BEST PRACTICE PROGRAMS FOR INJURY PREVENTION

Ontario Injury Prevention Resource Centre

Best Practice Programs for Injury Prevention.
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Foreword

Best Practice Programs for Injury Prevention provides summaries of important, successful injury prevention programs from around the world. We hope you will find this report informative, encouraging, and inspiring when you plan injury prevention programs in your community.

Best Practice Programs for Injury Prevention is a publication of the Ontario Injury Prevention Resource Centre. This report is a companion document to Community Action Guide for Injury Prevention produced by OPHA in 1993 (revised and reprinted, 1995). Funding for Best Practices was provided by the Ontario Ministry of Health, Emergency Health Services Branch.

The Ontario Injury Prevention Resource Centre was established in 1994 and is located within the Ontario Public Health Association. The Resource Centre provides support and networking opportunities to community injury prevention initiatives throughout the province of Ontario. The Ontario Injury Prevention Resource Centre is supported by the Ontario Ministry of Health, Emergency Health Services Branch.

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Bev Woods

Coordinator
Ontario Injury Prevention Resource Centre

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Best Practice Programs for Injury Prevention

INTRODUCTION

This report identifies published studies of injury prevention programs which have yielded positive outcomes. These programs are called "best practice" programs because they have been formally evaluated and found to achieve successful results.

Methodology

In order to identify best practice programs, the following methodology was used:

1. Literature searches were done with the indexes *MEDLINE*, *CINAHL*, *Sport Discus* and *ERIC*[1] using the subject headings "Traffic Accidents - Prevention and Control" and "Accidental Falls - Prevention and Control".[2] The searches were limited to articles published between January 1, 1990 and February 28, 1995.[3] The searches yielded 703 articles. Citations for these articles are provided in Appendix A.

2. An initial selection process was undertaken. The following criteria were applied: available in a journal which can be accessed, provided in English or French, pertains to programs in developed countries and has relevance to one of the four priority areas for injury prevention designated by the Ontario Ministry of Health in 1992, namely,
   - prevention of cyclist injury among the 5 to 15-year age group;
   - prevention of injuries to motor vehicle occupants in the 16 to 24-year age group;
   - prevention of injuries to motor vehicles occupants in all age groups through increased use of seat belts and decreased impaired driving; or
   - prevention of falls in the elderly population.

This reduced the pool of articles to 150. Citations for these articles are provided in Appendix B according to priority area.

[1]Searches conducted using *MEDLINE* and *CINAHL* yielded the largest number of relevant articles. *Sport Discus* was a useful source of articles relating to falls in the elderly. *ERIC* was not found to be a useful database as it does not use the subject headings: "injury", "accidents" or "safety".

[2]The term "accidental" is no longer used in the injury prevention field because of the largely preventable nature of these injuries. However, the term is used in *MEDLINE*.

[3]These databases are available at some hospital libraries and most university libraries.

3. A second selection process was undertaken. Only articles which described soundly evaluated programs (i.e., studies which used a meaningful sample size, applied statistical tests to the results and demonstrated some generalizability) were selected. This final sample consisted of 12 articles describing best practice programs.

Organization of the report

Descriptions of the best practice programs are grouped as follows:

- **Section A:** Reducing bicyclist injuries in 5 - 15-year-olds
- **Section B:** Preventing motor vehicle traffic injuries
- **Section C:** Preventing injuries due to falls in the elderly.

Section B is divided into four parts: (i) preventing traffic injuries through decreased impaired driving, (ii) preventing traffic injuries through use of seat belts; (iii) preventing traffic injuries through driver education and restrictions for young drivers; and (iv) preventing traffic injuries through curfews.

Each best practice program is described under the headings:

- **Reference:** full citation for the article
- **Goal:** purpose
- **Process:** how the program was offered or how the study was done, including costs, staffing, target population, etc.
- **Results:** evidence of success, such as decrease in number of injuries, or increase in number of child restraints used
- **Discussion:** implications of the findings.

Additional programs in each of the priority theme areas are included under the heading "Other Relevant Research". These programs, although they do not meet the above criteria, have produced valuable results, pertinent to injury prevention in Ontario. These studies are described under the following headings: **Purpose, Findings, Conclusions and Recommendations.**

A summary of the key findings is provided at the end of each section. These findings are discussed in the context of other research results and current policy and programs in Ontario.

Terminology

Two key terms are used in the articles -- intervention and control. "Intervention" refers to the particular technique that has been used to try to bring about a desired outcome. In this document, all interventions are intended to reduce injuries. The group that is exposed to the technique is known as the "intervention group". The group who does not receive the intervention is known as the "control group". Therefore, the impact of an intervention is measured by comparing outcomes for the intervention group with those for the control group.

Some acronyms which are used in this report are:

DUI - Driving Under the Influence
BAC - Blood Alcohol Concentration
RBT - Random Breath Testing
DDP - Drunk Driving Program
HMO - Health Maintenance Organization.

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SECTION A

Reducing Bicyclist Injuries in 5 - 15-Year-Olds

Best Practice Programs for Injury Prevention

SECTION A

Reducing Bicyclist Injuries in 5 - 15-Year-Olds

BEST PRACTICE PROGRAMS

PROGRAM # 1:

MANDATORY BICYCLE HELMET USE: EXPERIENCE IN VICTORIA, AUSTRALIA.

Reference:

Vulcan, PA, Cameron MH, Watson WL. (1992) Mandatory bicycle helmet use: experience in Victoria, Australia. *World Journal of Surgery* 16:389-397.

Goal:

To reduce injuries through mandatory bicycle helmet use.

Process:

In 1990, the state legislature in Victoria, Australia passed the first state law in the world requiring the use of an approved, securely-fitted bicycle helmet when driving on highways, roads, bicycle paths, shared footways, and public parks. Under this law, no one was also allowed to carry another person on a highway unless that person was wearing an approved helmet. (Certain people were exempt such as those with certain medical conditions, and practising members of an organised religion who wear a headdress.)

Considerable work went into the campaign to get this law passed. Some of the initial impetus was evidence that showed different patterns of injury for motorcyclists and bicyclists. The frequency of skull fractures was found to be significantly higher among bicyclists - who seldom wore helmets - than among motorcyclists - who nearly all wore helmets (McDermott & Klug, 1982). Several related laws were also passed such as those requiring seat belts, and those governing the use of general purpose helmets. An educational program for young teens was begun promoting the use of bicycle helmets, and requiring that helmets be worn for all school cycling activities.

Research was also commissioned to determine the attitudes of bicyclists to helmet wearing (1983). This study found strong negative reactions by older boys to bicycle helmets, heightened sensitivity among older boys to peer group pressure, and a lesser effect of peer pressure on younger boys and girls. The study concluded that promotional activity should be targeted at the mothers of primary school age children.

The research also concluded that the key points to communicate to the public were: the availability of helmets that meet approved safety standards; the seriousness of the head injury problem, both in collisions with cars and in single bicycle accidents; the degree of protection provided by the helmets; and the importance of the helmets for younger, less skilled bicycle riders. Based on this research, two TV and radio commercials that aired for several months and a pamphlet were developed. These were part of an extensive promotional and educational campaign about bicycle safety.

A helmet promotion task force was also established made up of representatives from a wide variety of organizations including cyclists, physicians, injury prevention groups, teachers and police, as well as bicycle retailers, helmet importers, and helmet manufacturers. One of their successful activities was the organization of bulk helmet purchasing schemes that allowed retailers to make helmets available to the public at reduced rates.

When reviewing the steps towards passage of the law, the *Report of the Parliamentary Social Development Committee* was the most important factor. The report presented 11 recommendations regarding child pedestrian and bicycle safety, and their primary recommendation was mandatory helmet use.

Results:

Usage

- Under the helmet promotion and rebate schemes described above, usage rates improved between 1983 and 1990 from 5% to 70% for primary school children, from 2% to 20% in secondary students, and from 27% to 40% for adults.
- After the 1990 mandatory helmet legislation, usage rates improved to 70% - 90% for all groups.

Injury reduction

Initial effects of the law on bicyclist head injuries have been measured by examining data from three sources: insurance claims from cyclists who were killed or hospitalised following collision with a motor vehicle; records of child cyclists' presentations at the Emergency Departments of three hospitals in one city; and records of admissions of bicyclists to public hospitals in Victoria as a result of crashes. Findings:

- As the use of helmets increased, the number of bicyclists killed or admitted to hospital with head injuries had fallen consistently.
- In the six months following the introduction of the law, the number of bicyclists with head injuries decreased by 46% relative to the corresponding period during the previous year.
- Since the 1980s, the number of head injuries has fallen consistently, while the number of other injuries increased and then remained constant.
- **During the 6-month period after the law, the number of head injuries decreased by 46% and the number of other bicyclist injuries decreased by 35%.** (The authors note that although the number of bicyclists involved in collisions has decreased since the law was passed, either due to reduced bicycle use or reduced risk, the total number of road traffic injuries in 1990 was about 20% below the 1989 level.)
- The number of bicyclists less than 15 years of age with a head injury decreased by 40% from the previous year.
- The number of child cyclists involved in crashes and presenting at hospitals also decreased by 25%.
- Admissions of bicyclists to public hospitals with head injuries also decreased during the post-law period as did the number with other injuries; head injuries decreased by 47% and bicyclists with other injuries decreased by 30%.
- Overall, the reduction in the number of bicyclists with head injuries following the helmet law seems to have been achieved by (1) reducing the number of cyclists involved in crashes and (2) by reducing the risk of head injury for cyclists who were injured.

