**ABSTRACT**

**Objective:** This study evaluated a four-year bicycle helmet promotion campaign.

**Methods:** Children’s attitudes, social norms, intentions to wear a bicycle helmet as well as helmet ownership were measured. Evaluation was based on a pre-experimental static group comparison design repeated at two (1991) and four years (1993) after implantation, with a non-randomized control group. 3,424 students completed a self-administered questionnaire (experimental: 2,097, control: 1,327).

**Results:** The program had a significant impact on helmet ownership (1989: 4%; 1991: 26%; 1993: 56%). The program was the principal predictor of high intention to use a bicycle helmet. Time was the principal predictor of ownership with exposure to the program being the next predictor.

**Conclusion:** This study showed that time is an important factor in bicycle helmet acquisition, and that a long-term community-based program can accelerate the process of adopting this behaviour.

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**Evaluation of a Four-year Bicycle Helmet Promotion Campaign in Quebec Aimed at Children Ages 8 to 12: Impact on Attitudes, Norms and Behaviours**

Céline Farley, MSc; Joanne Otis, PhD; Marie Benoît, MSc

Bicycle-related injuries are a major public health problem. Children aged 5 to 14 years are most affected by this type of accident, and head injuries are frequent, being present in 60 to 80% of mortalities.²⁵

Helmet use can reduce the frequency and severity of head injuries.²⁵ Many programs promoting helmet use among children have been developed and present multiple intervention strategies such as communication, health education and community organization,²⁶ but few are based explicitly on a theoretical intervention model considering the different factors likely to influence the adoption of a behaviour.

Several evaluations of bicycle safety helmet promotion programs have been published.¹²-²³ However, there is little information on the evolution of the psychosocial factors which influence motivation to use a bicycle helmet, helmet ownership and helmet use in relation to the implementation and duration of the programs. From a public health standpoint, this information is essential for identifying effective action and attaining the desired objectives more rapidly.

To reduce head injuries among children in the Montérégie (on the South Shore of Montreal), a four-year program promoting bicycle helmets (1990-93) was implemented. This paper reports the findings of a series of studies aimed at evaluating the effect of this program on motivating children to use bicycle helmets and on the level of helmet ownership.

**Bicycle helmet promotion program in the Montérégie, 1990-1993**

The program targeted elementary school children. At the time of the preliminary study in 1989, 4% of children reported owning a helmet and the program objective was to bring this level up to 20% by 1993.

The program design was based on the PRECEDE²⁵ framework and on Rogers’ diffusion of innovations theory.²⁶ A preliminary study identified those factors likely to influence the intention of young cyclists to use helmets and the content of the messages to be conveyed.²⁴ Intervention strategies focussed on persuasive communication and community organization. The program began in 1990, and the activities took place each year, from April to August, through 1993. Standard educational activities (posters, pamphlets, association games, role playing) to encourage changes in attitudes and values with regard to helmet use were carried out mainly in schools in May and June. Community-based activities focussing on facilitating helmet acquisition (increasing product availability, discount coupons of $5 and $10 for group purchases, and offering helmets as prizes) and reinforcing helmet use (awards, guidelines and regulations requiring helmet use) were conducted from April to August. An organizing committee handled program coordination, and the activities were conducted by a variety of people and organizations: teachers, local police, social clubs, sporting goods retailers, municipal recreation departments, and organizers of sporting events. More than 200 schools and 250 agencies participated.
in the program each year: 12,214 posters, 319,944 pamphlets, 4,965 educational guides, and 72,672 discount coupons were distributed throughout the region, and over 4,600 bicycle helmets were given out free to children.27

METHODS

Evaluation was based on a pre-experimental static group comparison design repeated at two and four years after the program kick-off, with a non-randomized control group.28 The 1991 and 1993 surveys aimed to compare the findings for a given year between two groups of children. The study population included approximately 50,000 French-speaking children in Grades 4, 5, and 6 (aged 8 to 12) attending 244 schools in the Montérégie. The control group included 6,513 children of the same age, residing in municipalities in another region (which did not have an equivalent program) chosen for its similarity to that of the experimental group.

A two-stage cluster sampling (stage 1, schools; stage 2, classes) stratified according to grade level and group (target and control) was used. This strategy was chosen for economic and practical considerations. Simple random sampling was not possible. The higher standard errors of estimates produced by the cluster sampling were counterbalanced by the gains in reliability (lower standard errors) obtained by the stratification.29 A total of 22 schools were selected at random (target group and control group), then in each of the schools one class per grade level was chosen randomly for a total of 68 classes. In 1991 and 1993, the experimental group had 1,008 and 1,089 students, respectively, and the control group had 652 and 675.

