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Pay-As-You-Drive Pricing For Insurance Affordability

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Summary
This paper describes how Pay-As-You-Drive (PAYD) pricing can increase vehicle insurance affordability. With conventional pricing, motorists pay a fixed premium for unlimited mileage coverage. PAYD charges premiums by the vehicle-mile, so a lower-risk driver pays 2-4¢ per mile and a higher-risk driver pays 10-20¢ per mile. This lets motorists save money by reducing their mileage, and tends to benefit lower-income motorists. Pay-As-You-Drive can be a consumer option, so motorists select the rate structure they prefer.

PAYD redefines the concept of insurance affordability and offers a new approach to reducing uninsured driving. Currently, "insurance affordability" means that even high-risk, lower-income motorists can afford unlimited-mileage coverage. High risk drivers have more than ten times the claims as lower-risk drivers, and so their premiums should be more than ten times higher, but this is considered *unaffordable*. The conventional solution forces lower-risk motorists to cross-subsidize higher-risk motorists, which is unfair and encourages high-risk driving. PAYD pricing redefines insurance affordability to mean that higher-risk drivers must limit their mileage to the amount of risk exposure they can afford. This reduces high risk driving and accidents, reducing crash costs rather than simply shifting costs between rate classes.

Pay-As-You-Drive pricing provides a variety of benefits. It reduces accidents, rather than simply shifting costs from one group to another. It can increase insurance affordability, reduce uninsured driving, and provide consumer savings. It makes premiums more accurately reflect the claim costs of each individual motorist, and rewards motorists who reduce their accident risk. Because it gives higher-risk motorists the greatest incentive to reduce their mileage, it can provide large safety benefits. It is also an effective strategy for reducing congestion, road and parking facility cost, energy consumption and pollution emissions. It is currently being tested by some insurance companies.

The Problem

Automobile insurance is a major consumer expense, costing an average household nearly $1,000 annually, representing 2% of household expenses, as indicated in Table 1.

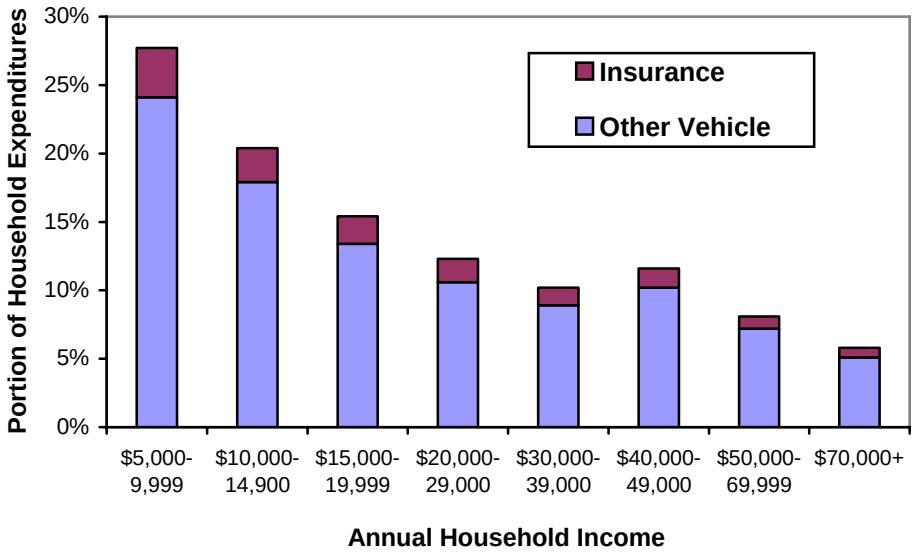
Table 1 **Vehicle Expenditures by Household Income** (BLS, 2002)

	Total	$5,000-9,999	$10,000-14,900	$15,000-19,999	$20,000-29,000	$30,000-39,000	$40,000-49,000	$50,000-69,999	$70,000+
Vehicles	2	0.9	1.2	1.4	1.6	2	2.1	2.5	2.9
Total Expenditures	$42,557	$16,488	$20,918	$25,015	$28,836	$35,095	$35,095	$50,406	$76,627
Vehicle Expenses	$7,580	$2,433	$3,786	$4,576	$5,044	$6,777	$8,269	$10,084	$12,653
Vehicle Insurance	*$920*	*$319*	*$461*	*$586*	*$707*	*$877*	*$1,024*	*$1,160*	*$1,465*

This table shows vehicle and vehicle insurance expenditures by household income.

These average values understate the large financial burden vehicle insurance places on many financially struggling households. Younger, and inexperienced drivers, and residents of lower-income neighborhoods tend to pay particularly high rates despite their low incomes. Low-income vehicle-owning households devote about five times the portion of their household budget to vehicle insurance as high-income households.

Figure 1 **Vehicle Expenditures by Vehicle-Owning Households** (BLS, 2002)[1]



This graph illustrates vehicle insurance and other vehicle expenses as a portion of total expenditures for vehicle-owing households by income class. Lower-income households devote a far greater portion of their budget to insurance than higher-income households.

[1] These values assume that *all* vehicle expenditures in each income class are borne by vehicle owning households. This somewhat overstates the financial burden on vehicle-owning households, since a portion of these costs are actually borne by zero-vehicle households (i.e., households that do not own an automobile), for example, when they borrow or rent a car. On the other hand, some vehicle costs are not included in these values, particularly residential parking costs, which average hundreds of dollars annually and are borne by both vehicle owning and zero-vehicle households, so an even greater portion of household expenditures are devoted to motor vehicles than indicated in this figure.

An older vehicle can often be purchased for just a few hundred dollars and annual operating costs can be minimized if it is driven low annual mileage. However, there are few options for reducing insurance costs. For many lower income households, insurance is by far the largest cost of driving, or the reason they cannot afford a vehicle.

With current insurance pricing, higher-risk, lower-income households face three options:

1. Spend a large portion of income on vehicle insurance.
2. Forego vehicle ownership, although this reduces economic and social opportunities.
3. Drive uninsured, although this is illegal in most jurisdictions.