Discussion:

The authors believe that a full year of data about bicyclist injuries after legislation is necessary to achieve results with higher levels of statistical significance. This further

data would also help determine if the reduction in injuries could be correlated to increases in helmet-wearing rates.

Mandatory helmet use legislation in Ontario differs from that of Victoria in at least one important area - it is restricted to those under 18 years of age. Therefore, the reduction in injuries observed in Victoria may not be duplicated in Ontario. Kraus, Peek and Williams (1995), who researched motorcycle helmet laws in California, reported that a law requiring helmets only for those under 15½ years of age resulted in only 58% compliance compared with 99% when helmets became mandatory for everyone. Ontario's current law sends the message that riding a bicycle without a helmet is risky only for those under the age of 18, whereas research has clearly demonstrated that the risk of head injury is present for *anyone* who cycles without a helmet (McDermott, 1992). Ontario's law places helmet wearing in the category of other age-restricted behaviours such as purchasing cigarettes or drinking alcoholic beverages, rather than in the same category as universal laws such as wearing seat belts or obeying posted speed limits.

The relevant research supports the Ontario helmet legislation as a first-step that will raise awareness about the importance of helmets while cycling and should also increase use in the targeted age group. However, since research indicates that the legislation would have a much greater impact if it included all cyclists, the immediate goal for community programs should be to continue to promote helmet use; the long-range goal should be legislation making helmet use mandatory for all.

Compliance with the bicycle helmet law in Ontario will be difficult to evaluate since, unlike Victoria, there have not been any regular, systematic, observational helmet use surveys throughout the province. Self-reported bicycle helmet use among those aged 12 and over was asked in the 1990 Ontario Health Survey and again in the 1995 National Population Health Survey, but this data excludes many of those in the high-risk group - 5 to 11-year-olds.

It is important to note that large increases in helmet use were observed following the bicycle helmet law in Victoria despite little or no enforcement of the law. This pattern has also been found immediately after the passage of seat restraint laws (Tipton, Camp and Hsu, 1990) and motorcycle helmet laws (Kraus, Peek, and Williams, 1995). The most recent Ontario seat restraint survey suggests that increased belief in the safety benefits of a law are important to improvements in compliance rates. In this survey, individuals stated that they were more likely to have begun to increase their

seat belt use if they had been in an injury-producing motor vehicle crash. In addition, a change of reason was seen between those surveyed in 1984 and those in 1991. In 1991, a much higher percentage indicated that they wore their seat belt "for safety" rather than "because it is the law". The percentage who wore their seat belts also increased by 15% from 1984 to 1991.

Following the Victoria bicycle helmet law, *all* cyclist injuries, not only head injuries, decreased by 35%. The authors suggested this was due to both a reduction in the number of bicyclists, and a reduction in risky cycling behaviours. This same pattern was observed in California following the universal motorcycle helmet law reported above. The authors of that study also indicated that the number of motorcycles purchased, the number of motorcyclists observed, as well as the number of injuries and deaths also decreased after the law. They concluded that motorcyclists who objected to wearing a helmet declined to purchase or ride a motorcycle after the passage of the law, and that this group represented individuals who are generally greater risk takers and at much higher risk for motorcycle crash and injury. Since Ontario's bicycle helmet law does not include all age groups, this pattern of decreased overall cyclist injuries or fewer cyclists in other high risk groups (16 - 24-year-olds) may not be observed.

Ontario does have similar injury databases to those in Victoria, therefore the same comparisons of bicyclist injury outcome measurements pre- and post-law for the target age group are possible. Comparisons could also be made between the high-risk age groups and those age groups not included in the law but who might also have high rates of bicycle use, such as college and university students who often use bikes as their main means of transportation.

The promotional strategy leading up to the helmet legislation in Victoria and the participation of the Education Department in the campaign present several ideas which could be effective in Ontario communities. In particular, the Australian strategy of promotion coupled with helmet rebates and price reductions could prove beneficial on a province-wide basis for Ontario. Recent research in a suburb of Toronto by Parkin et al. (1993) demonstrated that helmet education and promotion resulted in increased helmet use only in elementary school children in high-income areas, suggesting that the cost of helmets could be a barrier to their use. Higher motor vehicle traffic injury rates have also been reported in children from lower income families in urban areas (Dougherty, Pless and Wilkins, 1990).

The promotional strategy in Victoria was based on research concerning the best way to attractively market the use of helmets. A Canadian study of Grade 4 to 6 students in Montreal (Otis, Lesage, Godin, et al, 1992) identified the following factors as most influential in children's intentions to wear a helmet: helmets must be seen to be fun and attractive; helmets can provide a new look and a sporting image; and friends must approve of and value wearing them. In addition, as in Victoria, the authors noted that parents, particularly mothers, can reinforce their children's use of helmets; their involvement should be encouraged.

In one respect, Ontario should have an advantage over Victoria in the promotion of helmet use because the use of helmets is already accepted and required for children who play hockey. It should be relatively easy for parents to see that if a child's head needs protection from the impact of a flying puck or from collision with the boards, then the child's head would also need protection in a collision with a car or an impact with pavement or concrete while riding a bike.

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OTHER RELEVANT RESEARCH

STUDY # 1:

THE BICYCLE: A DEVELOPMENTAL TOY VERSUS A VEHICLE.

Reference:

Agran PF, Winn DG. (1993). The bicycle: a developmental toy versus a vehicle. *Pediatrics* 91(4):752-755.

Purpose:

To determine if there was a greater likelihood of injury resulting from using a bicycle for fun versus for transportation.

Findings:

This survey was done in Orange County California with 289 bicyclists aged 0 - 14 years who came to the emergency department for evaluation and treatment.

- Those 10 to 14 years of age used their bikes more frequently for transportation or a purposeful trip; they also rode on multi-lane streets and more frequently rode alone.
- Those who used their bikes for play were younger, rode closer to home, and rode on residential streets with fewer traffic lanes, lower posted speed limits, and lighter traffic.
- No difference in number, severity or location of injury was found between children who used their bikes for play versus those who used them for transportation.

Conclusions and Recommendations:

- An appropriate age at which children are permitted to bicycle in the street is required.
- Bicyclists must be separated from larger vehicle traffic.
- Bicyclists must be taught the rules of the road.
- Licensing bicyclists should be considered.
- Helmets are required.

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STUDY # 2:

PREVENTION OF BICYCLE ACCIDENTS.

Reference:

Simpson AH, Mineiro J. (1992) Prevention of bicycle accidents. *Injury* 23(3):171-173.

Purpose:

To examine causes of bicyclist injuries in order to identify directions for prevention.

Findings:

In Oxford, England, detailed information was collected on 1,831 cyclists injured over a 29-month period.

- Among children 0 - 7 years old, 87% of accidents were due to cyclist error.
- Among 8 - 12-year-olds, 66% of accidents were due to cyclist error.
- The 8 - 12-year-old cyclists were twice as likely to have caused the accident if they had not had formal training.
- Over the age of 18 years, 41% of accidents were due to another road user.
- A motor vehicle was involved in one third of the accidents.

Conclusions and Recommendations:

- Children under the age of eight should not be allowed on public roads, and older children should only be allowed after formal training.
- Bicycle training should be included in the school curriculum.
- A campaign to raise awareness of motorists could reduce the number of bicycle accidents.
- More roads and tracks should be designated to bicycle use.
- Cyclists should be encouraged to wear more protective gear such as helmets.

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STUDY # 3:

CYCLING HEALTH BELIEFS, CRASH EXPERIENCES AND NIGHT CYCLING BEHAVIOUR OF 13-YEAR-OLDS.

Reference:

Langley JD, Williams SM. (1992) Cycling health beliefs, crash experiences and night cycling behaviour of 13-year-olds. *Journal of Paediatric Child Health* 28:231-235.

Purpose:

To determine the relationship between certain beliefs about health to crash experiences, bicycling at night, and the use of tail-lights at night.

Findings:

The study involved 730 children aged 13 in New Zealand.

- Only a minority of the 13-year-olds interviewed said that they were not worried about being involved in a crash with a car.
- The majority did not consider that crashes were a matter of chance. They also did not think that there are significant barriers to adopting safety measures.
- 13-year-olds tended to consider the chances of being apprehended by a traffic officer for failure to use a tail-light at night to be low.
- There was no consistent pattern between health beliefs and either cycling at night, using a tail-light at night or crash experiences.

Conclusions and Recommendations:

Health beliefs and crash experiences have little influence on cycling without a light at night for 13-year-olds.

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STUDY # 4:

TRAINING YOUNG CYCLISTS TO COPE WITH DYNAMIC TRAFFIC SITUATIONS.

