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Abstract

Safety belt use reached 79% in 2003, a 4 percentage point improvement over the 75% rate seen last year. Approximately 17% of belt nonusers were converted to users, twice the rate seen in previous years. Use continues to vary in different parts of the country, with higher rates in states that can enforce their belt laws more stringently. These results are from the National Occupant Protection Use Survey (NOPUS), the only probability-based observational survey of belt use on the road nationwide. The survey is conducted annually by the National Center for Statistics and Analysis in the National Highway Traffic Safety Administration (NHTSA). This report presents the findings of the 2003 survey.

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TABLE of CONTENTS

TABLE of FIGURES

1. Introduction

The National Occupant Protection Use Survey (NOPUS) is an observational survey of safety belt use that began in 1994 and has been used by the National Highway Traffic Safety Administration (NHTSA) to measure the nation's belt use. Unlike telephone surveys that ask respondents whether they use belts, NOPUS observes actual use on the roads, and so provides a better estimate (although telephone surveys are useful for studying unobservable characteristics of use, such as a person's income level). In addition, NOPUS provides a reliable estimate of use whose error can be measured since it collects data on a probability sample of roadways. In fact, NOPUS provides the only probability-based observed measure of belt use on the nation's roads.

NOPUS provides estimates of use at the national level and at four regional levels (the Northeast, Midwest, South, and West). NOPUS cannot provide state estimates, which can be found through surveys conducted by the states' highway safety offices, whose results are published annually by NHTSA.

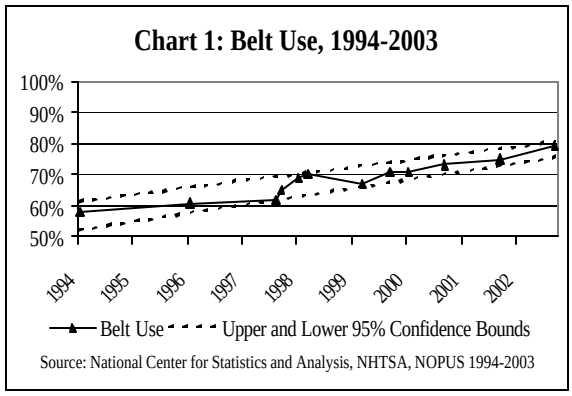
The information in this report comes from NOPUS's Moving Traffic Study, which collects a small amount of information on a large number of vehicles to estimate national use as accurately as possible. NHTSA periodically conducts an additional survey, the Controlled Intersection Study, which collects more information, such as estimated age and race/ethnicity and child restraint use, on a smaller number of vehicles to better understand where use is low and where it is increasing.

This report is organized as follows. Sections 2 and 3 summarize the findings of the 2003 survey. Section 4 contains detailed tables of estimates. Section 5 gives the survey methodology, including methods newly employed in 2003, and reviews basic statistical techniques, such as determining statistical significance and calculating margins of error.

Several things should be kept in mind to properly interpret the estimates in this report. The estimates reflect use in the front outboard seating positions of passenger vehicles during daytime. The 2003 data collection employed new techniques that might have affected the 2003 belt use estimates. Several of the tables in Section 4 contain "conversion rates". This is the percentage reduction in belt nonuse that occurred between 2002 and 2003. Conversion rates are used to assess improvement in belt use rates. The reader should consult Section 5 for more information.

2. The National Use Rate

The 2003 survey found belt use nationwide to be 79%. The four percentage point gain in use from 2002 is larger than the usual two point improvement seen. This might be viewed as evidence of the success of the 2003 "Click It or Ticket" belt campaign, conducted by NHTSA and state highway safety offices between May 19 and May 26, 2003. NHTSA purchased $8 million in advertising on 500 TV and 350 radio spots, warning the public that they may be ticketed and fined for nonuse. Fully 12,000 law enforcement agencies in 43 states, the District of Columbia, and Puerto Rico conducted checkpoints, writing more than 600,000 tickets combined. States purchased $16 million in advertisements, aired on 89,000 TV and 93,000 radio spots. The NOPUS data were collected between June 2 and June 29, 2003, shortly after the campaign ended, and so may reflect a temporary bump in use due to the campaign.



However, while the 4 percentage point national gain is larger than that normally seen, the 2003 national estimate of 79% is within the regression lines of the 95% confidence bounds of the previous NOPUS estimates. That is, the 2003 estimate is within statistical error of the previous trend, and so while the NOPUS data indicates the campaign was a success, we cannot say with statistical confidence that it produced larger increases in use than those seen in the past.

