qualitative confirmation for some of these results from other findings that do not suffer from truncated-sample problems. For example, a study by California's Department of Insurance (1995) confirms the existence of an inverse relationship between average household income in postal districts and the percentage of households owning uninsured vehicles. This reinforces results shown in Table IV.1, that uninsured motorists tend to be low-income individuals. It also confirms indirectly the results for other socioeconomic variables shown in the first five rows of the table, as well as the results on car age and motorist ethnicity, because these tend to be correlated with income.

Other studies also confirm the qualitative nature of the results shown in Table IV.1, although these studies also suffer from truncated-sample problems. For example, Kuan and Peck (1981), confirm the existence of a strong inverse relationship between income and the number of uninsured motorists in California. So does Maril's survey in Maricopa county, Arizona (Maril 1994).

However while it is comforting to know that there is evidence to corroborate qualitatively the results in Table IV.1, we are still in the dark on how good are the magnitudes attached to some of these results. We do not know much, for example, about the tendency of older adults or upper-income individuals to falsify the insurance status of their vehicles – maybe out of a sense of pride or because of social pressure. If underreporting ownership of uninsured vehicles is more pronounced among older than younger adults, then not only is the 13% ownership of uninsured vehicles reported in Table IV.1 for older adults an underestimate, but so are the percentages reported for motorists with higher incomes and higher levels of education, motorists who own their homes, and retired motorists. The opposite would be true if the percentage of young uninsured motorists is underreported. Of course, it is quite likely that both younger adults as well as older adults included in IRC's survey did not disclose their ownership of uninsured vehicles. The bias this introduces in the magnitudes reported in Table IV.1 can go either way, depending on which group's underreporting of uninsured vehicles is more pronounced. Unfortunately, we have no extraneous information that will shed further light on these questions.

B. Why Are There Uninsured Motorists?

Several factors may explain why motorists drive without insurance. We discuss some of these in the following paragraphs. But what is sorely missing in the literature on uninsured motorists is a quantification of the effects of these factors. Some half-hearted efforts at quantification were made but these efforts hardly went beyond including two variables in a regression equation or estimating gross correlation coefficients between one factor (i.e., average income on one hand and percentage of uninsured motorists in a region on the other). To date, no model has been proposed in the literature that includes these factors simultaneously and attempts to quantify the contribution of each one of them to the likelihood that a motorist may choose to drive without insurance.

Clues pointing to the factors that explain why people drive without insurance can be garnered from Table IV.1 on the profile of the uninsured motorists. Prominent among these is a low socioeconomic status, which implies quite often very few assets to protect as well as a low ability to pay for much beyond the essentials. This has been found to be the case by several researchers (e.g., Maril 1994).

These background factors notwithstanding, perhaps the biggest villain in the creation of the uninsured motorist problem is the rigidity of the current method of pricing the insurance service. Without it, it is doubtful that the uninsured motorist problem would have reached the proportions it has reached to day. The generally weak enforcement of mandatory laws aggravates the problem further. Let me explain.

Inner cities, where most uninsured motorists reside, have the highest insurance rates. But what makes those rates particularly unbearable is the fact that they cannot be broken up and the payment is totally unrelated to the motorist's ability to pay. The motorist cannot buy only what she can afford to pay for. She cannot fit the services to her particular situation. She either pays for the full insurance, regardless of whether or not she needs it all, or else goes uninsured. Nothing in between. Under the current regime, you cannot regulate the expenditure on insurance by, for example, limiting your car use only to the essential, in the same way you regulate the amount of food you buy to make your food expenses fit your budget. It is as if you either find the money to buy all the food in the grocery store or go without food. Nothing in between.

The sacrifice the current insurance pricing method imposes on the motorist is thus made unnecessarily onerous by the inflexibility of the method used by the insurance companies in pricing the service, such as requiring the mandatory insurance to be acquired in one huge block and not in any affordable increments tied, for example, to the extent of car use. [26] This puts the insurance payment beyond the reach of a larger segment of the population than otherwise would have been the case. In a recent IRC survey, 41% of the respondents owning an uninsured vehicle said they did not insure because the premium was too high (IRC 1999).

[26] Khazzoom addresses the issues associated with the implementation of a pay-at-the-pump insurance, as a way of dealing with this problem (Khazzoom 1999).