Reference:

van Schagen IN, Brookhuis KA. (1994) Training young cyclists to cope with dynamic traffic situations. *Accident Analysis and Prevention* 26(2):223-230.

Purpose:

To determine the value of two training methods to teach young cyclists how to deal with traffic at intersections.

Findings:

Forty-nine 8 - 9-year-olds in the Netherlands participated in the study. One training method relied on direct modelling of correct behaviours, and the other focused on the rules of safe cycling.

- Children initially performed better on a knowledge test after the rule training, but these gains were lost after one month.
- Neither training method had any effect on observed cycling behaviour.
- Correct application of the priority rules appeared to be very difficult to teach.

Conclusions and Recommendations:

Cyclists at this age seem to apply informal rather than formal rules when dealing with other traffic. These informal rules should form the starting point for training activities of young cyclists because formal rules do not fit into children's cognitive framework, and therefore cannot be stored and retrieved effectively.

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SUMMARY OF BEST PRACTICE PROGRAMS

REDUCING BICYCLIST INJURIES IN 5 - 15-YEAR-OLDS

- Bike safety promotion, including helmet promotion and helmet cost reduction schemes, is needed in elementary and high schools.
- The current helmet law should be extended to include all pedal cyclists.
- Helmet use surveys are needed to evaluate helmet use initiatives.

SECTION B

Preventing Motor Vehicle Traffic Injuries

Best Practice Programs for Injury Prevention

SECTION B

Preventing Motor Vehicle Traffic Injuries

PART I:

PREVENTING TRAFFIC INJURIES THROUGH DECREASED IMPAIRED DRIVING

BEST PRACTICE PROGRAMS

PROGRAM # 1:

EVALUATION OF EDUCATIONAL INTERVENTION UPON KNOWLEDGE, ATTITUDES, AND BEHAVIOUR CONCERNING DRINKING/DRUGGED DRIVING.

Reference:

Kooler JM, Bruvold WH. (1992) Evaluation of educational intervention upon knowledge, attitudes, and behaviour concerning drinking/drugged driving. *Journal of Drug Education* 22(1):87-100.
[Detailed description of the program is available from: William H. Bruvold, 503 Warren Hall, School of Public Health, University of California, Berkeley, CA 94701.]

Goal:

To evaluate an educational program for drivers under 18 regarding the dangers of drinking and driving. (Driving under the influence of alcohol is referred to in this manual as "DUI".)

Process:

The program took place in Contra Costa County, California, and is similar to a program developed in the Federal Republic of Germany. It is based on the principal that young people who have an internalized belief that DUI is inappropriate will not do so (Klitzner, 1987). The program is designed to develop the attitudinal and behavioural components of such a belief by providing: (1) information on the laws and consequences of DUI; (2) alternatives to DUI, such as public transportation and

designated drivers; and (3) general and specific skills to resist peer pressures regarding DUI.

Participants are referred to the program by probation officers. They are required to attend 18 hours of classes on three consecutive weekends. Participants take part in knowledge tests before and after, as well as other tests to assess changes in their attitudes and behaviours.

Between 1983 and 1988, 100 juvenile DUI offenders took part in the program. Those who did not attend the program formed the primary comparison group; those who were convicted before the class was offered formed a secondary comparison group.

Results:

The tests showed that the class had a significant increase in DUI knowledge and a significant improvement in DUI attitudes and behaviours as a result of the classes. Furthermore, participation in the classes was associated with a substantial reduction in repeated DUI offenses, and this decrease could not be explained by the independent variables of age, gender, or race.

Discussion:

The participants in this study were self-selected rather than having been randomly assigned to treatment and control groups. The variables of age, gender and race were rejected as contributors to the lower recidivism rates, however other untested variables might have been factors in their participation. For example, young offenders with serious drinking problems might have opted out of the education program, and might be more likely to drink and drive again whether or not they participated in the education program.

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PROGRAM # 2:

CALIFORNIA'S YOUTHFUL DRUNK DRIVING PROGRAM REDUCES DRIVING UNDER THE INFLUENCE (DUI) RECIDIVISM.

Reference:

Featherstone, K. (1994) California's youthful drunk driving program reduces driving under the influence (DUI) recidivism. *Journal of Trauma Nursing* 1(2):43. [Detailed description of the program is available from: K. Featherstone, 7425 Westgate Drive, Citrus Heights, CA 95610.]

Goal:

To reduce repeat DUIs among youth.

Process:

Under California law, the courts can sentence 16 - 25-year-olds who have been convicted of driving under the influence (DUI) to participate in this program instead of paying a heavy fine. In addition, participation in the program may mean that they do not have their driver's licence suspended for as long a time. Most participants are first-time offenders.

Initial funds were provided by a federal grant. After the program is established, it sustains itself through participant fees of $75-$100 US.

The program consists of four phases:

- *Orientation and Assessment:*
  participants are assessed for their appropriateness for the program.
- *Coroner's Office Visit:*
  participants see a graphic slide presentation and learn about alcohol-related deaths investigated by the coroner's office.
- *Observation in a Trauma Centre:*
  participants observe emergency and trauma care during a high-use period, and they are given tasks to complete from a wheelchair.
- *Wrap-up Workshop:*
  participants discuss their experiences during the program and their plans for changing their drinking behaviour.

Results:

The program has been in place for five years; it has been adopted in seven counties in California, and plans are being made to expand it. No information was given about numbers of participants.

The usual recidivism rates for DUI offenders are 15% - 30%. Repeat DUI offense rates for participants in this program were very low - "between 1% and 2%".

Discussion:

This was a report rather than a full research article, and does not report on any detailed evaluations of the program. Unless the success of this program is attributable to the fact that the participants had decided to change their drinking behaviours and would have done so without the program, the very low recidivism rate suggests that this is a very successful program. This is supported by the findings in one California county where they found a 32% recidivism rate for those who enrolled in the program but did not complete it.

Somewhat similar programs are in place in Canada: CHAT - Community and Hospital Against Trauma (developed at Hamilton General Hospital, Ontario), PARTY - Prevent Alcohol Related Trauma in Youth (developed at Sunnybrook Hospital, Toronto, Ontario) and IMPACT - Impaired Minds Produced by Alcohol Cause Trauma (developed in London, Ontario). These Canadian programs incorporate an additional feature in that they expose participants to first-hand accounts from young people who have been involved in serious motor vehicle accidents. Weider (1994) provides details of how the PARTY program has been used in Calgary, Alberta, and includes anecdotal comments from participants. No evaluative results for the PARTY, CHAT or IMPACT programs were available at this printing, however the findings of both Kooler (above) and Featherstone would suggest that these Ontario programs should result in a reduction in DUI.

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PROGRAM # 3:

DRINK-DRIVING LAW ENFORCEMENT AND THE LEGAL BLOOD ALCOHOL LIMIT IN NEW SOUTH WALES.

Reference:

Homel R. (1994) Drink-driving law enforcement and the legal blood alcohol limit in New South Wales. *Accident Analysis and Prevention* 26(2):147-155.

Goal:

To evaluate the effectiveness of a law lowering the legal blood alcohol concentration (BAC) from .08% to .05%, and the effectiveness of Random Breath Testing (RBT).

Process:

A law reducing the legal BAC was introduced in New South Wales in 1980, and RBT was introduced in 1982. These moves were part of a series of initiatives designed to decrease road traffic crashes and injury. Included in the initiatives were a child restraint law, increased fines for driving under the influence, lower speed limit, and mandatory breath testing.

The reduction of the legal BAC to .05% received headline treatment in the newspapers but was not supported by paid publicity, and police enforcement levels were no higher than usual. RBT however, was introduced with extensive media publicity and was enforced in a highly visible and energetic manner by police. The government increased penalties for drinking and driving, and introduced compulsory blood testing for drivers admitted to hospital after an accident.

In the RBT checkpoints, motorists were selected randomly and all drivers pulled over were asked to take a preliminary roadside breath test, regardless of the type of vehicle or their manner of driving. No attempt was made to detect symptoms of alcohol use through observation, as is done in sobriety checkpoints in the United States. Those who test positive were detained for a more detailed breath analysis that provided a reading that can be tendered as evidence in court.

Results:

- Random Breath Testing resulted in an immediate 36% reduction in alcohol-related fatalities and serious injuries, and an overall reduction of 22% in fatal crashes.
- These improvements were sustained in the five following years that were included in the analysis.
- The number of fatalities on main roads decreased more than did the number on side roads.
- The reduction in the legal BAC had an impact on Saturday fatal crashes only, reducing fatalities by 13%.
- The effect of the lower legal BAC was greatly boosted by the implementation of RBT.
- The effect of RBT was much more marked on weekends and holidays.
- None of the other safety initiatives had a significant impact on accident rates.

Discussion:

The authors consider the drop in weekend fatalities to have most likely been caused by the .05% law that acted as a deterrent for some drivers who feared getting caught, and indirectly provided an excuse for some drinkers to limit their consumption. However, because the law was not well publicized, and because enforcement at that time was based on detection, the effect was necessarily limited. Thus the law likely increased the perceived probability of arrest because drinkers believed that they had a greater chance of failing the test if they continued to drink at their accustomed levels.

