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**Evaluation of the Effectiveness of Air Bags and Seat Belts:
Estimates of Lives Saved Among Front Seat Occupants of
Light-Duty Vehicles Involved in Collisions Attributable to the
Use of Seat Belts and Air Bags in Canada**

A Follow Up

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Evaluation of the Effectiveness of Air Bags and Seat Belts: Estimates of Lives Saved Among Front Seat Occupants of Light-Duty Vehicles Involved in Collisions Attributable to the Use of Seat Belts and Air Bags in Canada

A Follow Up

The installation of air bags into light-duty motor vehicles over the past decade has caused a debate and concern within and among organizations and governments with responsibilities for the safety of motorists (Stewart, Arora, & Dalmotas, 1998). Considerable discussion still surrounds the issue of the overall effectiveness of air bags and their impact on the safety of vehicle occupants.

To evaluate the impact and benefits attributable to the use of seat belts and the installation of air bags in light duty motor vehicles, a study was conducted at Transport Canada in 1998. The main objective of this study was to estimate the number of front occupant lives saved by both seat belts and air bags in light-duty vehicles involved in collisions over the eight-year period of 1990-1997. To accomplish this, a Seat Belt/Air Bag Evaluation Model was developed and used for measuring the independent and joint effects of seat belts and air bags on the safety of front outboard vehicle occupants. Details on the model, the modules comprising the model, the theoretical foundations of the study and its analytical methodologies can be found in Stewart, Arora, and Dalmotas (1998).

The study found that about 8,600 driver and right front passenger lives were saved by seat belts over the eight-year period of 1990-1997, and that about 152 driver and right front passenger lives were saved by air bags over the same eight-year period. The economic benefits, reported in this study that can be attributed to the use of seat belts by front occupants of light-duty vehicles are about \$12.9 billion over the eight-year period (1990-1997). The economic benefits accrued to the installation of air bags into the front seating positions of light-duty vehicles over the same eight-year period (1990-1997) are approximately \$228 million.

The aim of the present study is to extend the analysis conducted by Stewart, Arora and Dalmotas (1998) to the year 2000. Therefore, the methodology of the original study was used within the Seat Belt/Air Bag Evaluation Model, proposed by the authors. Input parameters for each of the years 1997-2000 were obtained from Transport Canada's Traffic Accident Information Database (TRAID). As well, the results from the National Annual Seat Belt Survey for each of the years 1997-2000 were used as input parameters for the model. Finally, data on the proportion of light-duty vehicles equipped with air bags for the front vehicle occupants in each of the years 1997-2000 was used to generate estimates through replication of the original study's methodology.

When the analysis conducted by Stewart, Arora and Dalmotas in 1998 was extended to the year 2000, it was estimated that 11,690 front outboard light-duty vehicle occupant lives were saved by seat belts over the eleven-year period of 1990-2000. The number of front outboard light-duty vehicle occupant lives saved by air bags over the same eleven-year period is 313.

From an economic perspective, the value of a ‘lost life’ (i.e., cost to society) is estimated to a financial loss of \$1,5 million. Therefore, the economic benefits that can be attributed to the wearing of seat belts by front occupants of light-duty vehicles over the eleven-year period of 1990-2000 are about \$17,5 billion. Those attributable to the installation of air bags into the front seating positions of light-duty vehicles over the same eleven-year period are approximately \$469,5 million. The same economic approach was used for estimating the economic benefits attributable to the use of seat belts and availability of air bags in the original study.

Table 1 presents the annual and cumulative estimates for the number of front light-duty vehicle occupant lives that have been saved in collisions due to wearing seat belts and availability of air bags for the eleven-year period of 1990-2000.

Calendar Year	Annual Number of Front Outboard Light-Duty Vehicle Occupant Lives Saved		Cumulative Number of Front Outboard Light-Duty Vehicle Occupant Lives Saved	
	Net Seat Belt Savings	Net Air Bag Savings	Net Seat Belt Savings	Net Air Bag Savings
1990	973	1	973	1
1991	1,036	3	2,009	4
1992	1,056	5	3,065	9
1993	1,114	11	4,179	20
1994	1,092	16	5,271	36
1995	1,168	28	6,439	63
1996	1,071	37	7,510	101
1997	1,051	51	8,561	152
1998	1,002	51	9,563	203
1999	1,062	55	10,625	258
2000	1,064	55	11,690	313

Table 1. Annual and Cumulative Estimates of the Number of Front Outboard Light Duty Vehicle Occupant Lives Saved by Seat Belts and Air Bags, 1990-2000

Graphical representation of the annual and cumulative results for the number of front light-duty vehicle occupant lives saved in collisions due to wearing seat belts or due to availability of air bags for the eleven-year period (1990-2000) are presented in Figures 1 and 2.