In addition, half of the observation sites incorporated new data collection technologies in 2003. (See the section "New Technologies".) We believe the technologies improve the accuracy of the NOPUS data and have a positive effect on the estimates, but we cannot quantify the effect at this time. That is, the while we have confidence in NOPUS's belt use estimates in 2003, and believe them to be more accurate than those from previous years, the estimated changes from 2002 to 2003 in this note might be overstated.

2.1 Increasing Belt Use Saves Lives

Belts are approximately 50% effective for preventing fatality in crashes in which motorists would otherwise die, and so raising belt use saves lives. It is estimated that raising use to 79% from 75% prevented 1,000 deaths that would have otherwise occurred in 2003. Since belts saved an estimated 14,000 motorists in 2002, we would predict that belts will have prevented 15,000 deaths by the end of 2003. (Traffic Safety Facts – Overview, 2002) In saving lives and preventing injuries, belt use saves billions of dollars in costs to society annually, mainly through preventing the loss in productivity and reducing the medical costs that would otherwise occur. (Blincoe et al, 2000) At least 15,000 lives will be saved in each future year if belt use is maintained at 79% or higher.

3. Subnational Estimates

3.1 Use Remains Higher in States with Stronger Laws

"Primary" belt enforcement laws allow officers to stop and ticket a motorist simply for not using their belt, whereas in a state with a "secondary" law, the motorist must exhibit another infraction, such as an expired license tag, to be stopped. In 2003, there were 21 primary states, 29 secondary states, and 1 state that effectively has no belt use law. (In New Hampshire, it is legal for motorists over 18 to ride unbelted.) The District of Columbia and Puerto Rico have primary laws.

NOPUS has consistently found higher use rates in the presence of primary laws, with collective statistically different rates of 83% in primary states compared to 75% in secondary ones in 2003. Primary states have statistically similar rates in 2002 and 2003, while the increase in secondary states is statistically significant.

3.2 Where Did Use Increase?

In addition to increasing nationwide, use also rose since 2002 in the following categories with 95% confidence:

- in the South
- in states governed by secondary belt laws
- in each type of vehicle (passenger cars; vans & sport utility vehicles; and pickup trucks)
- among both drivers and (right front) passengers
- during both weekdays and weekends, and
- during both weekday rush hour and weekday non-rush hour periods.

Other characteristics saw increases from the 2002 rates that were significant with lesser, but still fairly high, degrees of confidence. The following categories exhibited increases that are significant with between 80% and 95% confidence:

- the Northeast (94.97% confidence)
- regions governed by primary belt laws (87% confidence), and
- the West (86% confidence).

3.3 Where Is Use Low?

Each of the following assertions is true with 95% confidence.

- Use remains lower in secondary states than in primary ones.
- Use remains lower in pickup trucks, than in passenger cars, vans, and sport utility vehicles (SUVs).
- Use is lower in the Northeast than in the South or West.
- Use is lower in the Midwest than in the West.

NOPUS has consistently found use to be lower in secondary states than in primary ones, and has consistently found pickups to have the lowest use among vehicle types. The pattern of regional differences seems to vary from year to year.

4. Tables of Detailed Estimates

Table 1: Belt Use Summary

Characteristic	2003		2002		2002-2003 Change		
	Belt Use	Standard Error	Belt Use	Standard Error	Esti-mate	Standard Error	Conver-sion Rate
Overall	79%	1.2%	75%	1.1%	4% (S)	1.4%	17%
Primary Enforcement	83% (H)	1.6%	80% (H)	1.9%	3%	1.6%	15%
Secondary Enforcement	75%	2.1%	69%	1.2%	6% (S)	1.5%	19%
Drivers	80% (H)	1%	76% (H)	1%	4% (S)	1.3%	17%
Passengers	77%	1%	73%	1%	4% (S)	1.2%	15%
Passenger Cars	81%	1.0%	77%	1.0%	4% (S)	1.0%	17%
SUVs & Vans	83%	1.0%	78%	1.1%	5% (S)	1.3%	23%
Pickup Trucks	69% (L)	2.2%	64% (L)	1.6%	5% (S)	2.4%	14%
Northeast*	74%	1.9%	69%	1.6%	5%	2.2%	16%
Midwest*	75%	2.4%	74%	2.9%	1%	1.9%	4%
South*	80%	1.7%	76%	1.5%	4% (S)	1.9%	17%
West*	84%	3.5%	79%	2.8%	5%	3.4%	24%
Weekday	78%	1.3%	75%	1.0%	3% (S)	1.6%	12%
Rush Hour	79%	1.6%	76%	1.2%	3% (S)	1.5%	13%
Non-Rush Hour	79%	1.2%	75%	1.2%	4% (S)	1.4%	16%
Weekend	81%	1.7%	76%	1.9%	5% (S)	1.6%	21%