The authors also comment that the way a .05% law is enforced is critical, as is the degree of public support for the lower limit. Introducing both the .05% law and RBT could be expected to maximize the traffic safety impact. The surveys in Australia suggest that laws like RBT and .05% BAC become more popular *after* they are enacted.

This study also supports zero tolerance for BAC for beginning drivers, since there is strong public support for measures that would deter inexperienced drivers from engaging in illegal behaviour (drinking underage, or drinking and driving). This type of policy has also proven effective in reducing fatal crashes on weekends, which is one of the time periods shown to have the highest rates of teen crashes.

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PROGRAM # 4:

MANDATED SERVER TRAINING AND REDUCED ALCOHOL-INVOLVED TRAFFIC CRASHES.

Reference:

Holder HD, Wagenaar AC. (1994) Mandated server training and reduced alcohol-involved traffic crashes: a time series analysis of the Oregon experience. *Accident Analysis and Prevention* 26(1):89-97.

Goal:

To determine the value of training bartenders and managers as a means to reduce alcohol-related traffic accidents.

Process:

A state-wide mandated training program for alcohol servers was established in Oregon in December, 1986. The goal was to instruct servers regarding the dangers of DUI so they would take responsibility for monitoring alcohol consumption of customers who would be driving. Servers and managers/owners completed this training once over a five-year cycle.

Results:

- By 1990, over 50% of managers and servers had been trained.
- Following the implementation of the server training policy, there was a statistically significant reduction in single-vehicle night-time traffic crashes involving high percentages of alcohol. At the end of the third year of the program, there was a 23% reduction in crashes - a rate even higher than that accomplished by raising the legal drinking age to 21.
- Further research is needed to determine if initial successes were maintained.

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PROGRAM # 5:

THE LONG-TERM TRAFFIC SAFETY IMPACT OF A PILOT ALCOHOL ABUSE TREATMENT AS AN ALTERNATIVE TO LICENCE SUSPENSIONS.

Reference:

Sadler DD, Perrine MW, Peckand RC. (1991) The long-term traffic safety impact of a pilot alcohol abuse treatment as an alternative to licence suspensions. *Accident Analysis and Prevention* 23(4):203-224.
[Detailed description of the program is available in *Evaluation of the California Drunk Driving Countermeasure System*, Vol.2, Research and Development Office, California Department of Motor Vehicles, Sacramento, California 95853.]

Goal:

To examine the long-term impact of an alcohol treatment program as an alternative to licence suspension.

Process:

This study followed 8,275 people who were repeat Driving Under the Influence (DUI) offenders who received their conviction for a second or subsequent DUI offense between January 1976 and February 1977. Participants were divided into those who had participated in the pilot alcohol abuse treatment program, and two comparison groups. The four-year driving records of members of all three groups were examined for any accidents or convictions.

In 1976, Drunk Driving Programs (DDP) were set up in four counties in California as an alternative to traditional sanctions for repeat drunk driving offenders. In exchange for their participation in a 12-month DDP, repeat offenders retained their driving privileges thereby avoiding the usual mandatory penalties - licence suspended for 12 months or licence revoked for 3 years.

The DDP included:
(i) close supervision of a participant's progress,
(ii) a variety of treatment services for alcohol abusers, and
(iii) maximum fees and provisions for serving persons who cannot afford fees.

Programs were required to provide periodic reports of their participants' progress to the courts, and to report immediately any noncompliance with program rules. Upon receiving a noncompliance report, courts were required to order the immediate suspension or revocation of the person's licence.

The rationale for the model was the belief that rehabilitation offers greater potential as a countermeasure than either suspending or revoking the licence. Implicit in this belief is the assumption that the loss of one's driving privilege is not likely to result in any permanent change in drinking and driving behaviour, and, in fact, may give rise to socioeconomic problems for the offender through loss of employment and subsequent stress in personal and family life. Long-term therapy, on the other hand, might alter the drinking driver's lifestyle so as to produce positive changes in his/her drinking and driving behaviour.

Results:

Of the original 8,275 participants, 83 were lost to attrition (3 sources for attrition), and 372 dropped out before finishing treatment programs.
2,534 participants took part in the DDP; 2,420 opted not to take the DDP option; and 2,866 were in the control group.

In comparison with those whose licences were suspended, participants in the treatment program had:

(1) a significantly higher rate (70%) of non-alcohol-related accidents and convictions;
(2) a significantly lower rate (9%) of alcohol-related convictions,
(3) no difference in alcohol-related accidents, and
(4) a significantly higher rate (30%) of total accidents.

The results suggest that the waiving licence-suspension as an incentive to participate in a drinking driver program had a detrimental impact on traffic safety.

In addition, because fewer licences were suspended under this program, some of the accidents that these drivers had could have been avoided.

The most telling finding was that over 40% from both groups were convicted of at least one alcohol-related traffic violation during the four-year follow-up period. Neither approach appears to have had much of an impact on subsequent DUI involvement.

Discussion:

The researchers comment that the findings of the present study are consistent with those of prior research, and contribute to the growing consensus that penalties involving licences are an effective traffic safety countermeasure for older or repeat DUI offenders. This study also demonstrated, as did earlier studies, that these penalties are more effective than either no-licence action, limited licence action, or alcohol abuse treatment in lieu of licence action for this group.

The criteria in both levels of the Graduated Licensing Program for beginning drivers in Ontario includes zero tolerance for blood alcohol. The penalty acts as a form of licence suspension since drivers who violate this restriction return to the beginning of the program. According to the results of this research, the penalties of the Ontario Program should be an effective deterrent to beginning drivers, and should result in fewer total accidents in this high risk group.

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SUMMARY OF BEST PRACTICE PROGRAMS

PREVENTING MOTOR VEHICLE CRASH INJURY THROUGH DECREASES IN IMPAIRED DRIVING

- Randomized Breath Testing checkpoints, such as the R.I.D.E. program, are effective, especially on weekends and holidays.

- Support licence suspension plus Drunk Driving Program (DDP) for repeat DUI offenders. (Licence suspension is more effective than DDP in reducing injury-producing motor vehicle crashes).

- A Graduated Licensing Program with zero tolerance for blood alcohol content is an effective deterrent to impaired driving in beginning drivers, however, it requires checkpoint enforcement to be most effective.

- Legislation is required to reduce the legal blood alcohol content to 0.05%.

- Mandatory Server Training, such as the Server Intervention Program of the Addiction Research Foundation, is an effective program.

PART II:
PREVENTING TRAFFIC INJURIES THROUGH USE OF SEAT RESTRAINTS

BEST PRACTICE PROGRAMS

PROGRAM # 1:

THE EFFECTS OF MANDATORY SEAT BELT LEGISLATION ON SELF-REPORTED SEAT BELT USE AMONG MALE AND FEMALE COLLEGE STUDENTS.

Reference:

Tipton RM, Camp CC, Hsu K. (1990) The effects of mandatory seat belt legislation on self-reported seat belt use among male and female college students. *Accident Analysis and Prevention* 22(6):543-548.

Goal:

To determine the effects of legislation on seat belt use among college students.

Process:

The study was conducted with first year psychology students at an urban university in Virginia. Participation was voluntary, and responses were treated anonymously. A questionnaire on seat belt use was administered at three times: 2 months before a compulsory seat belt law, 2 months after, and 16 months after the law went into effect. A different sample was used each time, and a total of 752 students were surveyed - about 70% female and 30% male. Respondents were categorized according to how often they wore a seat belt: 1) seldom or never, 2) occasionally, 3) usually, and 4) always or almost always.

Results:

- Self-reported use for the total sample was significantly greater at 16-months post-law and 2-months post-law than before the law.
- Both males and females separately reported significantly increased seat belt use from 2 months pre-law to 2-months post-law.
- Among females who always or almost always wore their seat belt, the proportion increased from 49.8% pre-law to 68.3% at 2-months post-law to 70.5% at 16 months post-law.

- Among males who always or almost always wore their seat belt, the proportion increased from 44.2% pre-law, to 64.0% at 2-months post-law, but then it declined to 59.7% at 16-months post-law.
- Only females reported significantly higher seat belt use at 16 months post-law.
- At 2-months post-law, 25.5% of the females gave compliance with the law as their reason for using a seat belt, but only 9.8% gave this reason at 16-months post-law. Among the men, there was no significant difference in their responses at these times.

Discussion:

Self-reporting studies of this kind are not considered to be as accurate as actual observations; however, because the responses in this study were anonymous, we can assume that the respondents might have been more truthful. Furthermore, this study had the advantage of assessing a range of seat belt wearing behaviours (occasionally, usually, always), whereas an observational study only gives information for one point in time.

This research suggests that college-age males (those in the upper end of the high-risk 16 - 24-year-old age group) are probably very resistant to regulated behaviours. Since seat-belt legislation has already been in effect for almost 20 years in Ontario, further compliance for this group will be difficult to achieve and will probably be dependent on increased enforcement. The program related to impaired driving (Sadler, Perrine, and Peck, 1991, described above) confirms the advantage of enforcement over education for high risk male drivers. For females, however, regulation appears to be more effective in this age group. Immediately after the legislation, females were more compliant. They also seemed to internalize the regulated behaviour as seen by their continued high rates of use 16 months after the law although their reason for use changed.