FIGURE 1

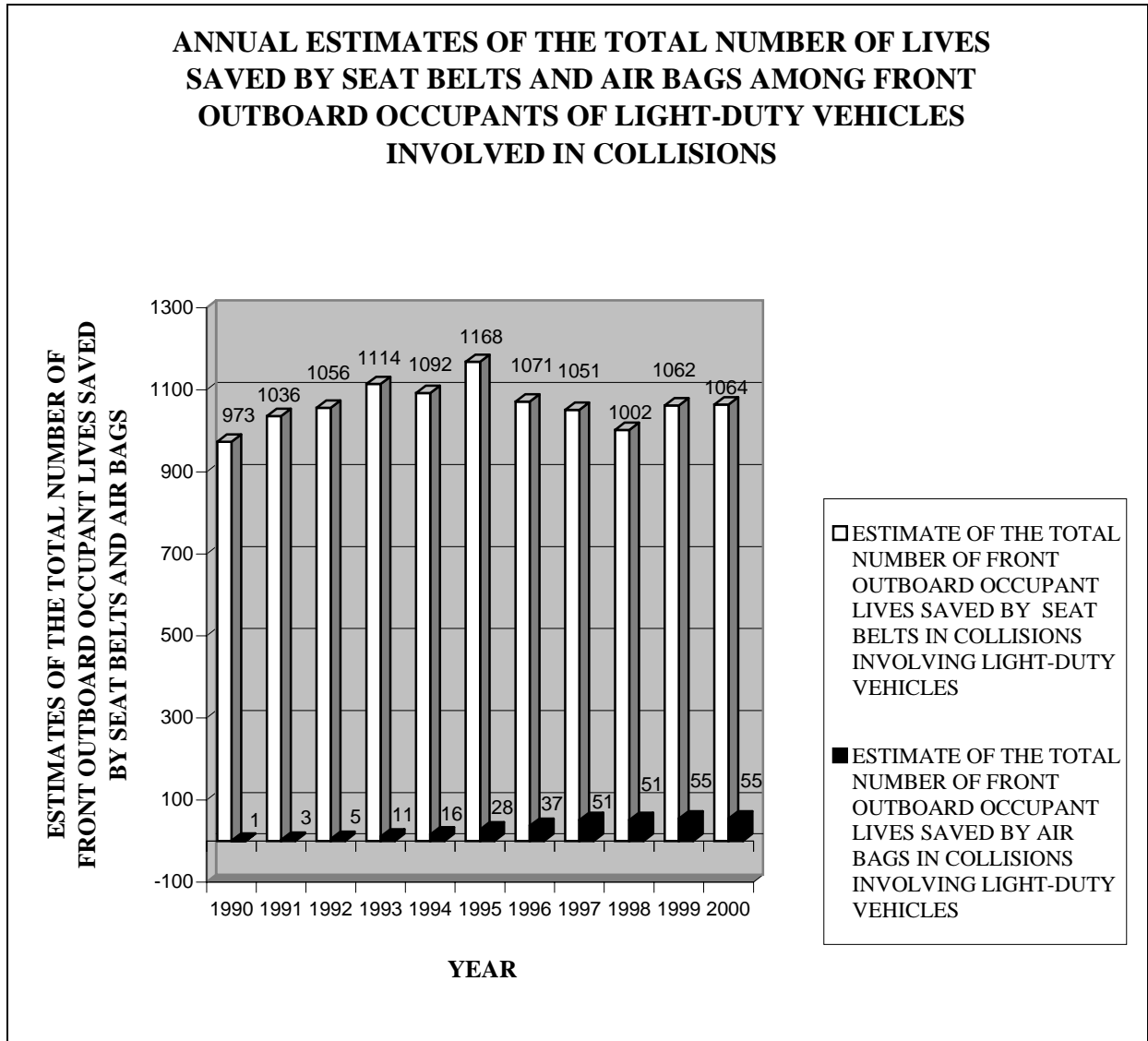
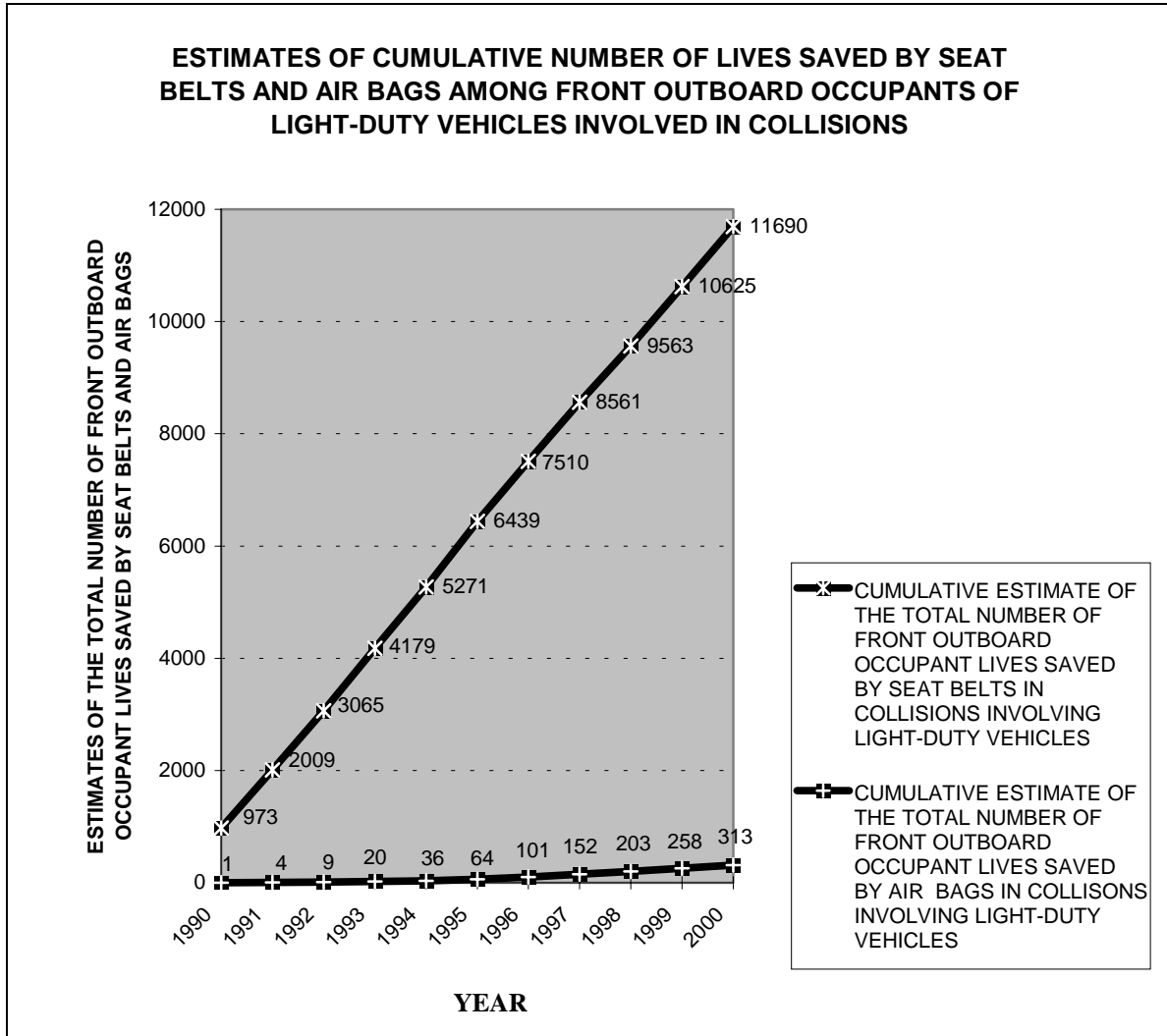