(S): Statistically significant change

(H), (L): Significantly high or low in category

*The following pairwise differences were significant in 2003: Northeast-South, Midwest-West, and Northeast-West, while Northeast-West and Northeast-South were significant in 2002

Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 2: Belt Use, 2000-2002

Characteristic	June 2003	June 2002	June 2001	Fall 2000
Overall	79%	75%	73%	71%
Primary Enforcement	83%	80%	78%	77%
Secondary Enforcement	75%	69%	67%	64%
Drivers	80%	76%	74%	72%
Passengers	77%	73%	72%	68%
Passenger Cars	81%	77%	76%	74%
SUVs & Vans	83%	78%	75%	74%
Pickup Trucks	69%	64%	62%	59%
Northeast	74%	69%	62%	67%
Midwest	75%	74%	72%	68%
South	80%	76%	76%	69%
West	84%	79%	77%	80%
Weekday	78%	75%	73%	71%
Rush Hour	79%	76%	75%	73%
Non-Rush Hour	79%	75%	72%	70%
Weekend	81%	76%	74%	73%

Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2000-2003

Table 3: Sample Sizes

Numbers of	2003	2002	Change
Observation Sites	1972	1965	0%
Vehicles Observed	162,195	158,412	2%
Occupants Observed	213,668	209,037	2%

Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 4: Belt Use in States with Primary Enforcement and the District of Columbia*

Characteristic	2003		2002		2002-2003 Change		
	Belt Use	Standard Error	Belt Use	Standard Error	Esti-mate	Standard Error	Conversion Rate
Overall	83%	1.6%	80%	1.9%	3%	1.6%	15%
Drivers	83%	1.6%	81%	1.8%	2%	1.6%	11%
Passengers	81%	1.6%	77%	2.3%	4% (S)	1.6%	17%
Passenger Cars	84%	1.4%	82%	1.8%	2%	1.3%	11%
Drivers	85%	1.3%	83%	1.7%	2%	1.5%	12%
Passengers	81%	2.1%	78%	2.1%	3%	1.5%	14%
SUVs & Vans	86%	1.1%	83%	1.5%	3% (S)	1.4%	18%
Drivers	86%	1.2%	84%	1.4%	2%	1.5%	13%
Passengers	86%	1.0%	81%	1.8%	5% (S)	1.5%	26%
Pickup Trucks	73%	3.1%	70%	2.7%	3%	3.2%	10%
Drivers	74%	3.1%	71%	2.5%	3%	3.0%	10%
Passengers	73%	3.2%	67%	4.1%	6%	4.3%	18%

*D.C. also has a primary enforcement law.
(S): Statistically significant change
In each year and vehicle type, driver use was statistically similar to passenger use.
Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 5: Belt Use in States with Secondary Enforcement

Characteristic	2003		2002		2002-2003 Change		
	Belt Use	Standard Error	Belt Use	Standard Error	Esti-mate	Standard Error	Conversion Rate
Overall	75%	2.1%	69%	1.2%	6% (S)	1.5%	19%
Drivers	76%	2.1%	69%	1.2%	7% (S)	1.6%	23%
Passengers	72%	2.0%	68%	1.5%	4% (S)	1.4%	13%
Passenger Cars	78%	1.8%	71%	1.1%	7% (S)	1.2%	24%
Drivers	79%	1.8%	72%	1.1%	7% (S)	1.2%	25%
Passengers	74%	1.9%	68%	1.8%	6% (S)	1.7%	19%
SUVs & Vans	78%	1.9%	73%	1.5%	5% (S)	2.0%	19%
Drivers	79%	2.0%	73%	1.6%	6% (S)	2.1%	22%
Passengers	77%	1.9%	74%	2.3%	3%	2.7%	12%
Pickup Trucks	63%	3.2%	53%	2.1%	10% (S)	2.8%	21%
Drivers	63%	3.4%	52%	1.9%	11% (S)	3.0%	23%
Passengers	60%	2.8%	55%	4.3%	5%	3.6%	11%

(S): Statistically significant change
In each year and vehicle type, driver use was statistically similar to passenger use.
Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 7: Belt Use in the Northeast, by Vehicle Type and Occupant Type