In addition to the established seat belt law in Ontario, the Graduated Licensing Program added a new law related to seat belts. It requires that both Level 1 and Level 2 drivers (minimum age 16 and 17 years respectively) restrict the number of passengers in their vehicle to the number of working seat belts. Any violations of seat belt laws result in loss of driving status. If young drivers in Ontario follow the patterns found in this study, the result should be increased seat belt use in this age group. Research by Riccio-Howe (1991) also indicates that drivers who learned to drive under a seat belt law were more likely to continue to wear seat belts even when such laws were repealed.

PROGRAM # 2:

CHILD CARE CENTRES: A COMMUNITY RESOURCE FOR INJURY PREVENTION.

Reference:

Stuy M, Green M, Doll J. (1993) Child care centres: a community resource for injury prevention. *Developmental and Behaviourial Pediatrics* 14(4):224-229.

Goal:

To assess the value of using child care centres as a resource for injury prevention. This study examined a program that was designed to foster the use of child restraints by parents at the child care centre.

Process:

This program for parents and children was established at a child care centre for 2 - 6-year-olds in a low income area of a large city in Indiana. A similar centre in the area served as the control group. Both centres have similar fees, staff training and class size. At least 70% of the families at each centre were single parent families, and over 40% had family incomes less than $15,000. Ninety-four children were at the intervention centre, and 139 children were at the control centre.

A trained parent and child educator from the Automotive Safety for Children Program at a children's hospital instructed the child care staff on proper child restraint procedures for each age group from birth to 6 years. Parents were notified about the program through a letter from the director of the centre requesting the parents' compliance with both the laws of the state and the recommendations regarding the use of child restraints during travel to and from the centre. Information was also provided regarding proper child restraints, and staff were available to answer any questions.

Programming to promote child restraint use was carried out for four months at the intervention centre. It included discussions about safety, the need for child restraints in cars, and other safety topics such as water safety, firearm safety, and poison prevention. Educational materials such as video tapes on car safety, audio tapes of buckle-up songs, stickers, and pictures for children to colour were also made available. Programming also included a Child Safety Night featuring a display of the

children's drawings and photographs, and a parent question-answer period. Children were rewarded with stickers when they told the teacher they were buckled up. The centre's monthly newsletter referred to safety topics regularly, and included testimonials from children regarding why they buckle up. Follow-up information and support was always available from the Riley Automotive Safety for Children Program. Supportive services were also provided to the control centre as part of a previously established safety program.

Results:

- Before the intervention, information was collected on the parents' knowledge of correct restraint use at both the intervention and the control centres. Restraint use was observed for families at both centres before the intervention and then at monthly intervals.
- At pre-intervention, 44% of the parents at the intervention centre and 42% of the parents at the control centre were able to correctly identify correct restraint use for their youngest child. These rates were significantly lower than that obtained from the National Highway Traffic Safety Administration multi-city survey, and were consistent with the assumption that both centres had a high-risk population. There was no difference in compliance regarding seat restraints between the two centres at pre-intervention.
- Throughout the study period, correct child restraint use remained at 20-30% for the control centre. However, at the intervention centre, rates of correct restraint use increased to 65%.
- At the intervention centre, 50% of those who did not previously use child restraints became users. At the control centre, there was no change from non-use to use, nor from use to non-use.
- Those parents who used seat belts were more likely to use restraints with their children, and those who did not use seat belts were less likely to use child restraints.

Discussion:

The findings of this study confirm the effectiveness of using child care centres to foster consistent use of child restraint devices by parents. The study investigators believed that even greater benefits could have been achieved if both parents, rather than only the registering parent, had been required to be involved in the program. These findings also suggest that the benefits of such a program can be generalized to the family unit and be also beneficial to the parents and siblings. Since child care centres provide the developmental and social environment for 20% to 25% of children

needing supervision (in the U.S.), community child development workers could play a significant role in injury prevention.

Correct child restraint use is an area requiring considerable improvement in Ontario. Correct usage rates for child seat restraints were *much lower* than restraint use for any other passenger in both the 1984 and the 1991 Ontario seat restraint survey. A study in New Zealand (Inder and Geddis, 1990) indicated that mothers of infants were least likely to use their infant seats if they were only travelling a short distance, or if they found the seat difficult to use. A rushed trip to a child care centre at the beginning or end of the working day would fit that criteria for many families. In addition, the work by Dougherty, Pless, and Wilkins (1990) indicates that children in low-income families are at higher risk for motor vehicle traffic injury than other children. All of this research supports the benefits of a child care centre program such as the one described in this study in increasing correct child restraint use. .

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PART II:
PREVENTING TRAFFIC INJURIES THROUGH USE OF SEAT RESTRAINTS

OTHER RELEVANT RESEARCH

STUDY # 1:

HEALTH VALUES, LOCUS OF CONTROL, AND CUES TO ACTION AS PREDICTORS OF ADOLESCENT SAFETY BELT USE.

Reference:

Riccio-Howe LA. (1991). Health values, locus of control, and cues to action as predictors of adolescent safety belt use. *Journal of Adolescent Health* 12: 256-262.

Purpose:

In Somerville, Massachusetts, 52 Grade 11 and 12 students were questioned about their own and their parents' seat belt use, and about their feelings regarding seat belt use. The study took place six months after an 11-month mandatory seat belt law was repealed.

Findings:

- The most powerful predictor of adolescent safety belt use was seat belt use by a parent or friend.
- Females were influenced slightly more by parents' use than by friends. Males were greatly influenced by friends' use and slightly less by parents'.
- Those who learned to drive during the seat belt law were more likely to continue to use a seat belt; however, learning to drive during the mandatory seat belt law ranked third overall as a predictor.
- Higher seat belt use was reported for passengers in the front seat compared with the back seat.

Conclusions and Recommendations:

The results supported the hypothesis that adolescents feel they have control over the outcome of driving, and therefore feel they do not need to wear seat belts.

Seat belt promotion programs should have these components: (1) education for parents about their influence on their children's use of seat belts, (2) peer workshops to encourage belt use, and (3) education for teens about the benefits of use including information to counter their principal reasons for non-use: discomfort and fear of being trapped.

Seat belt use rate in this study was only 29%. In Ontario, this age group had usage rates of over 80% (1991). Thus the findings from this study regarding non-use may not be applicable to the minority (20%) of adolescents in Ontario do not use seat belts regularly.

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STUDY # 2:

RESTRAINT EFFECTIVENESS, OCCUPANT EJECTION FROM CARS, AND FATALITY REDUCTIONS.

Reference:

Evans L. (1990). Restraint effectiveness, occupant ejection from cars, and fatality reductions. *Accident Analysis and Prevention* 22(2):167-175.

Purpose:

This U.S. study compared the effectiveness of airbags in preventing fatalities in motor vehicle crashes to the effectiveness of lap/shoulder belts in terms of the proportion of fatalities that would have been avoided by preventing ejection from the car.

Findings:

- Prevention of ejection accounted for almost half of the effectiveness of lap/shoulder belts.
- Airbags were estimated to have brought about an 18% reduction in fatalities to drivers, and a 13% reduction to right front passengers.
- Drivers who switch from lap/shoulder belt to using only airbags increase their fatality risk by 41%.

Conclusions and Recommendations:

Safety programs and driver education programs should stress the need to use the lap/shoulder belts even when a car has dual airbags.

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SUMMARY OF BEST PRACTICE PROGRAMS

PREVENTING TRAFFIC INJURIES THROUGH INCREASED SEAT RESTRAINT USE

- Child seat restraint and motor vehicle safety education programs for families can be effectively taught through child care centres.
- The public needs further education about correct passenger restraints, especially for children.
- The public needs further education about correct airbag restraint use - airbags are an additional safety feature rather than a replacement for seat belts.
- Graduated Licensing Program should increase seat restraint use in beginning drivers and their passengers, but it needs follow-up evaluation regarding effectiveness.

PART III:
PREVENTING TRAFFIC INJURIES THROUGH DRIVER EDUCATION AND RESTRICTIONS FOR YOUNG DRIVERS

OTHER RELEVANT RESEARCH

STUDY # 1:

THE EFFECTS OF AGE AND EXPERIENCE ON ACCIDENTS WITH INJURIES: SHOULD THE LICENSING AGE BE RAISED?

Reference:

Laberge-Nadeau C, Maag U, Bourbeau R. (1992) The effects of age and experience on accidents with injuries: should the licensing age be raised? *Accident Analysis and Prevention* 24(2):107-116.

Purpose:

To investigate the recommendation that the licensing age for young drivers be raised.