As a result, many lower-income motorists drive uninsured. Various studies indicate that 10-35% of vehicles are uninsured, and this increases to more than 50% in some lower-income communities (Hunstad, 1999; also see uninsured vehicle reports produced by many state insurance commissioners, which can be found by an Internet search of the words “uninsured” “motorist” and “report”). This creates significant financial and legal problems both for the motorists who drive uninsured, and other road users, who must bear the costs of uninsured accidents.

In lower-income communities this creates a spiral of rising premium rates, declining insurance affordability, an increasing portion of uninsured vehicles, and increasing claims per insured vehicle. Motorists in these areas are labeled “high risk,” although their risk per mile driven is actually no greater than average (Butler, 2000).

These problems are severe because for many people the ability to drive is necessary for important activities such as education, employment, and medical services. Lower-income therefore needs to be able to drive for at least some travel.

Conventional insurance pricing also creates problems for middle-income drivers who face high costs for insuring an extra vehicle, such as an old truck used for errands or a recreational vehicle that is only driven a few hundred miles each year.

Conventional Solutions

Insurance unaffordability is recognized as a significant problem and various solutions have been proposed. These tend to fall into three major categories:

1. Reduce insurance overhead costs, such as using regulations to limit insurance company profits, encouraging competition in the vehicle insurance market, and establishing no-fault coverages to reduce legal expenses. However, potential savings are limited and they also create problems. For example, limiting insurer profits may reduce competition, and no-fault coverage leaves many accident victims unsatisfied with their compensation.
2. Reduce compensation rates, such as limiting accident victim's ability to sue for compensation, particularly "non-economic" losses such as pain and suffering. This also leaves many accident victims unsatisfied with their compensation.
3. Rely on cross-subsidies from lower-risk to higher-risk motorists. This is the most common solution to insurance inaffordability, although it is not widely recognized because it is hidden in regulatory rules and resulting rate structures. Higher-risk motorist categories tend to have an order of magnitude higher claims rates than lower-risk categories but premiums fail to reflect this range. A lower-risk category might average $300 annually in claim costs, and a higher-risk category might average $3,000 annually, higher-risk premiums are reduced to "only" $1,500, and lower-risk premiums are increased to $500 for "affordability" sake. Although the higher-risk premiums hardly seem affordable, they are actually lower than what is required to cover claim costs.

Each of these solutions has been tried, but they all have limited potential and they create other significant problems. In particular, both reducing compensation rates and increasing cross-subsidies involve a tradeoff between affordability and efficient pricing, a no-win proposition. According to a fundamental economic principle, consumers should bear the costs they impose and capture the savings that result when they reduce costs. With regard to vehicle insurance, motorists should pay more whenever they increase the risk of causing a crash and insurance claim, and pay less if they reduce their risks. With conventional solutions, efforts to increase insurance affordability inevitably require underpricing true costs, reducing motorists' incentive to minimize risk.

Redefining The Problem

Insurance affordability currently means that even higher-risk, lower-income motorists can afford to purchase unlimited-mileage vehicle insurance coverage. Redefining the problem allows new solutions.

Current insurance pricing is like an all-you-can-eat restaurant, policies cover unlimited miles driven and therefore unlimited risk exposure. Like an all-you-can-eat restaurant, this encourages consumption, requires higher prices, and is unfair for people with modest appetites. All-you-can-eat pricing is great for gluttons, but bad for people on a limited diet or budget. Most people would agree that charging a flat fee for an unlimited supply of household electricity, vehicle fuel, or groceries would be unfair and encourages wasteful consumption, and so is undesirable.

An alternative insurance pricing option is called Pay-As-You-Drive, which means that a vehicle's insurance premiums are based directly on how much it is driven. This redefines insurance affordability to mean that drivers limit their mileage to the risk they can afford.

There is nothing radical or difficult about consumption-based pricing. Most goods are sold by the pound, gallon, minute, mile, or some other unit. Some goods that previously had fixed prices are sifting to variable pricing, such as the increasingly common practice of metering water. PAYD is already being tested by some insurance companies. The specific details of PAYD insurance pricing is described in the next section.

What would be the consequences if gasoline were sold like vehicle insurance?
With gasoline sold by the car-year, vehicle owners would make one annual advance payment which allows them to draw gasoline unrestricted at a company's fuel stations. Prices would be based on the average cost of supplying gasoline to similar motorists.

Unmetered fuel would cause a spiral of increased fuel consumption, mileage, and overall vehicle costs, including externalities such as accident risk, congestion, and pollution. Motorists who use less fuel than average would find this unfair and unaffordable, and so would drop out of the system, but those who use more fuel than average would defend it because they enjoy benefits.

Such a system would be irrational. It is comparable to current insurance pricing.