Characteristic	2003		2002		2002-2003 Change		
	Belt Use	Standard Error	Belt Use	Standard Error	Esti-mate	Standard Error	Conversion Rate
Overall	74%	1.9%	69%	1.6%	5%	2.2%	16%
Drivers	74%	1.9%	70%	1.7%	4% (S)	2.3%	13%
Passengers	71%	2.7%	67%	1.8%	4%	2.1%	12%
Passenger Cars	75%	2.0%	71%	1.7%	4%	2.3%	14%
Drivers	76%	1.9%	72%	1.7%	4%	2.5%	14%
Passengers	70%	2.8%	68%	1.8%	2%	2.2%	6%
SUVs & Vans	77%	2.4%	72%	2.1%	5%	3.0%	18%
Drivers	77%	2.0%	72%	2.3%	5%	3.1%	18%
Passengers	76%	3.7%	71%	2.4%	5%	3.4%	17%
Pickup Trucks	56%	2.8%	50%	3.1%	6% (S)	2.9%	12%
Drivers	56%	2.9%	50%	3.1%	6% (S)		12%
Passengers	58%	3.2%	51%	4.5%	7%	4.9%	14%

(S): Statistically significant change

In each year and vehicle type, driver use was statistically similar to passenger use.

Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 8: Belt Use in the Midwest, by Vehicle Type and Occupant Type

Characteristic	2003		2002		2002-2003 Change		
	Belt Use	Standard Error	Belt Use	Standard Error	Esti-mate	Standard Error	Conver-sion Rate
Overall	75%	2.4%	74%	2.9%	1%	1.9%	4%
Drivers	75%	2.4%	74%	3.0%	1%	2.1%	4%
Passengers	74%	2.5%	73%	2.9%	1%	1.9%	4%
Passenger Cars	76%	2.5%	75%	2.7%	1%	1.8%	4%
Drivers	77%	2.5%	76%	2.9%	1%	2.1%	4%
Passengers	75%	2.7%	73%	3.1%	2%	2.2%	7%
SUVs & Vans	78%	2.4%	76%	2.9%	2%	2.5%	8%
Drivers	78%	2.5%	76%	3.2%	2%	2.9%	8%
Passengers	78%	2.3%	77%	3.9%	1%	3.9%	4%
Pickup Trucks	65%	3.0%	62%	4.8%	3%	4.1%	8%
Drivers	65%	2.8%	62%	4.6%	3%	4.4%	8%
Passengers	65%	4.2%	64%	8.0%	1%	6.0%	3%

No 2002-2003 differences were statistically significant.

In each year and vehicle type, driver use was statistically similar to passenger use.

Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 10: Belt Use in the West, by Vehicle Type and Occupant Type

Characteristic	2003		2002		2002-2003 Change		
	Belt Use	Standard Error	Belt Use	Standard Error	Esti-mate	Standard Error	Conver-sion Rate
Overall	84%	3.5%	79%	2.8%	5%	3.4%	24%
Drivers	85%	3.6%	80%	2.8%	5%	3.8%	25%
Passengers	80%	3.0%	76%	3.1%	4%	2.3%	17%
Passenger Cars	86%	3.4%	81%	2.9%	5%	2.9%	26%
Drivers	88%	3.0%	83%	2.8%	5%	3.2%	29%
Passengers	81%	4.4%	77%	3.2%	4%	2.8%	17%
SUVs & Vans	87%	2.7%	82%	2.3%	5%	3.4%	28%
Drivers	88%	3.2%	82%	2.6%	6%	4.3%	33%
Passengers	85%	1.6%	81%	2.1%	4% (S)	2.0%	21%
Pickup Trucks	76%	4.3%	68%	3.0%	8%	5.0%	25%
Drivers	77%	4.6%	69%	2.8%	8%	5.4%	26%
Passengers	73%	4.3%	68%	4.7%	5%	6.0%	16%

(S): Statistically significant change

In each year and vehicle type, driver use was statistically similar to passenger use.

Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 9: Belt Use in the South, by Vehicle Type and Occupant Type

Characteristic	2003		2002		2002-2003 Change		
	Belt Use	Standard Error	Belt Use	Standard Error	Esti-mate	Standard Error	Conversion Rate
Overall	80%	1.7%	76%	1.5%	4% (S)	1.9%	17%
Drivers	81%	1.7%	77%	1.3%	4% (S)	1.9%	17%
Passengers	78%	1.6%	73%	2.5%	5% (S)	2.5%	19%
Passenger Cars	84%	1.3%	78%	1.4%	6% (S)	1.5%	27%
Drivers	85% (H)	1.3%	79% (H)	1.3%	6% (S)	1.4%	29%
Passengers	80%	1.4%	74%	2.2%	6% (S)	2.4%	23%
SUVs & Vans	85%	1.2%	80%	1.7%	5% (S)	2.0%	25%
Drivers	85%	1.2%	81%	1.6%	4% (S)	2.1%	21%
Passengers	83%	1.4%	79%	2.2%	4%	2.5%	19%
Pickup Trucks	68%	3.2%	63%	2.7%	5%	3.1%	14%
Drivers	68%	3.3%	64%	2.4%	4%	3.2%	11%
Passengers	65%	3.4%	59%	4.8%	6%	4.2%	15%