In the fall of 1991 and 1993, a pretested self-administered questionnaire30 was completed by the students during class time (Table I). The same directions were repeated to each of the groups. It was necessary to read the questions to the Grade 4 students and to have all of them complete each question before moving on to the next one. The questionnaire took approximately twenty minutes to complete.

Hierarchical logistic regression seemed best suited to evaluating the effect of the program. We wanted to evaluate the overall effect of the program on intention to use and helmet ownership by including in the model exposure to the program, sex, age and grade level.

These analyses were done first on the 1991 data to understand the effect of the program after two years in operation, and then on the 1993 data to evaluate the effect after four years. The two data banks were then merged (1991-1993). The time factor was added to the different models and all interactions, such as the interaction between the length of time the program had been in operation and exposure to it, were verified.

RESULTS

The number of children who completed the evaluation questionnaire in 1991 and 1993 was similar (1,660 and 1,764 respectively). Approximately 62% of the sample came from the Montérégie (experimental region). No significant difference was observed between the experimental and control groups for 1991 for the variables age, sex, and grade level. In 1993, only the average age differed: it was 10.25 in the experimental group and 10.44 in the control group. Generally speaking, the proportion of girls and boys was similar and the sample was evenly divided among the three grade levels.

<table>
<thead>
<tr>
<th>Variables Measured 1991 and 1993</th>
</tr>
</thead>
<tbody>
<tr>
<td>----------------------------------</td>
</tr>
<tr>
<td>Behavioural belief (attitudes)</td>
</tr>
<tr>
<td>Wearing a helmet</td>
</tr>
<tr>
<td>• is fun</td>
</tr>
<tr>
<td>• looks sporty</td>
</tr>
<tr>
<td>• is safe</td>
</tr>
<tr>
<td>• bothers</td>
</tr>
<tr>
<td>• is ugly</td>
</tr>
<tr>
<td>• looks ridiculous</td>
</tr>
<tr>
<td>• looks like a chicken</td>
</tr>
<tr>
<td>Normative belief (social norm)</td>
</tr>
<tr>
<td>Who would be supportive of their</td>
</tr>
<tr>
<td>wearing a bicycle helmet each</td>
</tr>
<tr>
<td>time they rode a bicycle</td>
</tr>
<tr>
<td>• father</td>
</tr>
<tr>
<td>• mother</td>
</tr>
<tr>
<td>• friends</td>
</tr>
<tr>
<td>• teachers</td>
</tr>
<tr>
<td>Enabling factors (strategies could encourage children to wear their helmets every time they rode a bicycle)</td>
</tr>
<tr>
<td>• a safe place to store helmets in school</td>
</tr>
<tr>
<td>• law requiring helmet use</td>
</tr>
<tr>
<td>• nicer looking helmets</td>
</tr>
<tr>
<td>• anti-theft system for helmet</td>
</tr>
<tr>
<td>Intention to wear a helmet every 4 points</td>
</tr>
<tr>
<td>time a child rode a bicycle</td>
</tr>
<tr>
<td>• close to home</td>
</tr>
<tr>
<td>• to go to the store</td>
</tr>
<tr>
<td>• to go to the park</td>
</tr>
<tr>
<td>• on a bicycle path</td>
</tr>
<tr>
<td>• to go to school</td>
</tr>
<tr>
<td>• to go riding with friends and</td>
</tr>
<tr>
<td>with family</td>
</tr>
<tr>
<td>Helmet ownership</td>
</tr>
<tr>
<td>• Do you have a bicycle helmet</td>
</tr>
</tbody>
</table>

Some sociodemographic variables were noted including sex, age and student’s grade level.
Evolution of bicycle helmet ownership

Helmet ownership seems to have grown substantially and progressively in the Montérégie. In 1989 just 4% (34/797) of children reported owning a bicycle helmet; after the second year of the program, 1 in 4 children reported owning a helmet; and after the fourth year, the figure was 1 in 2. Helmet ownership also increased in the control group, more than doubling between 1991 and 1993. Table II suggests that helmet ownership grew over those years regardless of sex and grade level. Independent of the year, helmet ownership increased in the experimental region, compared to 36% of the children in the control group, reported owning a helmet. The secular trend of increasing helmet ownership in both the

Effect of the program on intention to use bicycle helmets and on helmet ownership

The objectives of the program were to increase children’s motivation to use bicycle helmets and to increase the proportion of children owning one. This was to be accomplished through modification of their attitudes (behavioural beliefs), their perceived social pressure (normative beliefs), etc. Multivariate logistic regression was used to verify the effect of the program on intention and on helmet ownership, while taking into account these psychosocial variables and controlling for sex and age. Table III illustrates the results obtained.