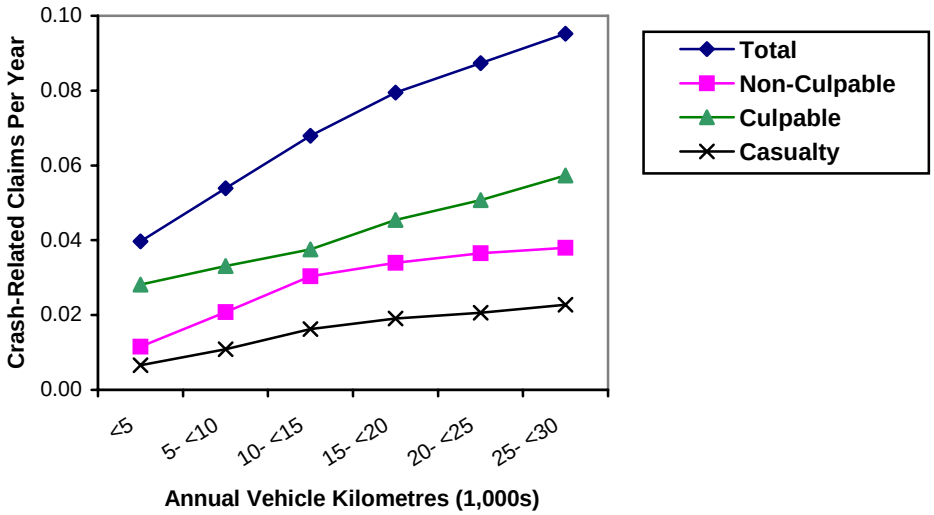
Description of PAYD

Pay-As-You-Drive Insurance (also called *Distance-Based Vehicle Insurance*, *Mileage-Based Insurance* and *Per-Mile Premiums*) changes vehicle insurance from a fixed cost into a variable cost by prorating premiums by mileage. The more you drive the more you pay and the less you drive the more you save. This is done by changing the unit of exposure (i.e., how premiums are measured) from the vehicle-year to the vehicle-mile or vehicle-kilometer. Existing rating factors are incorporated so higher-risk motorists pay more per unit than lower-risk drivers. For example, a $250 annual premium becomes 2¢ per mile, and a $2,000 annual premium becomes 16¢ per mile. An average motorist would pay about 4¢ per mile. PAYD can be optional, so motorists would choose their rate structure, just as consumers choose rate structures for telephone and Internet service.

Motorists who continue their current mileage would be no worse off on average then they are now, while those who reduce their mileage save money. Pay-As-You-Drive pricing can help achieve several public policy goals including fairness, affordability, road safety, consumer savings and choice. It helps reduce traffic congestion, road and parking facility cost savings, and environmental impacts. It can particularly benefit lower-income drivers.

Pay-As-You-Drive insurance reflects the principle that prices should be based on costs. Research indicates that within existing price categories, annual claims increase with annual vehicle mileage, as illustrated in Figure 2. Mileage is just one of several factors that affect crash rates. It would not improve actuarial accuracy (i.e., how well prices reflect insurance costs for each type of vehicle) to use mileage *instead* of other rating factors, for example, to charge all motorists the same per-mile insurance fee, but accuracy improves significantly if annual mileage is incorporated *in addition* to existing rate factors. Any other price structure overcharges low-mileage motorists and undercharges high-mileage motorists within each rate class.

Figure 2 **Crash Rates by Annual Vehicle Mileage** (Litman 2001)



Crashes per vehicle tend to increase with annual mileage.

How It Is Implemented

Pay-As-You-Drive pricing is implemented by individual insurance companies, although legal or administrative changes may be needed to remove regulatory barriers. States can implement legislation to encourage insurers to offer Pay-As-You-Drive pricing, and public-private projects can help pilot and promote this pricing option, as described in the case studies section below.

There are several possible ways to collect mileage-based premiums. One is to have motorists prepay for the miles they expect to drive during the term of coverage (typically a year), either in a lump sum or in several payments. For example, some motorists might pay for 12,000 miles at the start of the term, while others might pay for just 5,000 miles at first and make additional payments as needed. The total premium is calculated at the end of the term based on recorded mileage. Vehicle owners pay any outstanding balance or are credited for unused miles.

Pay-As-You-Drive pricing requires verified mileage data. This can be collected in various ways. The simplest approach is to have brokers or vehicle owners report odometer readings, with random verification spot checks. Another approach is to require odometer audits as described below, which could provide data as accurate as other metered goods (such as electricity) with minimal extra cost. The most sophisticated (and costly) approach is to use automated mileage reporting systems, such as those currently being tested by OnStar in the U.S. and Norwich Union in the U.K.

Odometer Audits

Odometer audits involve the collection of odometer data by a certified business. An odometer audit requires five steps:

1. Check speedometer and instrument cluster for indications of tampering.
2. Record tire size and check that it is within the specified range.
3. Attach a small seal to the ends of mechanical odometer cables to indicate if it has been removed. This is unnecessary on most newer vehicles with electronic speedometers.
4. Check odometer accuracy and calibrate with a dynamometer (this step is optional, or could be performed on a spot-check basis).
5. Record odometer reading and forward results to the vehicle licensing agency.

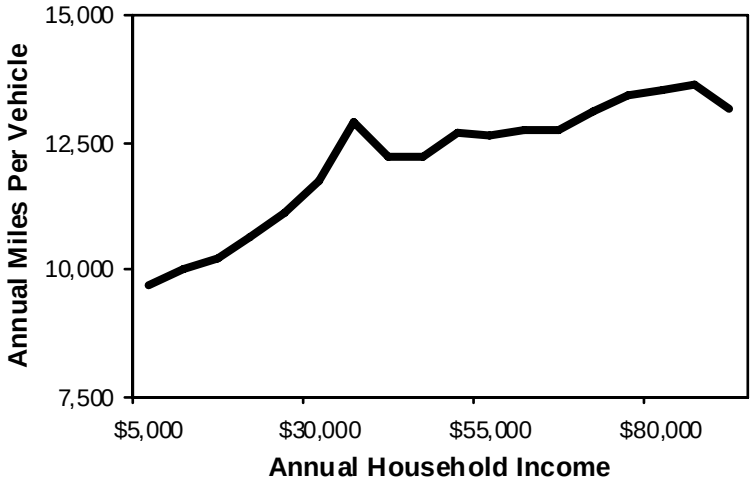
Odometer audits would be performed when a vehicle's insurance is renewed, in most cases once a year. Odometer audits typically require 5 to 10 minutes, and less if performed with other vehicle servicing (tune ups, emission inspections, etc.), with an incremental cost of $5 to $10 (assuming chargeout rates of $60 per hour). Existing vehicle service businesses and emission inspection stations could be certified as auditors, and some insurance agencies might offer free audits as a marketing strategy. Auditors could be certified by a government agency, as with other types of public services, or by individual insurance companies or insurance professional organizations.

Impacts on Lower Income Motorists

Pay-As-You-Drive pricing benefits lower-income motorists in several ways. Lower-income motorists tend to drive their vehicles significantly less than average and so would save money directly. In addition, they tend to place a high value on financial savings and so are likely to respond to PAYD by reducing mileage and capturing additional savings. Low income motorists are most likely to drive less in response to high gas prices, PAYD provides additional savings for each mile not driven due to high gas prices. PAYD makes insuring a vehicle more affordable, allowing some lower-income households to own a vehicle (providing basic mobility), or to insure the vehicles they own (reducing legal and financial risks).