Findings:

This study examined computer data from the Quebec provincial insurance corporation for 1970 to 1984 to determine the injury accident rates in terms of age and experience. An experienced driver was defined as someone who had been licensed for at least one year. The study did not take into account distance driven. Results:

- More young men, particularly 16-year-olds, obtained new driving permits during this time period.
- Experienced as well as inexperienced 16 - 18-year-olds had a very high accident rate. This accident rate decreased with age.
- Accident rates for young women were much lower and decreased more gradually with age than for men.
- Driver education classes had a weak, positive effect.

Conclusions and Recommendations:

Age-related factors, *other than driving inexperience*, are associated with involvement in accidents, especially in young males. Since driving behaviour is regarded as a major determinant of accident involvement, policies aimed at behaviour modification are warranted. The evidence gathered indicates that 16 - 24-year-old drivers are a high-

accident group, and driver education, as it is now implemented, cannot be regarded as a satisfactory solution by itself. Driver education may not be as effective as it could be because it tends to focus on knowledge acquisition and skill development without trying to exert social influence.

Measures such as a driving probation period, night curfew, and prolonged accompanied driving might have positive influence on driving behaviours.

As a strategy to reduce the incidence and severity of accidents, raising the licensing age from 16 to 17 was recommended to U.S. Congress. Although the authors believe that such a measure would meet tough political resistance in North America, they recommend raising the age in Canada to 18, as it is in most European countries.

Comments:

The Ontario Graduated Licensing Program (effective 1994) puts into effect many of the recommendations made by these researchers. By requiring a minimum of one year (8 months with driver education) in Level 1, young drivers are not likely to receive their first level licence until they are 17, nor likely to be fully licensed until they are 18. In Level 1 of this program, they have a 12 a.m. to 5 a.m. driving curfew; they have more stringent accompanied driving requirements (a licensed driver with a minimum of 4 years driving experience is the only allowed front seat passenger); and they are not allowed on Series 400 highways. Based on research such as that cited above, the Graduated Licensing Program should result in immediate reductions in injury incidence and severity for 16 - 18-year-old drivers. Other aspects of the Ontario Graduated Licensing Program are discussed in the sections on seat restraints and on drinking and driving.

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STUDY # 2:

YOUTH AND TRAFFIC SAFETY: EFFECTS OF DRIVING AGE, EXPERIENCE, AND EDUCATION.

Reference:

Levy DT. (1990) Youth and traffic safety: the effects of driving age, experience, and education. *Accident Analysis and Prevention* 22(4):327-334.

Purpose:

This research study examined the effect of driving age, driving experience, and mandatory driver education on traffic fatalities of youth. Data were examined for ages 16 to 17 in 47 states over 9 years.

Findings:

- Youngest drivers had the highest driver fatality rates, and these rates decreased for each successive age.
- Driver fatalities were lower for 15 - 17-year-olds in states that had curfews for minors.
- Driver education had a small effect on decreasing fatality rates.

Conclusions and Recommendations:

Age does matter. Drivers at younger ages, particularly 15 years old, have considerably higher rates of motor vehicle fatalities. On the other hand, driver experience has minor, if any, influence. Further research about the experience effect is required due to measurement difficulties.

Raising the driving age merits serious attention in addressing safety concerns regarding young drivers.

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STUDY # 3:

SYSTEMATIC COOPERATION BETWEEN DRIVING SCHOOLS AND PARENTS IN DRIVER EDUCATION: AN EXPERIMENT.

Reference:

Gregersen NP. (1994) Systematic cooperation between driving schools and parents in driver education, an experiment. *Accident Analysis and Prevention* 26(4):453-461.

Purpose:

To evaluate driver education.

Findings:

In this Swedish study, 17-year-olds were divided into two groups: the intervention group received a driver education program plus private instruction from an adult (such as a parent), and the other group received only private instruction. The program for the intervention group included: (1) "commentary driving" to improve scanning behaviour, (2) special practice to help the learner experience his/her own limitations in driving skills, and (3) cooperation and communication between the driving school and parents. Results:

- In the first year after getting their licences, self-reported crashes were significantly higher for the intervention group; crashes were significantly lower in the second year, and there was no difference between the groups for the two years combined.
- According to self-reported questionnaires, those with driver education were a little more careful and a little less confident in their driving skills.

Conclusions and Recommendations:

The system of coordinating the teaching by driving school and parents had no advantage over parent instruction alone. The authors suggest that this was because the learners could not fully benefit from the changes until the second year of driving because of cognitive overload. Other studies of the effects of driver education have been inconsistent in their results.

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STUDY # 4:

AN EXAMINATION OF GENDER DIFFERENCES IN TRAFFIC ACCIDENT RISK PERCEPTION.

Reference:

DeJoy DM. (1992) An examination of gender differences in traffic accident risk perception. *Accident Analysis and Prevention* 24(3):237-246.

Purpose:

To examine gender differences in how young adults perceive their risk for traffic accidents.

Findings:

Experienced drivers, ages 18 to 24, completed a three-part questionnaire in which they judged their own driving safety, skill and likelihood of having an accident relative to two reference groups: drivers their own age and sex, and the average motorist. Results:

- Males and females held similar misperceptions concerning the frequency and the likelihood that risky behaviours would produce accidents.
- Both males and females had false positive views of their own skills and safety, with males tending to be more confident of their skills.
- Males tended to view their driving skills as equal or superior to those in the two reference groups.
- Females tended to see themselves as less skilled than the average motorist.
- Driving record was the single best predictor of their perceived safety as drivers, i.e. if they had not been in a traffic collision, they tended to perceive that they were unlikely to be involved in a crash in the future.

Conclusions and Recommendations:

This study suggests that young males, because they have an exaggerated sense of their driving skills, are at greater risk for motor vehicle crashes. They do not consider driving to be a dangerous activity; when they do consider a particular type of driving behaviour or situation to be dangerous, they tend not to apply this danger to themselves personally. As a result, strong measures will be necessary to counter the optimism of these young male drivers. The authors suggest that driver education programs need provide direct demonstrations of the limits of one's driving skill in

avoiding accidents and to demonstrate the mismatch between their perceived levels and their actual levels of driving skill.

Comments:

Community programs such as CHAT, PARTY, and IMPACT include the personal experiences of young people who have had serious motor vehicle crashes due to their own behaviour. These programs would provide important data about the real risks of motor vehicle injury to young drivers.

The 1990 Ontario Health Survey data indicates that risky driving behaviours in Ontario 16 - 24-year-olds are higher than in any other age group and therefore, the results of the above research are very relevant to this group. The Graduated Licensing Program in Ontario sends this message to beginning drivers about the greater risks involved in night-time driving, driving under the influence, and driving on the higher-speed highways, by limiting these activities.

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STUDY # 5:

MULTIFACTORIAL CAUSES OF ADOLESCENT DRIVER ACCIDENTS: INVESTIGATION OF TIME AS A MAJOR VARIABLE.

Reference:

Alexander EA, Kallail KJ, Burdsal JP, Ege DL. (1990) Multifactorial causes of adolescent driver accidents: investigation of time as a major variable. *Journal of Adolescent Health Care* 11:413-417.

Purpose:

To investigate time as a major factor in traffic accidents among teen drivers.

Findings:

This 1987 study in Wichita, Kansas examined all reported motor vehicle accidents (1,903) involving drivers aged 18 and under. Their goal was to determine which time variables may have influenced the accident, including time of day, day of the week, and school versus non-school day. Results:

- Most frequent time for accidents was noon to 6 p.m. on both school and non-school days.
- Most accidents happened to male drivers.
- There was a higher accident prevalence on school days with a cluster of accidents before school, during lunch hours, and immediately after school.
- Accidents on weekends and non-school days clustered later in the day.
- Alcohol-related and accidents producing injury occurred more frequently on weekends and holidays than on school days.
- Inattentive driving was the most frequent cause of adolescent driving accidents.

Conclusions and Recommendations:

Driver education should address risks associated with non-evening hours activities and with the most common causes of accidents - speed inappropriate for weather conditions, failure to assess risk accurately, preoccupation with peer passengers, and drinking and driving.

Younger and less experienced adolescent drivers should have restricted privileges for driving to school.

PART IV:
PREVENTING TRAFFIC INJURIES THROUGH CURFEWS

BEST PRACTICE PROGRAMS

PROGRAM # 1:

CITY CURFEW ORDINANCES AND TEENAGE MOTOR VEHICLE INJURY.

Reference:

Preusser DF, Williams AF, Lund AK, Zador PL. (1990) City curfew ordinances and teenage motor vehicle injury. *Accident Analysis and Prevention* 22(4):391-397.

Goal:

To determine if curfews have a positive effect in reducing the incidence of motor vehicle injuries.

Process:

This study compared four American cities: Columbus, Cleveland, Detroit, and Cincinnati. These cities have similar average household incomes and comparable numbers of vehicles per person. Cincinnati has the smallest population - much smaller than Detroit, and somewhat smaller than Columbus and Cleveland.

Cincinnati does not have a curfew bylaw. Detroit, Cleveland and Columbus have curfews that make it illegal for a minor (defined as a teenager between the ages of 13 and 17) to be in public areas between certain hours. Although each bylaw is slightly different, they all have the effect of reducing the number of hours teens can be out unaccompanied at night. (Curfew exceptions are granted when the minor is accompanied by a parent or guardian, and for travel to and from work.) The 25 - 64-year age group was used as a control population for motor vehicle injury patterns in the four cities. The primary measure was all late-night, highway-related injury for the 13 - 17-year age group.