(S): Statistically significant change

(H): Statistically significant driver-passenger difference in use

Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 11: Belt Use on Weekdays, by Vehicle Type and Occupant Type

Characteristic	2003		2002		2002-2003 Change		
	Belt Use	Standard Error	Belt Use	Standard Error	Esti-mate	Standard Error	Conver-sion Rate
Overall	78%	1.3%	75%	1.0%	3% (S)	1.6%	12%
Drivers	79%	1.4%	76% (H)	1.0%	3% (S)	1.6%	13%
Passengers	76%	1.3%	72%	1.3%	4% (S)	1.7%	14%
Passenger Cars	81%	1.1%	77%	1.0%	4% (S)	1.4%	17%
Drivers	82% (H)	1.1%	78% (H)	1.0%	4% (S)	1.4%	18%
Passengers	77%	1.2%	73%	1.4%	4% (S)	1.6%	15%
SUVs & Vans	82%	1.1%	78%	1.2%	4% (S)	1.7%	18%
Drivers	82%	1.1%	78%	1.4%	4% (S)	1.9%	18%
Passengers	80%	1.1%	77%	1.6%	3%	1.8%	13%
Pickup Trucks	68%	2.7%	63%	1.4%	5%	2.9%	14%
Drivers	69%	2.7%	64%	1.4%	5%	3.0%	14%
Passengers	65%	3.1%	60%	2.6%	5%	4.0%	13%

(S): Statistically significant change

(H): Statistically significant driver-passenger difference in use

Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 12: Belt Use on Weekends, by Vehicle Type and Occupant Type

Characteristic	2003		2002		2002-2003 Change		
	Belt Use	Standard Error	Belt Use	Standard Error	Esti-mate	Standard Error	Conver-sion Rate
Overall	81%	1.7%	76%	1.9%	5% (S)	1.6%	21%
Drivers	81%	1.6%	77%	1.8%	4% (S)	1.7%	17%
Passengers	79%	2.0%	75%	2.0%	4% (S)	1.5%	16%
Passenger Cars	82%	1.6%	78%	1.8%	4% (S)	1.5%	18%
Drivers	84%	1.4%	79%	1.8%	5% (S)	1.5%	24%
Passengers	78%	2.5%	76%	2.0%	2%	2.0%	8%
SUVs & Vans	84%	1.5%	79%	2.0%	5% (S)	2.0%	24%
Drivers	84%	1.6%	80%	1.9%	4% (S)	2.2%	20%
Passengers	84%	1.6%	79%	2.3%	5% (S)	2.3%	24%
Pickup Trucks	72%	2.2%	66%	3.1%	6% (S)	2.6%	18%
Drivers	71%	2.4%	65%	2.9%	6% (S)	3.0%	17%
Passengers	73%	2.8%	67%	4.1%	6% (S)	2.8%	18%

(S): Statistically significant change

In each year and vehicle type, driver use was statistically similar to passenger use.

Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 13: Belt Use During Rush Hour* on Weekdays, by Vehicle Type and Occupant Type

Characteristic	2003		2002		2002-2003 Change		
	Belt Use	Standard Error	Belt Use	Standard Error	Esti-mate	Standard Error	Conver-sion Rate
Overall	79%	1.6%	76%	1.2%	3% (S)	1.5%	13%
Drivers	80%	1.6%	76%	1.2%	4% (S)	1.6%	17%
Passengers	76%	1.6%	73%	1.5%	3%	1.6%	11%
Passenger Cars	81%	1.4%	78%	1.2%	3% (S)	1.4%	14%
Drivers	82% (H)	1.4%	78%	1.1%	4% (S)	1.4%	18%
Passengers	77%	1.7%	75%	1.8%	2%	1.8%	8%
SUVs & Vans	82%	1.3%	78%	1.4%	4% (S)	1.7%	18%
Drivers	82%	1.4%	78%	1.7%	4%	2.2%	18%
Passengers	79%	1.3%	77%	2.5%	2%	2.5%	9%
Pickup Trucks	68%	2.6%	64%	2.1%	4%	2.4%	11%
Drivers	69%	2.8%	65%	2.0%	4%	2.3%	11%
Passengers	65%	2.6%	61%	4.2%	4%	4.1%	10%