Figure 3 shows the lower annual mileage of vehicles owned by lower-income households, and with PAYD pricing lower-income households are likely to reduce their annual mileage further (also see Rice, 2008).

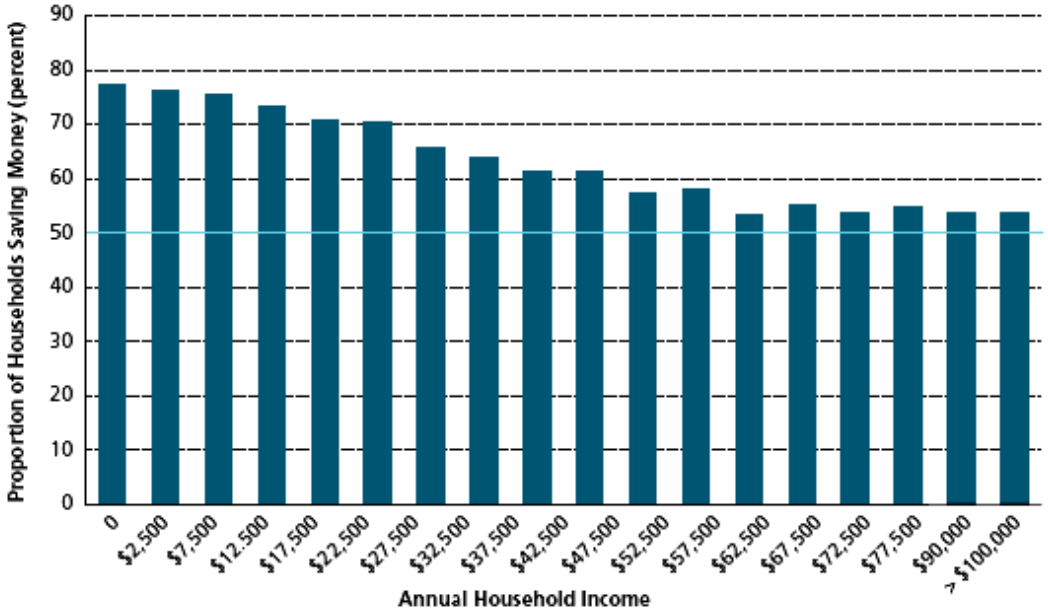
Figure 3 **Average Annual Vehicle Mileage By Income** (NPTS, 1998)



Per-vehicle travel increases with income.

Figure 4 illustrates the projected direct financial impacts of PAYD pricing based on current mileage, actual savings are likely to be greater because most motorists (particularly those with lower incomes) would reduce their annual mileage, and therefore claim costs. The lowest income classes tend to save the largest amounts in both total dollars and percentage of income, while wealthier motorists who pay more under PAYD pay a small additional percentage of their income. Brookings' national study on PAYD shows that 2/3 of all households save an average of $270 per vehicle (Bordoff and Noel, 2008). Although low mileage and low income motorists save the most, a majority of households in every income category save some money.

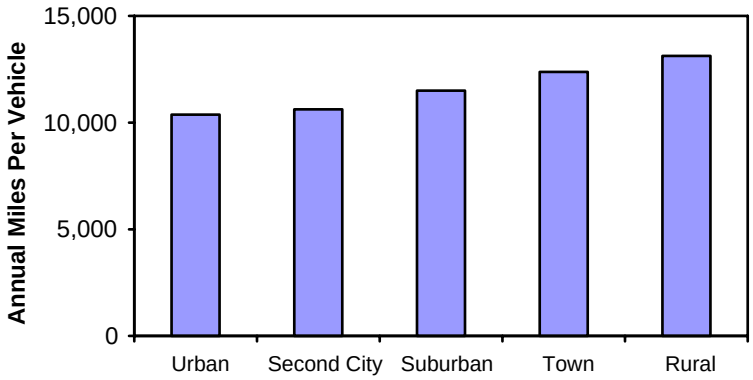
Figure 4 **PAYD Household Savings By Income Class** (Bordoff and Noel, 2008)



Lower income classes tend to save money with PAYD pricing, since they tend to drive lower annual mileage, while higher income classes that pay more bear a small increase relative to their income.

A common concern with PAYD is that low-income motorists with long commutes could pay more. However, the number of low-income motorists who drive a vehicle more than 15,000 annual miles (the level at which a premiums are noticeably higher) is very small, since this requires thousands of dollars in vehicle and fuel expenses. PAYD pricing is based on total annual mileage per vehicle, not commute length. Commute travel is only a fraction of total household travel, representing only about a quarter of total annual miles traveled. With PAYD, only motorists who drive more than average for their rate group when faced with this price structure would pay noticeably more. This would be more than about 12,000 annual miles for urban residents and more than about 14,000 annual miles for rural residents, as indicated in Figure 5.

Figure 5 **Average Annual Miles by Geographic Location** (NPTS, 1998)



Average per-vehicle mileage is higher for residents in lower-density areas.

PAYD provides an important new option to workers with lower-income or uncertain employment prospects. To illustrate this, consider the options currently available to somebody just entering the workforce, who may be able to afford a car, but not the $1,500 insurance premium imposed on motorists with no driving history living in an area with high insurance rates. With a $7.50 hourly income insurance consumes more than their first month's income. Similarly, consider the situation of workers who lose their jobs and so reduce their vehicle use. With current pricing, they continue paying the same vehicle insurance premiums, although both their income and chance of an insurance claim decline. They may find insurance costs a major financial burden, and so face the prospect of driving uninsured, or giving up their car and the employment opportunities it provides. With PAYD, unemployed workers pay lower premiums and so can afford to keep a car for essential trips, job searches, and future employment options.