Youth, parents, and those who organize activities for youth were generally aware of these curfews. At the time of this study, the Detroit curfew was strongly enforced; the Cleveland curfew was enforced, especially in the summer months; and the Columbus

curfew was generally not enforced but was sometimes used if the police encountered a large number of juveniles late at night.

Results:

- The number of injured persons was 23% lower for that age group in those cities when the curfew was in effect. This totals a saving of 93 highway injuries per year across the three cities.
- Fewer injuries were reported for all categories of victims - passengers, drivers, cyclists and pedestrians.
- Rates of motor vehicle injuries in the curfew cities for 16 and 17-year-old drivers were 2.5% to 4% lower and 1% to 7% lower for 16 and 17-year-old passengers compared with Cincinnati.

Discussion:

City curfews in the U.S. were originally implemented to limit drug abuse, to prevent crime, and/or to give parents more control over their children. The authors of this study stress that curfews should also be considered for the purpose of reducing motor vehicle crash injury during the particularly hazardous late night hours.

In the Ontario Graduated Licensing Program, beginning drivers (generally 16 - 17-year-olds) are restricted from driving between the hours of 12 a.m. and 5 a.m., and also must be accompanied at all times by a licensed driver with a minimum of 4 years of licensed driving experience. This requirement may have a similar effect on injuries as the curfew does in the cities described above but requires systematic evaluation.

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SUMMARY OF BEST PRACTICE PROGRAMS

PREVENTING TRAFFIC INJURIES THROUGH DRIVER EDUCATION AND RESTRICTIONS FOR YOUNG DRIVERS

- The Graduated Licensing Program should be effective in reducing traffic injuries among youth; however, systematic evaluation of the program is required.

- Driver education programs should include the following topics - risky driving behaviours, perceived versus actual skills of drivers, and driving as a dangerous activity.

SECTION C

Preventing Injuries Due to Falls in the Elderly

Best Practice Programs for Injury Prevention

SECTION C
Preventing Injuries Due to Falls in the Elderly

Researchers have done considerable work on risk factors associated with falls in the elderly, however not on the prevention of falls (See References, Appendix C). The literature review identified very few rigorous research studies regarding fall prevention, and of these, only a few reported positive outcomes.

However, in 1993, a series of eight well-designed research studies administered through Washington University, St. Louis, Missouri, received funding for numerous studies on fall prevention (Ory et al, 1993). These studies should contribute immensely to our knowledge of effective fall prevention programs for the elderly. Known as "Frailty and Injuries: Cooperative Studies of Intervention Techniques" or more commonly "the FICSIT Trials", these studies examine the value of a variety of techniques to prevent injury due to falls among the elderly. Each of these research sites feeds study information into a common database, and all sites use the following measures: 1) psychosocial health and demographic measures; 2) physical health measures; 3) fall-related measures; and 4) cost-effectiveness measures.

To date, only one of the FICSIT studies (Tinetti et al, 1995) has been completed, and a second has published preliminary results (Hornbrook et al, 1994). The completed study showed positive outcomes for the participants including a reduction in the incidence of falls. Description of these two studies follow. Final results from all the FICSIT trials are scheduled to be published during 1996.

Citations for the FICSIT articles are included in the References (see Appendix B). Requests for further information about the FICSIT trials should be addressed to:

FICSIT CC
Washington University
Box 8067,
660 S. Euclid
St. Louis, MO 63110
U.S.A.

BEST PRACTICE PROGRAMS

PROGRAM # 1:

YALE FICSIT: RISK FACTOR ABATEMENT STRATEGY FOR FALL PREVENTION.

Reference:

(1) Tinetti ME, Baker DI, Garrett PA, Gottschalk M et al. (1993) Yale FICSIT: Risk factor abatement strategy for fall prevention. *Journal of the American Geriatrics Society* 41(3):315-320.

(2) Tinetti ME, Baker DI, McAvay G, Claus EB, et al. (1994) A multifactorial intervention to reduce the risk of falling among elderly people living in the community. *The New England Journal of Medicine* 331(13):821-827.

Goals:

To reduce risk factors that contribute to falls in the elderly.

Process:

[Please note: this summary is based on two studies describing the same program.] Subjects were members of a HMO who were more than 69 years old. They were mentally sound, not terminally ill, not too physically active, and had at least one of these fall risk factors: postural hypotension, sedative use, at least four targeted medications, impaired upper and lower extremity strength, impaired range of motion, foot problems, and problems with balance, gait and transferring into bath and/or onto toilet. Between 25 and 30 eligible and willing patients of each of 16 participating physicians were randomly selected and assigned to a group.

The Intervention Group

Participants who were assigned to the intervention group received home visits by either the nurse practitioner or the physiotherapist or both, depending on the risk factors and the interventions required. Participants received interventions specific to their risk factors based on standardized protocols that were developed for each intervention. This was done to ensure that those with the same risk factors received identical intervention strategies.

The Control Group

These participants received a series of home visits from third and fourth year social work students. The number of visits ranged from 2 to 18 and were determined by the risk factors identified at the beginning of the study. Visits were matched to the number of nursing and physiotherapy visits for the intervention group.

Results:

- After 12 months, positive outcomes were identified for the intervention group. A significantly smaller percentage of this group continued to take at least four prescription medications, to transfer unsafely to their bathtub or toilet, or to have impairment in balance or gait.
- There was a significant difference between the groups in the length of time to the first fall and in the percentage of subjects who did fall. Only 35% fell in the intervention group compared to 47% in the control group.
- Similarly, there were fewer falls requiring medical care or resulting in serious injury among the intervention group.
- The intervention group had higher self-confidence scores (using the Falls Efficacy Scale) compared with the control group at the end of the study.
- The cost of the intervention was $891 per subject in the intervention group. By subtracting the number of falls in this group with the larger number in the control group, the cost for each fall presumed to be prevented was calculated to be $1,947. Since the cost for one fall requiring medical care has been calculated to be $12,392, this appears to be a highly cost-effective program.

Discussion:

The authors suggest that the effectiveness of the intervention may be due to the process of selecting subjects at risk for falling and to targeting several modifiable risk factors. The authors found little effect of the intervention on muscle strength; they hypothesize that this could be because manual muscle testing is insensitive to change, or because the intensity or duration of the exercise program may not have been great enough to bring about improvement. Also, because of the priorities assigned to the various risk factors, some subjects with muscle weakness did not receive instructions for a strengthening exercise program.

Members of the control group also saw a reduction in risk factors. The authors hypothesize that this may have resulted from normal variations in certain factors such

as medication use, heightened motivation among those subjects who took part in the trial, and bias toward healthier subjects.

The authors stated that a risk-reduction strategy of this kind could readily be implemented as part of the clinical care of elderly patients. Funding will be much easier to obtain if there is evidence of savings due to treatments that were prevented. Further, because many of these risk factors being addressed also contribute to immobility and general decline, the strategy studied here could result in an improvement in functional independence among elderly patients. There is good reason to predict this outcome since this strategy increased the subjects' confidence in performing daily activities.

A non-experimental study of outcomes from a falls clinic (Wolf-Klein et al, 1988) reported similar results to those of the above study. To manage the care of frequent fallers, the coordinated expertise of a geriatrician, a neurologist, a cardiologist, and a physiatrist were combined with resources in audiology, ophthalmology, and podiatry. Among the group of 36 elderly patients in the study who had recently fallen, 77% experienced no further falls. For successful management of high-risk elderly, the authors recommended a team approach addressing multiple risk factors, including correction of sensory impairment.

The Ontario Medical Association has published *A Physician's Guide to the Prevention of Falls in the Elderly* (1992) with five recommendations for health professionals (see page 57). These support a team approach to multiple risk factor reduction as recommended by both Tinetti and Wolf-Klein. The Guide also advises primary care physicians to assess all elderly patients for fall risk, and it provides guidelines for reviewing drug regimens in the elderly.

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PROGRAM # 2:

SENIORS' PROGRAM FOR INJURY CONTROL AND EDUCATION.

Reference:

Hornbrook MC, Stevens VJ, Wingfield DJ. (1993) Seniors' program for injury control and education. *Journal of the American Geriatrics Society* 41(3):309-314.

Goal:

To reduce injuries by means of improving aerobic capacity, strength, balance, home safety, and knowledge and attitudes about preventing falls in the elderly.

Process:

The target population was those aged 65 and older who lived independently. Of these, the participants also had to have either experienced a fall in the previous year, or experienced a near-fall in the past month, or been over age 75. Over 1,320 people were recruited for the study.

The Intervention Group:

Participants attended eleven 90-minute group sessions over a 4-month period, with 25 to 30 people in each group. Social networks among the participants provided additional support to change and maintain desired behaviours, and participants were also encouraged to bring along a support person (spouse, child, other relative, or friend) for further support.

