Figure 11.1. OBSERVATIONAL PLANS: Questions with a Causative Aspect 1

This Figure 11.1 contains two articles from *The Globe and Mail* with a common theme – the decreased number of traffic fatalities in 1994 in Canada (the *first* article EM9504)) and in Ontario (the *second* article EM9529). Of statistical interest is the different explanations suggested for these decreases. The articles remind us of the (usually severe) limitations on an Answer obtained with an *observational* Plan to a Question with a causative aspect.

EM9504: The Globe and Mail, March 28, 1995, page B23

Belts get credit for drop in deaths

Dramatic improvement in the fatality rate came when Canadians began to buckle up

BY PATRICK SULLIVAN
Special to The Globe and Mail

Most auto makers enjoyed robust profits in 1994, and by year's end the Canadians who drive their products were enjoying a dividend of their own – the country's lowest traffic-fatality figures in 39 years.

Transport Canada estimates that 3,021 motor vehicle drivers, passengers, motor cyclists and pedestrians were killed on Canada's roads in 1994, a 16.1-per-cent decrease from the 3,601 deaths recorded in 1993. It is the country's lowest total since 1955.

The department's data indicate that the 1994 decline is part of a general trend that began after 1973, when the record of 6,706 road deaths was set. By 1980, the annual total had dropped to 5,461 deaths, and by 1990 it fell to 3,966.

Chris Wilson, director-general of road safety and motor vehicle regulation at Transport Canada, says there are several reasons for the decrease but most of the credit has to go to increased seat-belt use.

He said surveys show that more than 90 per cent of drivers and passengers routinely buckle up today, and when seat-belt usage gets that high even most high-risk drivers, such as young men, are wearing belts.

"That is when you begin to see dramatic improvements," he said. As recently as 1986, surveys showed that only 63 per cent of Canadians were wearing seat belts.

The decline in traffic fatalities is most visible in hospital emergency rooms. "I personally have noticed it, and I think most emergency physicians would tell you the same thing," said Dr. Alan Drummond of Perth, Ont., a past president of the Canadian Association of Emergency Physicians.

Jan Ahuja, chief of emergency medicine at Ottawa's Civic Hospital, said seat belts are one of emergency doctors' best friends. In 1974, the year he graduated from medical school, their use was not mandatory and 6,290 people died in collisions. He attributes most of the 52-per-cent drop since then to the belts.

"The most severe injuries we see involve people who get in trouble by hitting a windshield or steering wheel, or being ejected following a collision – the very things a seat belt prevents," he said.

Safety experts esimate the belts have prevented 16,000 deaths and 300,000 injuries in Canada since 1980. Transport Canada says usage is now high in all provinces. In a 1994 survey, Newfoundland led with 95.7 per cent usage, and Manitoba came last at 86.1 per cent. The national average was 90.1 per cent.

Mr. Wilson said air bags have had an impact on traffic safety, but it is still relatively small because fewer than one in five cars on the road in 1994 were equipped with them.

"Where we do expect them to make a difference is in terms of major injuries that cause long-term problems, such as lost jobs, lifestyle changes and marriage breakdowns. Those numbers haven't been declining very quickly – there were 27,000 major injuries in 1985 and 25,000 in 1992. The decline is encouraging, but it's still small. I think air bags may have an impact by turning major injuries into minor ones."

Douglas Beirness, director of information for the Ottawa-based Traffic Injury Research Foundation, thinks traffic fatalities may now be approaching their lower limit.

He said the auto industry recognized that customers are interested in safety features and moved to provide them, but whether drivers use them properly is another question. Anti-lock brakes, which are now standard on many cars, were expected to reduce the number of accidents because they allow drivers to maintain steering control when brakes are applied, he said, "but this hasn't happened because people don't know how to use them properly."

And regardless of safety improvements, Dr. Ahuja said, a huge problem remains. "The majority of accidents we see are still related to alcohol use, and if I could make one recommendation for change it would be in this area."

A recent study, co-written by Dr. Beirness, supports that view. It found that almost half of all drivers killed on Canadian roads in 1991 had been drinking, and 62 per cent of them had a blood-alcohol level of at least 150 milligrams a decilitre; the legal limit is 80 mg/dl. The proportion of heavily impaired drivers has actually increased since the 1970s, the study indicated.

Until this drunk-driving problem is solved, many physicians say, it won't matter how safe auto makers make their cars.

1 Describe concisely the *Question* that underlies the article EM9504 reprinted above.
- Identify the *response* variates mentioned in the article and the *focal* (explanatory) variate.

2 Explain briefly whether the data on annual traffic fatalities in Canada come from investigations with *experimental* or *observational* Plans, and indicate what *statistical* issue is raised by this matter in the context of the article EM9504.

3 In our use of the FDEAC cycle, we distinguish (up to) six categories of error – study, non-response, sample, measurement, model and comparison. Outline, in the order you consider to be of *de*creasing importance, the six categories of error in the figure of 3,021 traffic fatalities in Canada in 1994, given early in the second paragraph of the article EM9504 reprinted above.