Under most proposals, PAYD would be a consumer option, so motorists would choose between unlimited-mileage and per-mile premiums, just as consumers can now choose among various telephone and internet service rate packages. Motorists would therefore choose PAYD only if they save money. Eventually, as more lower-mileage motorists choose this option rates for unlimited-mileage insurance would need to increase, since it would lose the cross subsidies that higher-mileage motorists currently receive to keep their premiums lower. As a result, over time the annual mileage point at which it is cost-effective to choose PAYD would increase, and more of the market should shift over, but that change should be slow and predicable.

Although some lower-income motorists may end up paying more with PAYD, a much greater number (probably ten times as many) would save money, including those who currently drive less than average in their rate class, and those who drive somewhat more but who would reduce their annual mileage if offered this incentive. Lower-income motorists tend to be price sensitive, and so are likely to reduce their mileage by 10-30%.

PAYD would help address the problem of uninsured vehicles and the spiraling insurance rates in lower-income communities. As explained by Butler (2000),

> "Compulsory insurance seems to work in upper-income zip codes where most people can afford to keep insurance on cars driven less than average. Because these cars cost insurers proportionately less in claims, they bring in extra profits and insurers privately call landing their business "skimming the cream." Insurers use extra profits from "cream" customers to compete by holding car insurance prices down for their preferred customers who have many other insurance needs. Customers typically skimmed and overcharged are those who commute by carpool, bus or bicycle, and also women, older people, and households with more cars than drivers.
>
> In low income zip codes, insurers redline many cars to higher "nonstandard" prices—not because their drivers are less careful, as insurers encourage everyone to believe—but because of the scarcity of "cream" to hold prices down. What really happens is that miles, costs, and insurance prices (per car) spiral up where high insurance cost and strong enforcement increase the incentive for ever more drivers to share fewer insured cars."

Equity Impacts

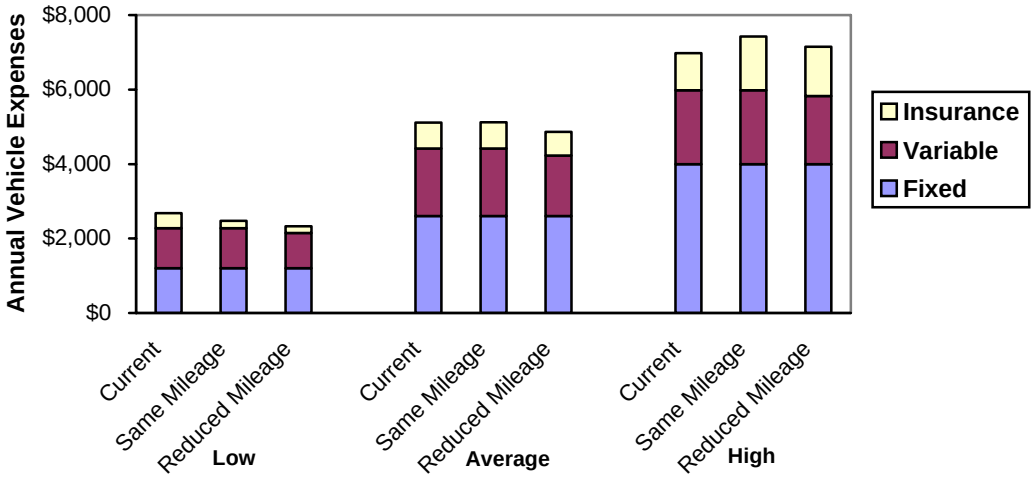
Current vehicle insurance pricing significantly overcharges motorists who drive their vehicles less than average each year, and undercharges those who drive more than average within each price class (Edlin, 2003; Litman, 2001). PAYD is fairer than current pricing because prices more accurately reflect insurance costs.

By redefining the concept of insurance affordability, Pay-As-You-Drive allows more actuarially accurate pricing. With current unlimited-mileage pricing, premiums for higher-risk motorists appear unreasonably high, considering that driving is virtually a necessity for most people. Most jurisdictions have decided that it is unacceptable to charge higher-risk drivers actuarially-accurate premiums of $3,000 to $5,000 annually, so they require insurers to serve such drivers at a lower rate, based on cross-subsidies from lower-risk drivers. With PAYD, it may be more acceptable to charge actuarially-accurate premiums, such as 25-35¢ per mile, since they individually can reduce their costs to an affordable level by reducing their mileage.

Since lower-income motorists drive their vehicles significantly less on average than higher-income motorists, current pricing is regressive. PAYD pricing benefits lower-income drivers who otherwise might be unable to afford vehicle insurance, and who place a high value on the opportunity to save money by reducing vehicle mileage. It benefits lower income communities that currently have unaffordably high insurance rates.

Figure 6 illustrates the financial impacts of PAYD pricing on different types of motorists. A low-cost, low-mile vehicle owned by a low-income motorist might save $225, an 8.4% reduction in total vehicle expenses. An average motorist saves $64 annually in insurance costs if vehicle travel declines 10% as expected. A high-mileage motorist pays $331 more per year, a 4.7% increase in total vehicle expenses.

Figure 6 **Current and PAYD Premiums Annual Costs Compared**



This figure compares the costs of Usage-Based Premiums for Low, Average and High mileage vehicles. "Current" refers to vehicles with fixed-price insurance. "Same Mileage" refers to vehicles with Usage-Based Premiums that do not reduce annual mileage. "Reduced Mileage" assumes a 10% reduction.

Travel Impacts

Pay-As-You-Drive insurance averages about 4¢ per mile. This is equivalent to an 80¢ per gallon increase in the price of fuel, but it is not a new fee at all, simply a different way to pay an existing vehicle charge. Based on various studies of motorist responses to financial incentives, this price structure estimated to reduce vehicle travel by 10% or more. Higher-risk motorists would pay larger per-mile premiums and so would have a greater incentive to reduce mileage. For example, a high-risk motorist who currently pays $2,000 annually for unlimited-mileage insurance would pay 16¢ per mile, and so could be expected to reduce their mileage by 30-40%, providing comparable reductions in risk.