FIGURE 2



The results of Stewart, Arora and Dalmotas (1998) study, as well as the results from the follow up to the year 2000 study presented in this report, demonstrate that both seat belts and air bags independently and jointly provide protection and prevent fatalities among front outboard light-duty vehicle occupants.

Furthermore, it should be noted that this study as well as its follow up provide a conservative estimate of the number of front vehicle occupant lives saved by air bags. This stems from the fact that the proportion of vehicles equipped with air bags at the front seating positions involved in collisions is derived from vehicle registration data (DesRosiers Automotive Consultants Inc.). This approach assumes that all in-use vehicles have an equal likelihood of collision involvement. In fact, exposure is known to vary as a function of age of vehicle, average annual travel mileage for newer vehicles being greater than that for older vehicles (Hu & Young, 1999; Rochon, 1977). The savings calculations, in terms of actual lives-saved, are very sensitive to assumed vehicle exposure. For example, when the Seat Belt/Air Bag Evaluation Model (Stewart, Arora, & Dalmotas, 1998) is used to estimate the number of front vehicle occupant lives saved by air bags using simple exposure model and an assumed vehicle life span of 12 years, the estimated number of front vehicle occupant lives saved by air bags more than doubles. Therefore, exposure effects need to be carefully taken into account in the Seat Belt/Air Bag Evaluation Model. The updated model will need to be validated by comparing the predicted distribution of fatalities by model year and calendar year against the actual distribution observed in TRRID.

Glossary

Light-duty vehicle:

Includes vehicles such as pickups, vans and sport-utility vehicles with a gross vehicle rating (GVWR) of less than 10,000 pounds (4 536 kg).

Front outboard vehicle occupants:

Designates the occupants seated in the two front positions closest to the doors.

References

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