*Rush hour is defined to comprise 8-9:30 AM and 3:30-6 PM.
(S): Statistically significant change
(H): Statistically significant driver-passenger difference in use
Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 14: Weekday Belt Use Outside of Rush Hour*, by Vehicle Type and Occupant Type

Characteristic	2003		2002		2002-2003 Change		
	Belt Use	Standard Error	Belt Use	Standard Error	Esti-mate	Standard Error	Conver-sion Rate
Overall	79%	1.2%	75%	1.2%	4% (S)	1.4%	16%
Drivers	80%	1.2%	76%	1.1%	4% (S)	1.6%	17%
Passengers	77%	1.1%	73%	1.5%	4% (S)	1.4%	15%
Passenger Cars	81%	1.0%	77%	1.2%	4% (S)	1.3%	17%
Drivers	82% (H)	1.0%	78%	1.2%	4% (S)	1.4%	18%
Passengers	77%	1.2%	73%	1.4%	4% (S)	1.3%	15%
SUVs & Vans	83%	1.1%	79%	1.2%	4% (S)	1.6%	19%
Drivers	83%	1.1%	79%	1.2%	4% (S)	1.7%	19%
Passengers	82%	1.1%	78%	1.4%	4% (S)	1.8%	18%
Pickup Trucks	69%	2.4%	63%	1.8%	6% (S)	2.9%	16%
Drivers	70%	2.3%	64%	1.7%	6% (S)	3.1%	17%
Passengers	68%	2.8%	63%	2.9%	5%	3.6%	14%

*The weekday period outside of rush hour is defined to be 9:30 AM - 3:30 PM.
(S): Statistically significant change
(H): Statistically significant driver-passenger difference in use
Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

Table 15: Belt Use, 1994-2003

Date	Use	Change, in Percentage Points	Conversion Rate
Fall 1994	58%		
Fall 1996	61%	3	7%
May 1998	62%	1	3%
June 1998	65%	3	8%
Fall 1998	69%	4	11%
Dec 1998	70%	1	3%
Dec 1999	67%	-3	-10%
June 2000	71%	4	12%
Fall 2000	71%	0	0%
June 2001	73%	2	7%
June 2002	75%	2	8%
June 2003	79%	4	17%

Source: National Center for Statistics and Analysis, NHTSA, NOPUS 2002-2003

5. On Interpreting the NOPUS Estimates

5.1 Estimates Reflect Front Seat Daytime Use

NOPUS provides a snapshot of actual belt use on the roads. Since its data are obtained through direct observation of traffic, certain restrictions are necessary. The survey observes shoulder belt use of the driver and any passenger in the right front seat in passenger vehicles in motion having no commercial or government markings between the hours of 8 AM and 6 PM. That is, NOPUS estimates basically reflect use among front seat occupants in the daytime. It is difficult to observe belt use at night or in the rear seat from the roadside or from inside a moving vehicle.

Since NOPUS provides a snapshot of use on the roads, the correct interpretation of the national rate is that at the average daylight moment in 2002, 79% of the front seat outboard occupants on the road were belted. From this, one can infer that motorists (in the front seat in daylight) were belted for 79% of their travel time in 2002. Although NOPUS estimates are frequently interpreted as the percentage of the population who buckle up with some degree of regularity, this is not strictly correct.

5.2 Technological Improvements

The survey is in the process of phasing in two technological improvements to the data collection process.

1. We are phasing in the use of Personal Data Assistants (PDAs) to replace clicker counters and paper forms.

2. We are phasing in the collection of interstate data from vehicles traveling the interstate, replacing the proxy observation of vehicles from exit ramps.

The PDAs are equipped with Global Positioning Systems (GPS) and have been programmed in a way that allows observers to record data with their thumbs without looking away from the road. The second improvement only applies to limited access highways, which comprise interstates, US, state, and county highways that have no traffic signals and allow entry and exit only through access ramps. For simplicity, we will call such roadways “interstates”.

Using the new technologies improves the quality of the data. Using PDAs eliminates all errors that arise from entering data from paper forms into a database. Data collectors simply download their data over a phone line to a central computer. In addition, PDAs prevent or reduce the occurrence of certain types of errors. Using the GPS technology, the PDAs alert data collectors if they are not at the scheduled observation site or are not collecting data at the scheduled time. In the event an observer collects data for more or less than the assigned 30 minutes, the collection time recorded by his/her PDA is used to make the proper adjustment to the estimation process.