Some people wonder whether motorists really can reduce their mileage, particularly lower-income motorists who use their vehicles for commuting or businesses travel. But commuting represents only about a quarter of total vehicle mileage. Given a modest financial incentive most motorists can reduce their mileage, either because the trips themselves are of marginal value (such as driving across town to save a few dollars on a purchase) or because other travel options are available, such as cycling, ridesharing, or transit. Experience with parking fees, optional parking cash out and road tolls indicates that motorists response to financial incentives (“Transportation Elasticities,” VTPI, 2004). Insurance for vehicles used for business is already priced based on their relatively high mileage, and so drivers of such vehicles would not necessarily pay more than they do now.

Optional Pay-As-You-Drive Insurance is likely to attract 25-50% of policies during the first few years, with penetration increasing over time as it become more competitive compared with vehicle-year pricing. Total travel impacts depend on how widely it is available and how well it is promoted.

Benefits

Pay-As-You-Drive Insurance can provide the following benefits:

- *Increased affordability*. Pay-As-You-Drive pricing vehicle insurance more affordable. It allows more lower-income households to insure a vehicle, and makes it more cost effective for households of any income class to insure an extra vehicle that is seldom driven, such as an old truck used for errands or a recreational vehicle.

- *Consumer savings*. The average motorist is predicted to save $50-100 per vehicle. These savings represent the reductions in insurance compensation costs that are returned to individual motorists who reduce their driving, and therefore reduce their chance of having a crash. These are true cost savings, not just economic transfers.

- *Increased safety*. Vehicle crashes should decline even more than mileage (a 10% mileage reduction is predicted to reduce crashes by 12-15%) because higher-risk motorists (who currently pay high premiums per vehicle-year) would pay higher per-mile fees, and would therefore have the greatest incentive to reduce their driving. If implemented throughout the U.S., this would save about 5,000 lives a year, and prevent a much larger number of disabilities and injuries.

- *Increased fairness.* Current insurance pricing overcharges motorists who drive less than average and undercharge those who drive more than average each year in a price category.

- *Progressive.* Since lower-income motorists tend to drive less than average, current insurance pricing is regressive. It forces lower-income motorists on average to subsidize the insurance costs of higher-income motorists. Butler (2000) argues that current insurance pricing results in extremely high premiums in lower-income areas (since a greater portion of low-mileage motorists drive uninsured which reduces funds to cross-subsidize higher-mileage motorists), a problem that can be corrected by PAYD pricing.

- *Reduced Uninsured Driving.* PAYD pricing makes insurance more affordable, which can help reduce uninsured driving. Surveys indicate that most uninsured drivers would pay for insurance if it were more affordable.

- *Reduced Need for Cross-Subsidies.* Pay-As-You-Drive pricing reduces the need to overcharge low-risk drivers in order to provide “affordable” unlimited-mileage insurance coverage to higher-risk motorists.

- *Reduced vehicle travel*. Pay-As-You-Drive Insurance is predicted to reduce vehicle travel by more than 10%, making this one of the most effective TDM strategies currently proposed. It reduces traffic congestion, road and parking facility costs, accident risk, pollution emissions, consumer costs, and urban sprawl.

- *Economic Efficiency*. Pay-As-You-Drive Insurance conveys to drivers the true costs they impose and allows motorists a chance to save money by reducing these costs. It reflects the principle that prices should reflect costs.

- *Emission reduction*. Distance-based fees would reduce energy consumption and pollution emissions.

Responses to Concerns About PAYD Insurance

This section discusses concerns that have been raised about PAYD pricing.

Insurance pricing already incorporates mileage.
Although some insurance companies incorporate mileage-related rate factors such as commute distance or estimated annual mileage, none begins to approach actuarially accurate, marginal pricing, and so fail to give motorists accurate price signals.

Mileage is less important in predicting crashes than other rating factors.
Whether mileage is more or less important than other risk factors is irrelevant for distance-based pricing options that incorporate existing rating factors (all except PATP). Until recently insurance companies had no reliable source of mileage data and so could not accurately determine the relationship between mileage and claims. Data based on independent odometer readings shows a strong relationship between mileage and claims within existing price categories.

Travel foregone could be lower risk than average, resulting in little crash reduction, and less insurance cost savings than reduced premium revenue.
This concern is technically valid, although there is no evidence that it is true. Available evidence indicates that broad vehicle travel reductions result in proportionally greater crash reductions and insurance savings. Additional research and pilot projects that test the effects of distance-based pricing could address this concern.

Distance-based insurance unfairly increases costs to high-mileage drivers.
Distance-based pricing would increase costs for motorists who drive significantly more than the current average within their price group. This is justified on actuarial grounds, and so increases fairness. Most motorists save money and experience net welfare gains with distance-based pricing, and very few would have their vehicle costs increase more than a few percent. Distance-based vehicle insurance benefits lower-income motorists to a significant degree overall.

Automobile insurance reform should focus on equity, affordability and safety.
Distance-based pricing helps achieve all of these goals. It increases equity by making premiums more actuarially accurate and reducing costs for lower income motorists. It allows motorists to save money and makes vehicle ownership more affordable. It significantly increases road safety.

Safety advances, congestion reduction, air pollution reduction and energy conservation can best be pursued in ways other than mileage-based insurance.
It is unnecessary to choose between distance-based pricing and other strategies. Distance-based pricing complements other strategies. Because of its multiple benefits, distance-based insurance can be one of the most cost-effective ways to achieve these objectives.

People need their cars too much to give them up. There will be no travel reduction.
Distance-based insurance is not expected to cause people to give up cars. In fact, by reducing fixed costs, vehicle ownership should increase slightly. There is extensive evidence that vehicle travel is affected by vehicle operating costs. A modest (5-15%) mileage reduction is predicted.

Consumers will not accept this change.
The Autograph pilot project, and market surveys indicate consumer demand for distance-based pricing. A broad range of interest groups support distance-based pricing. Support should increase as consumers and citizens learn more about its benefits.

Odometer fraud will be a major problem.
Although some odometer fraud may occur, it is expected to be a minor problem overall, with fraud rates comparable to other common consumer transactions, and far lower than with current insurance pricing. Odometers are increasingly tamper resistant, regular odometer auditing should discourage and identify most tampering, and the financial incentive for fraud is relatively low. Insurers financial exposure would be minimal since odometer fraud voids coverage.