Lax enforcement makes matters worse. It reduces the probability of being caught and increases the likelihood that a motorist will drive without insurance (NAIC 1989a). When the fine for driving without insurance is $100, and when the probability of being caught driving with no insurance is 0.05, the expected opportunity cost of driving without insurance is $5 ($100 x 0.05). Juxtaposed against the $800 or more an inner city motorist has to pay to be in compliance, it is not too difficult to see in what direction the pull will be for the low wealth individual, the unemployed worker, or the low income young motorist. The nature of the penalty also matters. If the penalty for driving without insurance is of a type that involves, for example, impounding the car or revoking the driver's license, the opportunity cost would have been higher, and most likely the number of uninsured motorists would have been smaller.[27] Evidence suggests that by increasing the probability of being discovered, database matching has brought about a reduction in the percentage of uninsured vehicles, at least in states for which we have data. For example, in Utah the percentage of uninsured vehicles dropped from 17.5% in January 1996 to 11.9% in April 1997 (Hunter 1997). In 1998 Utah's bill SB 6 allowed the revocation of registration upon conviction for no insurance and raised the minimum fine for no insurance (Utah Driver License Division 1999). In the meantime, database matching and identification of the uninsured vehicles continued on a monthly basis. By February 1999, the percentage of uninsured vehicles dropped to 10% (Utah State Tax Commission 1999).

Unavailability of public transportation may very well be an important reason for the existence of uninsured motorists. Intuitively, we would expect the availability of public transportation to reduce the propensity of taking a risk by driving uninsured. Unfortunately, no empirical study has been done to shed light on this question.

Lack of awareness of the existence of the mandatory laws may be a contributing factor. For example, Maril found that one tenth of the respondents to his questionnaire in Maricopa County, Arizona who said they owned an uninsured vehicle were unaware there was a law requiring them to insure their vehicles (Maril 1994). Maril's sample included a substantial component of aliens and non-English-speaking respondents.

Finally, we learn from the respondents to IRC's 1995 PAM that transitional factors may account for the reason why a substantial minority of uninsured motorists chooses not to insure their vehicle. These include: vehicle is not in operating condition (24% of those who said they own an uninsured vehicle), vehicle runs but it is not being used (17%), vehicle will soon be sold (2%). Other factors may be more permanent in nature and overlap with some of the factors we discussed, such as: car is too old, not worth insuring (2%); car does not need insurance (2%); company canceled, or company or agent refused to write (4%); other (8%). (PAM 1995).

Unfortunately, we do not know how much faith to put in the magnitudes reported in these surveys.

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[27] In a survey of departments of motor vehicles in thirty-two states, the respondents were asked to rate the success of various measures in reducing the number of uninsured motorists. The highest measure rate was attributed to driver license suspension and revocation (IRC 1999).

Appendix: Dealing with the Problem of Truncated Samples

Consider, for example, the case in which we are given the proportion of young drivers, calculated from an extremely large sample of motorists stopped by highway patrol for one infraction or another and found to be uninsured. Let Y, U, and S denote a young motorist, uninsured motorist, and motorist stopped by the police, respectively. What we would like to know is the probability that a motorist picked randomly from the population of uninsured motorists will be a young motorist. That is, we want the conditional probability P(Y|U)--where | indicates conditioning--that the person picked out is a young driver, given that she is an uninsured motorist. Instead, what the available sample results give is an estimate of P(Y|SU), the probability that the motorist is young, given that she was stopped and found to be uninsured.

Sometimes we can skirt the truncated-sample problem by rewriting the expression we are after in terms of other conditional probabilities. The hope is that this may yield an expression that enables us to estimate the parameter we are interested in without biasing our estimates. Consider P(YUS), the probability of the joint event that a motorist is young, uninsured, and stopped by the police. We can express this joint probability in terms of the following conditional probabilities:

$$P\,(YUS) = P\,(Y|SU).\ P\,(U|S).\ P\,(S) = P\,(S|YU).\ P\,(Y|U).\ P\,(U)$$

$$\Rightarrow \quad P\,(Y|U) = \{P\,(Y|SU).\ P\,(U|S).\ P\,(S)\} \;/\; \{P\,(S|YU).\ P\,(U)\} \qquad \text{(A.1)}$$

This equation gives us the expression for the probability P(Y|U) we are after, the probability that a person picked out is a young driver, given that she is an uninsured motorist.

But as it turns out, this still faces a stumbling block. Our sample result gives us an estimate of the first term in the numerator of (A.1), P(Y|SU) or the proportion of young motorists among those who were stopped and found uninsured. An estimate for the second term in the numerator, P(U|S) or the proportion of uninsured motorists among those stopped by the police, should be available from police records. The police may be able also to provide an estimate of P(S), the proportion of motorists stopped by the police for an infraction, that may be subjective but would hopefully be well-founded. Suppose we can also get a value for P(U) that appears in the denominator from database matching that makes proper allowance for unregistered vehicles. We would still need the proportion of motorists stopped by the police from among those who are young and uninsured motorists, a factor needed to estimate P(S|YU) which appears in the denominator. But any survey or interview that attempts to elicit the information necessary to estimate this probability will face the same truncated-sample problem we started with, so long as some young uninsured motorists stopped by the police chooses not to disclose that they are uninsured.

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