PDAs also reduce errors arising from certain distractions. The machines give verbal confirmation of the data entered, so observers are not distracted from wondering if they recorded the correct data (e.g. clicked the correct clicker). If the observer has entered incorrect information, s/he can press an “Oops” button that flags the information as erroneous. The PDAs

are also programmed to record information that could not feasibly be added to clicker data collection, such as when an observer cannot discern the presence of a passenger or whether a belt is in use. It can be difficult to see a (right front) passenger in a vehicle with tinted windows, in inclement weather, or when the passenger is a child. It can be difficult to ascertain belt use in inclement weather, when the vehicle has tinted windows, when the shoulder belt is attached to the seat instead of to the vehicle's frame (as it is in convertibles), or when the motorist's shirt is similar in color to the belt.

We believe that PDAs also make data collection more efficient. Only one data collector is needed to collect data with PDAs, while two are needed with clickers. It is not feasible for a single observer to record all data items, including vehicle type, seating position, and whether or not an occupant is belted, with clickers in any reasonably efficient manner. This can be done with PDAs since observers can record information quickly with their thumbs. At the time of this report's publication, we had not yet analyzed the relative efficiency of PDAs. Analyzing the observations per person hour billed is complicated because one should control for differences in the amount of travel that teams incurred to reach their observation sites.

Collecting interstate data from the interstate is an improvement in data quality over proxy collection from exit ramps. Observing from exit ramps, one encounters more travelers on short trips than one would from observing on the interstate. Consequently the exit ramp methodology observes a different population of travelers, who might have a different belt use rate. The Motor Vehicle Occupant Safety Survey consistently finds that part time users use belts less frequently on short trips. (Block, 2000) Consequently we would expect that observing use on the interstate from moving vehicles would produce higher and more accurate use estimates.

5.2.1 Quantifying the Effects of the Improvements

We do not have sufficient data to quantify the effects of using PDAs and collecting interstate data from moving vehicles at this time. We believe that each new method yields higher and more accurate use estimates than the data collection method it replaces. That is, we believe that previous NOPUS estimates understated use and the 2002-2003 change estimate overstates the change, but we cannot currently quantify the amounts of understatement and overstatement. We hope to be able to quantify the effects in 2004, and may revise previous NOPUS estimates at that time.

We would expect each of the two new collection methods to raise use estimates. As noted previously, we would expect use at any given time to be higher on an interstate than on its exit ramps, since the ramps contain a disproportionately large number of travelers on short trips. We would expect PDAs to increase use estimates, since we have found that observers collecting data with clickers tend to record unknowns, such as unknown belt use or inability to discern the presence of a passenger, as unbelted occupants. The clickers are simply marked as "Yes" and "No" for brevity, and particularly when collecting observations rapidly in heavy traffic, it might be natural to misinterpret the "No" clicker sometimes as "No passenger". Observers were told to use their best judgment to discern use, but generally to only click "Yes" (i.e. belted) if they can see a shoulder belt in front of the motorist's chest. Consequently it might be natural to disproportionately record nonuse when use is difficult to discern. We are examining the extent to which unknown values were recorded in the PDAs data to get a handle on how difficult it is to discern various characteristics and the extent to which unknowns might have contributed to

clicker-based estimates. We note that while we expect the new methods to raise use estimates, we also expect them to produce more accurate ones.

A test comparing the moving vehicle method with PDAs to the exit ramp method without PDAs at 12 interstate sites in 2001 found that the former produced statistically higher estimates, as we would expect. The test estimated positive changes both overall and in 7 of 9 categories, formed from 3 characterizations of the site as urban/rural/suburban and 3 vehicle types. The Wilcoxon signed rank test concluded from these 9 differences, with 95% confidence, that the new method has a positive effect. However, standard errors were generally large (6-23 percentage points), and the overall difference of 4 percentage points was not statistically different from 0 with 95% confidence, and so the effect of the new method could not be quantified.

However, the implementation of these methods in the 2002 NOPUS indicated the opposite effect. The moving vehicle method with PDAs was instituted at roughly 13% of the interstate sites in 2002, while the remaining interstate sites used the traditional clickers and paper forms. The collective use estimate from the sites that used the new method was 5 percentage points lower than that from the old method sites, but again this difference was not statistically different from 0. A breakdown into 18 categories (from 3 vehicle types, 2 occupant types, and 3 times of day and week) found the new method estimates higher in only 2 of the 18 categories. However, it is possible that the sites that used the new method had lower belt use than those using the old method.

Implementation at the interstate sites in the 2003 survey found the two collection methods to be statistically similar. Use was 0.9 percentage points higher at the sites that used the new method, which was not statistically different from 0.