(*continued overleaf*)

EM9529: The Globe and Mail, June 22, 1995, page A10

ANALYSIS / *Mike Harris hates it and promises to kill it, but accident statistics and public opinion may be vindicating the NDP's notorious pet project*

Taking more than a passing glance at photo radar

"Following a thorough review of safety statistics, both here in Ontario and elsewhere, we have concluded that photo radar is simply the government cash grab we had always expected."

– Mike Harris

BY MARTIN MITTELSTAEDT
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Among the NDP policies that irk in-coming Ontario premier Mike Harris the most is photo radar.

The Progressive Conservative Leader has denounced the device as a government revenue grab disguised as a highway safety measure. He has suggested that photo radar is another step along the road to a society run by an all-intrusive state where law enforcement officials keep tabs on people's every move.

But Mr. Harris may have the wrong story on photo radar.

The new devices haven't turned out to be a big revenue source for the government. And although many factors affect highway safety, the introduction of photo radar has coincided with the first steep drop in the number of fatalities on Ontario roads in four years.

And perhaps even more surprising than the reduced death toll is the rising public acceptance of photo radar. A recent poll by the Environics Research Group found that most Ontario residents approve of the devices being used to fine speeders.

Ontario Provincial Police began using photo radar last Aug. 15, part of a pilot project running to the end of this month. To date, police have issued 240,000 tickets for fines totalling $16-million. The NDP said photo radar would raise as much as $200-million annually.

The safety argument will be answered later this year, when the Ministry of Transport releases a report on the pilot project. A report by the ministry earlier this year indicated that the devices have already had a major impact by causing drivers to slow down.

Mr. Harris made his pledge to drop photo radar in March, basing his opinion on only four months of accident statistics at one OPP detachment and at one OPP district. The figures he cited seemed to show that photo radar had no effect on safety.

But something did occur to make Ontario roads safer last year. According to figures compiled by the OPP, the number of highway deaths they investigated plunged to 634, a drop of 118 (16 per cent). It was the first major decline in the fatality toll in four years.

The number of deaths had remained stable in the first four years of the decade, averaging 750 annually.

The reason for the sharp drop in the death toll is open to interpretation. Highway carnage has been in a long-term decline. Experts have attributed past drops in death rates to seat-belt use, campaigns against drunk driving and the introduction of safety features such as air bags.

Determining the precise effect of photo radar, given these other factors, is difficult. Last year also marked the start of graduated drivers licences in Ontario, meaning that inexperienced drivers must wait longer to have full use of the roads.

Mr. Harris said he opposed photo radar because alcohol is the key factor in 40 per cent of all driver fatalities. Excessive speed was cited in 18 per cent of fatal collisions.

Mr. Harris's statistics came from the 1992 Ontario Road Safety Annual Report by the Ministry of Transport, which covers all accidents, including those on city streets.

But looking only at highways, which is where photo radar is in use, the picture is completely different.

In fatal accidents investigated by the OPP over the past five years – mainly on highways – speed was the most important contributing factor. It was cited in 51 per cent of deaths in 1989, 44 per cent of deaths in 1990, 56 per cent in 1991, 42 per cent in 1992, 28 per cent in 1993 and 25 per cent in 1994.

It was only last year, for the first time in five years, that alcohol exceeded speeding as a cause of death, being cited as a contributing factor in 28 per cent of fatal accidents.

A politician hunting for easy votes might have found it in offering to cancel photo radar two years ago, when the idea was first advanced by provincial officials and was deeply unpopular.

But an Environics poll conducted in April found that a majority of Ontarians, 55 per cent, approved of used photo radar to fine speeders, while 44 per cent were opposed.

"We've actually seen support climbing at a very slow but steady pace since 1993, when we first started asking the question," said Jane Armstrong, a pollster at Environics.

The current poll results are an almost exact reversal of the figures from 1993.

Part of the reason for the growing support is that the longer photo radar is on provincial highways, the more used to it drivers become. Ms. Armstrong also said many respondents approve of the reduction in highway speeds that have been the major observable effect of the introduction of the technology.

The poll also found major variations in support and opposition to the devices.

Women are more strongly in favour of photo radar than men, while the strongest opposition is among young males aged 18 to 24, the group usually found to be the worst drivers in accident surveys. "You get the image of the young male not being too keen," Ms. Armstrong said.

4 Describe concisely the *Question* that underlies the article EM9529 reprinted above.
- Identify the *response* variates mentioned in the article EM9529 and the *focal* (explanatory) variate.

Compare and contrast your answer with that to Question 1 overleaf on page 11.1.
- Name the four *confounding* variates mentioned near the middle of the article EM9529.

5 Using information in the article EM9529 reprinted above, comment on the time period for the latest reduction in the number of fatalities on Ontario roads and the time period when photo radar was in operation.

6 The process of *stratifying* (or *stratification*) in statistics means 'subdividing'. Identify the stratifying of the 1994 Ontario traffic fatality data mentioned in the article EM9529, and explain briefly its contribution to answering the Question being asked.