Those in the intervention group took part in moderate endurance-building exercises, strength-building conditioning activities, lectures regarding home safety improvements, mental imagery to improve sensory awareness, and practice of behaviours to prevent falls. Considerable time was spent problem-solving and helping participants maintain exercise patterns as well as motivating and supporting their efforts. A typical session included physical activity followed by a relaxation exercise, a mental activity, a small group meeting, and a lecture regarding a current topic such as safe medication use, home safety, home repairs, and appropriate clothing and footwear. The primary component was the physical activity and the mental activity was secondary. Sessions were conducted by trained health personnel.

Endurance Training: Participants were instructed to incorporate endurance-building exercises into their daily routine based on their level of physical functioning. Individual programs with gradually increasing frequency and intensity were devised with a goal of achieving regular exercise sessions of at least 15 minutes, 3 to 5 days per week. The most common activity selected was walking. A 20-minute walking session was included in each group meeting. Those who were too frail to walk performed exercises while seated.

Strength Training: Exercise recommendations were tailored for each participant based on testing, and stressed improvements in leg muscle strength and trunk mobility. Exercise items used to provide resistance training were selected from common, inexpensive household items.

Home Safety Assessments: Participants performed their own home safety assessments following guidelines provided by the researchers, and then made the necessary repairs themselves.

Mental Practice: Because people are inevitably exposed to situations that might lead to falls, and because complete isolation is counterproductive to health, participants were taught ways to prevent falls. Guided visual imagery training was done in four areas: heightening perception of posture and balance; increasing sensory awareness; improving concentration in periods of stress; and coping with situations in which falls may occur.

The Control Group

These people received the same assessment as the other group, and were instructed that their contribution to the study was to carefully report their falls to help improve understanding of the causes and costs of falls among older people. They did not receive a pseudo-intervention and they continued to receive their usual health care from the Health Maintenance Organization (HMO). This care included access to health education and screening services, as well as falls prevention programs offered in the community.

Results:

The total number of sessions attended was the primary measure of the intensity of the intervention. Those in the intervention group tracked the number of minutes of endurance-building activities daily on graphs. To assess any adverse effects of the interventions, information on falls and relevant injuries was monitored by the FICSIT Coordinating Centre.

Health status measures, physical function measures, and falls outcome measures were collected at the beginning of the study, and will be assessed after one year to determine the effect(s) of the intervention, if any. These results are expected to be published with those of the other FICSIT studies sometime in 1996.

Discussion:

This project focused on the quality of life of older persons, with the goal of extending it for as many years as possible. The genetic and economic constraints of participants were considered, but the emphasis was on maximizing their physical, social, cognitive and emotional functioning.

Four questions related to economics were addressed in this project:

- the cost of the intervention protocol
- the costs of treating fall-related injuries among participants
- the cost savings, if any, from reduction in medical care for fall-related injuries (if the intervention is successful in reducing falls)
- the cost-effectiveness of the intervention strategy used at the site compared with interventions at other FICSIT sites

Requests for further information about this program should be directed to:

Dr. Mark C. Hornbrook
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3800 N. Kaiser Centre Dr.
Portland, OR 97227-1098
U.S.A.

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PROGRAM # 3:

THE EFFECT OF A 12-MONTH EXERCISE TRIAL ON BALANCE, STRENGTH AND FALLS IN OLDER WOMEN: A RANDOMIZED CONTROLLED TRIAL.

Reference:

Lord SR, Ward JA, Williams P, Strudwick M. (1995) The effect of a 12-month exercise trial on balance, strength and falls in older women: a randomized controlled trial. *Journal of the American Geriatrics Society* 43(11):1198-1206.

Goal:

To examine the effects of a 12-month exercise program for older women.

Process:

Women aged 60 - 85 were assigned to either an exercise group or a control group. The intervention group had 100 participants, and the control had 97. One-hour exercise classes were run twice a week for 10 to 12-week terms. Classes had 4 sections: warm up, conditioning, stretching, and relaxation, and were held at easily accessible locations. Personnel were trained in running such programs for older people; and both the rationale for the study and the assessment measures were explained clearly to both exercise and control subjects.

The dropout rate for the exercise program was 25% which includes those who discontinued because of illness, injury, or death. This was low and well below the figures for other studies of similar classes. The average number of sessions attended by the 75 exercisers who completed the program was 60 (i.e. about one per week).

Results:

- There was significant improvement in the exercise group in strength, reaction time, neuromuscular control, and two of the four measures used to measure sway.
- Fall frequency decreased for those who adhered to the exercise program. The "high adherers" to the program only had 45.8 falls per 100 participants, in contrast to 66.6 per 100 for those who were "low adherers" to the program, and 62.8 per 100 for the control group.
- The prevalence of multiple falls remained the same at 14.8% for the low adherers, dropped slightly in the controls, and was halved in the high adherers.

- Compared with those in the exercise program, a significantly greater percentage of people in the control group cited the cause of their falls as balance-related.
- Fewer exercisers suffered falls within their homes or "non-accidental" falls (i.e. falls other than a single trip or slip in which the subject stated that they would have fallen in the same circumstances if they had been 30 years younger).

Discussion:

The authors comment that the exercise program was found to be safe with no medical incidents occurring, and the subjects found the program enjoyable.

In terms of improvement of sway, the exercise program only improved sway on a soft foam surface, and the authors comment that reductions in sway on this type of surface could have resulted from the concurrent improvements in strength, neuromuscular control, and reaction time. Reductions in sway on a firm surface, on the other hand, are accomplished by improvements in the peripheral sensory systems which would not have been affected by the exercise program.

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SUMMARY OF BEST PRACTICE PROGRAMS

PREVENTING INJURIES DUE TO FALLS IN THE ELDERLY

For high-risk elderly (those with previous injury-producing fall in the last 12 months or those over 75 years of age):

- The Falls Clinic approach is strongly recommended. It involves assessment by a team of health professionals followed by a treatment and management program to address the two highest priority risk factors. Similar to cardiac rehabilitation programs, both individual treatment programs and group treatment programs have proven effective. Education about the risk factors and about prevention of falls should be included in the treatment program.

For lower-risk elderly:

- Primary care physicians and other community-based health professionals should follow the guidelines set by the Ontario Medical Association Subcommittee on the Prevention of Falls in the Elderly.

- Physical activity programs are needed for seniors. They should be of the required frequency, duration and intensity to promote improvements in strength, mobility, balance and physiologic function. They should be combined with education about risk factors and how to manage them. In particular, attention should be paid to encouraging year-round physical activity, and to addressing ways of dealing with winter weather since it is a deterrent to physical activity for many seniors.

- "Mall Walk" programs, which are popular in some urban centres, would be appropriate vehicles for fall prevention programs for the elderly. These programs use an activity which is popular with seniors, in an environment that is warm, dry, safe and accessible year-round. An education component as well as strength, mobility and balance activities could be incorporated into this setting with relative ease.

ONTARIO MEDICAL ASSOCIATION SUBCOMMITTEE RECOMMENDATIONS FOR THE PREVENTION OF FALLS IN THE ELDERLY

1. A standard home-safety assessment protocol designed to prevent falls should be readily available through existing community services, including occupational therapy, regional geriatric assessments and home-care programs.

2. Primary care physicians should assess elderly patients for falls, regardless of whether injury results from falls. Assessment should include examinations for intrinsic factors, specific assessment of gait and balance, and identification of "fear of falling".

3. Avoid prescribing long-life benzodiazepine for the elderly whenever possible. Anti-depressants, anti-psychotics, psychotropics and medications with sedative effects should be prescribed in doses and intervals appropriate to the elderly, and for limited time periods.

4. Drug regimens in the elderly should be reviewed at regular intervals, especially for patients on multiple drugs, and whenever there is a change in medication. Physicians, pharmacists, and community nurses can coordinate this review to improve safety as well as efficacy, compliance and cost.

5. Patients should be advised that regular physical activity and/or an exercise program is one of the most effective means of protecting the older patient from injury due to falls.

[from: Ontario Medical Association Subcommittee on Falls in the Elderly. The physicians' guide to the prevention of accidental falls in the elderly. *Ontario Medical Review* 1992, April.]

APPENDICES

Best Practice Programs for Injury Prevention

APPENDIX A

References

PART 1:
"Traffic Accidents - Prevention and Control"
(Citations from MEDLINE & other database searches - 01/90 - 02/95)

PART 2:
"Accidental Falls - Prevention and Control"
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APPENDIX B

References

PART 1:
Prevention of Cyclist Injury in the 5 - 15 Year Age Group
Prevention of Injuries to Motor Vehicle Occupants
(Articles retrieved from MEDLINE & other database searches - 01/90-02/95)

PART 2:
Preventing Injuries Due to Falls in the Elderly
(Articles retrieved from MEDLINE & other database searches - 01/90-/02/95)

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APPENDIX C

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Best Practices Programs and Other Relevant Research

Best Practice Programs for Injury Prevention

SECTION A

Reducing Bicyclist Injuries in 5 - 15-Year-Olds

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SECTION B

Preventing Motor Vehicle Traffic Injuries

PART I:

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SECTION C

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