It would increase administrative costs to insurers and inconvenience vehicle owners.
Odometer audits are significantly cheaper than vehicle emission inspections because they require less equipment and specialized training, can be performed in conjunction with other vehicle servicing, and can be provided by a large number of businesses in a competitive market. Total incremental costs are modest (predicted to be about $6 per vehicle year), and far smaller than direct benefits to consumers and society.

If distance-based pricing were better, insurance companies would already use it.
Individual insurers face several barriers to implementing distance-based pricing. An individual company faces relatively high administration costs to establish an odometer auditing system. Insurance regulators are often unsupportive of pricing innovations. An individual insurance company only captures a small portion of the total benefits, since most financial savings are passed back to customers or accrue to competitors. Insurers do not profit from reductions in uncompensated crash costs, congestion, infrastructure costs, or pollution, or benefit directly from increased equity.

Insurance companies currently maximize profits by maximizing their gross revenue, because they are dependent on investment income. A pricing strategy that reduces total crashes could reduce profits if regulators or market competition required a comparable reduction in premiums. Although there are potential financial and marketing benefits, these longer-term saving which would have to offset an individual insurer's short-term revenue losses and risks. It is therefore not surprising that few insurers have implemented distance-based pricing.

This type of pricing has never been used before.
Some vehicle insurance is already distance-based: rates for fleets and commercial vehicle coverage are often based on mileage, in addition to Progressive Insurance's Autograph coverage. There is nothing unique about pricing based on use. Prices for most goods are based on some measure of consumption, such as water and electric meters, and scales used to weigh food. Vehicle rentals and leases incorporate odometer-based price components. Vehicle insurance is unusual for having pricing that allows unlimited consumption (i.e., vehicle mileage).

Odometer auditing would be an invasion of privacy.
Odometer readings are already collected during vehicle servicing, vehicle sales and crash investigations. Odometer readings are even sold by private companies to used vehicle purchasers. Odometer auditing simply standardizes the collection of this information. Odometer auditing does not identify when or where a vehicle has been driven, or provide any other information that could be considered private. Odometer auditing would provide significant additional consumer benefits.

Examples and Case Studies

PAYD In Australia (www.payasyoudrive.com.au)

Starting in 2008, Real Insurance began offering *Pay-As-You-Drive* vehicle insurance in Australia. Motorists report their odometer reading at the beginning of the policy term and purchase a certain number of kilometers. Odometer readings are verified if there is a claim, giving motorists an incentive to be accurate (false readings void coverage). Any unused kilometers are either refunded if motorists cancel or don't renew (upon verification of vehicle odometers if requested by the company) or carried over to the next policy. If kilometers exceed prepayment the policy only provides basic coverage (liability, fire and theft). Policy holders can easily purchase additional kilometers at any time. This program was awarded Australia's Cheapest Car Insurance award by *Money Magazine*. A Magazine spokesperson said, "In these tough times consumers need to reduce costs wherever they can and shopping around for car insurance is a must. *Money Magazine* is pleased to be able to recognise and reward the best products and services – particularly at a time where it's so critical for consumers to rein in their spending."

Texas Per-Mile Insurance Legislation (www.capitol.state.tx.us)

Texas House Bill 45, passed in 2001, gives insurers permission to offer cents-per-mile pricing for vehicle insurance. Companies may begin offering this price option in January, 2002. It also requires insurance companies to separately track and report the claim losses and premium revenues for mileage-based and time-based premiums. Below is a press release by the Texas National Organization for Women, which lobbied for the bill. Various organizations in Texas are working together on a *Cents Per Mile For Car Insurance* campaign (www.centspermilenow.org) to promote Pay-As-You-Drive vehicle insurance.

California Department of Insurance PAYD (www.insurance.ca.gov)

After extensive public consultation the California Department of Insurance introduced a new, green auto insurance option available for California consumers not later than fall 2009. Pay-as-you-drive auto insurance is a way for motorists to more accurately pay for the coverage they need, by linking their premium more closely with the number of miles they drive. This incentive is intended to help reduce greenhouse gases and vehicle accidents.

"I am thrilled to pave the way for California drivers to obtain insurance that is more environmentally friendly and more accurately reflects driving habits," said Commissioner Poizner." As a strong advocate of healthy market competition and a healthy environment, I am especially pleased to encourage this kind of innovation and additional options for consumers."

Polis Direct Kilometre Policy (www.kilometerpolis.nl)

Polis Direct (www.polisdirect.nl), a major Dutch insurance company, began offering their 'Kilometre Policy' in November 2004. Per-kilometer premiums are calculated by dividing current premiums by the current policy's maximum annual kilometers, so a motorist who currently pays €500 for up to 20,000 kilometers would pay €0.025. Participants pay an "advance premium," which is 90% of their current premiums, so those who currently pay €500s under this system pay an advance premium of €450. At the end of the policy term motorists can receive a rebate of up to 50% of their premium for lower mileage, or pay up to 50% higher premiums if they drive more than the current maximum. Mileage data is collected during annual vehicle inspections, called the "national car card," and recorded in the national vehicle registration database. Participating motorists must be at least 24 years of age, have a car that sold new for less than €42,000 (Euro), and drive less than 40,000 kms annually.