As for using PDAs rather than clickers and paper forms on surface streets, we did not conduct a test comparing the two methods on the same collection of surface streets. The implementation of these methods on the surface streets in the 2003 survey found that the collective use estimate on the surface streets that used PDAs was 5 percentage points higher than the estimate from the clicker sites, and this difference was statistically significant. However this again could be due to an actual difference in belt use at the two sets of sites. Consequently we cannot conclude from this data that PDAs have an effect on surface streets, much less quantify any effect that might exist. We would expect that PDAs raise use estimates by a small amount.

In 2004, we hope to use both methods at the same large sample of interstates and surface streets to quantify the effects.

5.3 Assessing Improvement: Conversion Rates

Improvement in belt use is frequently measured by the percentage point increase in the use rate. However increasing belt use one percentage point from a 90% use rate is more difficult than it is from 50%. Doing so from 90% requires changing the behavior of a larger fraction of nonusers. (In addition when use is at 90%, many of those who do not buckle up are hard-core nonusers, and not likely to be swayed by media or enforcement campaigns.) A more rational measure of improvement is the reduction in nonuse, which we call the *conversion rate*. For instance nonuse was reduced from 25% in 2002 to 21% in 2003, yielding a conversion rate of (25-21)/25, or 16%. Using unrounded rates produces the 17% conversion rate that appears in Table 1.

Although it is not strictly correct, we often think of the conversion rate as the percentage of nonusers that were converted to users in the given time period. This would be a correct interpretation if NOPUS measured the percentage of the population that used belts (with some degree of regularity). E.g. if 79% of the population used safety belts more than half of the time, and 75% had previously done so, then 16% of those who used belts less frequently were converted to using belts at least half the time. However NOPUS measures a snapshot of belt use on the road, and so our interpretation is an oversimplification used only to help comprehend the concept.

5.4 Survey Methodology

NOPUS collects data at a random nationally representative sample of 2,000 sites during randomly assigned 30-minute observation periods. Data collectors observe the shoulder belt use of drivers and right front seat passengers in passenger vehicles in motion having with no commericial or government markings from the roadside or from a moving vehicle during daylight hours. A belt is considered in use if the observer can see the belt drawn across the chest, whether or not it is under the arm. When they cannot discern use observers collecting data with PDAs record the belt use as unknown, while those using clickers use their best judgment to decide whether the motorist appears belted or not. Children in child safety seats and booster seats with the shoulder belt in use are counted as belted. Relatively few children are observed since most children are in the unobserved back seat. The classification of vehicles into passenger cars, vans & sport utility vehicles (SUVs), and pickup trucks is made by the observers using their best judgment. Observers collect data between 8 AM and 6 PM, on all days of the week. Data for the 2003 NOPUS were observed between June 2 and June 29, 2003. Data are weighted in a way that incorporates the NOPUS sample design. See (Glassbrenner, 2002) for more information on the sample design, estimation, and data collection.

5.5 Definitions

NOPUS categorizes the states and the District of Columbia into the following four regions:

Northeast:	ME, VT, NH, MA, RI, CT, NY, PA, NJ
Midwest:	MI, OH, IN, IL, WI, MN, IA, MO, KS, NE, SD, ND
South:	WV, MD, DE, VA, KY, TN, NC, SC, GA, FL, AL, MS, AR, LA, OK, TX, DC
West:	AK, WA, OR, CA, NV, ID, UT, AZ, NM, CO, WY, MT, HI

Weekday data is broken down into rush hour, defined to comprise the periods 8:00 – 9:30 AM and 3:30 – 6:00 PM, with non-rush hour reflecting the period 9:30 AM to 3:30 PM (on weekdays).

5.6 Assessing Change: Statistical Significance

NOPUS observes a sample of motorists, and so may not yield the actual use rates. The amount of variation that would occur in the use rates of all possible samples (selected using the same design as NOPUS) is measured by the *standard error*. For instance the standard error on the nationwide increase of 4 percentage points in use is 1.4 percentage points. If the change in an estimate is larger than twice its standard error, we are 95% confident that the change we saw in

our sample reflects an actual change in use. The nationwide increase from 75% to 79% use fits this description, and so we are 95% confident that belt use actually rose in the past year. (In fact, a more complicated calculation yields 99.7% confidence in the increase.)

5.7 Computing the Margin of Error of a Use Rate

Similarly, we can be 95% confident that an actual use rate is within twice the standard error of that seen in the sample. For instance, the national rate of 79% seen in our sample has a standard error of 1.2 percentage points, and so we are 95% confident that belt use in the U.S. was between 77% and 81% in 2003.

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