General Motors and On-Star Offers PAYD Rates

GMAC Insurance and OnStar vehicle services have designed a new mileage discount program that will allow select OnStar subscribers to earn an extra discount based on the miles they drive. Initially, in 2004, this program is available in Arizona, Indiana, Illinois, and Pennsylvania with the intention of adding more in the near future. Service is limited to motorists who own a GM vehicle with On-Star service. The On-Star system will be used to automatically report vehicle odometer reading at the beginning and end of the policy term to verify vehicle mileage. Many motorists can save hundreds of dollars annually. Under the program, motorist who drive less than specified annual mileage will receive the following insurance premium discounts:

1-2,500 miles	40% discount
2,501-5,000 miles	33% discount
5,001- 7,500	28% discount
7,501-10,000	20% discount
10,001-12,500	11% discount
12,501-15,000	5% discount
15,001-99,999	0% discount

Oregon HB 3871 (www.oeconline.org/our-work/climate/transportation/payd)

Bill 2043 passed by the Oregon state legislature in June, 2003, provides $100/policy tax credits to insurers that offer Pay-As-You-Drive pricing. It is endorsed by the National Association of Independent Insurers, regional governments, the Oregon/Idaho chapter of the American Automobile Association, the Oregon Consumer League, The Oregon Environmental Council and other environmental organizations, citizen transportation reform groups and the Interfaith Global Warming Campaign. The Oregon Environmental Council (OEC) is building a database of potential PAYD insurance customers to convince the insurance industry that a market for PAYD insurance exists. The organization has posted a place on its Web site at www.oeconline.org where Oregon drivers can pledge their support for PAYD insurance. The OEC also developed a consumer-oriented brochure about PAYD insurance to introduce the concept and its benefits. The brochure includes a pre-stamped post card that people can send to the OEC to receive more information about the group's progress towards making PAYD insurance a reality in Oregon. The OEC's target is to distribute enough brochures to receive 3,000 to 10,000 responses.

USEPA Pay-As-You-Drive Insurance Program

The US Environmental Protection Agency is sponsoring voluntary government-industry partnerships to promote PAYD insurance pricing, modeled after other programs such as EnergyStar appliance development. The PAYD program offers recognition and technical support to insurance companies that choose to offer a PAYD insurance option. EPA is undertaking technical research to overcome barriers to PAYD insurance, and is working with state and local governments, industry groups, regulators, and other interested organizations to share information and leverage resources to help establish pilot programs, in concert with the insurance industry.

References And Resources For More Information

Jason E. Bordoff (2008) *Pay-As-You-Drive Car Insurance*, Brookings Institution (www.brookings.edu/articles/2008/spring_car_insurance_bordoff.aspx).

Jason Bordoff and Pascal Noel (2008), *Pay-As-You-Drive Auto Insurance: A Simple Way to Reduce Driving-Related Harms and Increase Equity*, The Brookings Institution (www.brookings.edu); at www.brookings.edu/papers/2008/07_payd_bordoffnoel.aspx.

Patrick Butler (2000), *Why The Standard Automobile Insurance Market Breaks Down In Low Income Zip Codes*, Report to the Texas House Committee on Insurance; at www.centspermilenow.org/633b-4522.pdf. Also see "Pay-per-Mile Auto Insurance" *Consumer Economic Issues in America*, 2003; at www.centspermilenow.org/652Garma.pdf.

Cents Per Mile For Car Insurance (www.centspermilenow.org) promotes "cents per mile" vehicle insurance as allowed by legislation passed in the state of Texas in 2001.

Stephen J. Dubner and Steven D. Levitt (2008), "Freakonomics: Not-So-Free Ride," *New York Times*, 20 April 2008, (www.nytimes.com/2008/04/20/magazine/20wwln-freakonomics-t.html).

Aaron S. Edlin (2003), "Per-Mile Premiums for Auto Insurance," *Economics for an Imperfect World*, MIT Press; at: http://works.bepress.com/aaron_edlin/28.

Environmental Defense PAYD Website (www.edf.org/page.cfm?tagID=31651).

Keri Funderberg, Michael Grant and Ed Coe (2003), "Changing Insurance One Mile At A Time," *Contingencies* (www.contingencies.org/novdec03/changing.pdf), Nov./Dec. 2003, pp. 34-38.

Allen Greenberg (2009), *Costs and Benefits of Varying Per-Mile Insurance Premiums Based Upon Measured Risks Specific to Each Mile Driven*, TRB Annual Meeting (www.trb.org); at www.vtpi.org/AG_PAYD.pdf.

Lyn Hunstad (1999), "Estimating the Uninsured Vehicle Rate From The Uninsured Motorist/Bodily Injury Ratio," *NAIC Research Quarterly*, Vo. V, Is. 1, January, pp. 1-7.

Todd Litman (1997), "Distance-Based Vehicle Insurance as a TDM Strategy," *Transportation Quarterly*, Vol. 51, No. 3, Summer, pp. 119-138; at www.vtpi.org/dbvi.pdf.

Todd Litman (2001), *Distance-Based Vehicle Insurance Feasibility, Benefits and Costs: Comprehensive Technical Report*, VTPI (www.vtpi.org); at www.vtpi.org/dbvi_com.pdf.

Todd Litman (2007), *Transportation Affordability: Evaluation and Improvement Strategies*, VTPI (www.vtpi.org); at www.vtpi.org/affordability.pdf.

Todd Litman (2008), *Pay-As-You-Drive Insurance: Recommendations for Implementation*, VTPI (www.vtpi.org); at www.vtpi.org/payd_rec.pdf.

National Organization For Women Insurance Project (www.now.org/issues/economic/insurance).

NPTS (1998), *National Personal Transportation Survey*, Bureau of Transport Statistics (www.bts.gov).

Ian W.H. Parry (2005), *Is Pay-As-You-Drive Insurance: a Better Way to Reduce Gasoline than Gasoline Taxes?*, RFF (www.rff.org); at www.rff.org/Documents/RFF-DP-05-15.pdf.

Lorien Rice (2004), *Transportation Spending by Low-Income California Households: Lessons for the San Francisco Bay Area*, Public Policy Institute of California (www.ppic.org); at www.ppic.org/content/pubs/rb/RB_704LRRB.pdf.

Sightline (2003), *NEW Facts: Pay-As-You-Drive Car Insurance*, NorthWest Environment Watch (www.sightline.org/research/sust_toolkit/solutions/payd).

William Vickrey (1968), "Automobile Accidents, Tort Law, Externalities and Insurance: An Economist's Critique," *Law and Contemporary Problems*, pp. 464-470; at www.vtpi.org/vic_acc.pdf.

VTPI (2008), *Online TDM Encyclopedia*, Victoria Transport Policy Institute (www.vtpi.org).