Thus, regarding intention to use a bicycle helmet every time they ride a bicycle, for all of the respondents from 1991-1993, there are six variables which seem to have a significant effect, with exposure to the program being the principal predictor, along with the child’s sex. More of the students in the experimental group and more girls are found among the group with high intention. Moreover, this high intention is also predicted by more positive behavioural beliefs, more favourable normative beliefs, and a greater agreement concerning enabling factors. The oldest students are found more among the group with low intention. Time, however (either two or four years after implementation of the program), does not seem to have had any effect on intention. We also observed that exposure to the program and certain other variables such as behavioural beliefs and enabling factors seemed more associated with a high intention in the group questioned in 1991 than in that surveyed in 1993. The role of normative beliefs on intention seemed to have the same importance in both 1991 and 1993.

As far as predicting helmet ownership, in the total sample (1991-1993) it was observed that at least twice as many students exposed to the program owned a helmet. Independent of exposure to the program, time was the most important predictor. Close to five times as many students who responded owned a helmet in 1993 as compared with 1991. Other variables improved prediction of ownership. Thus, students with more positive behavioural beliefs and more favourable normative beliefs were found among the group of owners. Moreover, there were more children who valued enabling factors (laws, place for storing helmets) and more older respondents in the group of non-owners. It was clear that the factors of exposure to the program and normative beliefs seemed to have a greater influence on helmet ownership in 1993 than they did in 1991.

**DISCUSSION**

The results of this study show that the program was effective in increasing the motivation of children to use as well as to own a bicycle helmet. After the fourth year of the program, 56% of the children in the experimental region, compared to 36% of children in the control group, reported owning a helmet. The secular trend of increasing helmet ownership in both the
experimental and control populations reflects the progressive diffusion of innovation. A nationwide bicycle helmet promotion campaign sponsored by the Canadian Medical Association, as well as other programs developed in Quebec and elsewhere in Canada, were introduced during the course of our program. This trend underlines the need for a control group to evaluate the effects of the program. Lastly, helmet ownership appears to be associated with age and sex. Girls and children in lower grades more frequently report owning a helmet.

The results of the multivariate logistic regression confirm for the total sample that time is the principal predictor of ownership and that exposure to the program is the principal predictor of high intention and the second predictor of ownership. A secular trend independent of the program leads us to believe that helmet ownership would have increased as well in Montérégie. Nevertheless, the program accelerated the adoption of this behaviour.

Being a young child, and having more positive behavioural beliefs and more favourable normative beliefs are associated with high intention and bicycle helmet ownership. Thus, younger children were more receptive to the prevention messages and the activities conducted to modify the student’s attitudes towards and acceptance of helmets. It is not only as simple to offer free helmets to children to get them to wear them. The children must follow the process of change through to trying the new behaviour. Low intention and non-ownership were associated with the importance attributed to enabling factors (law requiring helmet use, safe place...). After the fourth year of the program, children who had low intention to use a bicycle helmet or who still did not own a helmet were more resistant and were often the oldest. In fact, following Rogers’ theory, these children would fall into the category called the late adopters, i.e., those who would adopt a new idea only after the average members of society have done so. They will be convinced of the usefulness of the innovation, but peer pressure will be needed to motivate them to adopt it.

This should guide planners towards development of activities to increase the perception of acceptability of the behaviour among late adopters by influential people in their midst and towards implementation of reinforcing activities to prompt helmet owners to wear them, so as to increase visibility of the behaviour. The activities would create a more favourable social norm. Providing fashionable helmets as well as safe storage facilities for helmets may motivate late adopters to wear them. In addition, laws requiring helmet use would be an incentive for this group to conform to this preventive measure in order to avoid a fine. In Quebec there is still no such law.

The limitations of this study include the self-reported nature of the dependent variables and the measure of exposure. However, observation studies were conducted in 1991, 1992 and 1993 for the same population and the results showed a significant increase in helmet use from 1.3% in 1988 to 33% in 1993. These data support the results of the present study.

CONCLUSION

This study shows that time is an important variable in bicycle helmet acquisition, and that long-term programs accelerate the process of adopting this behaviour. In addition, the messages conveyed must be clearly identified for the target population and carried through several credible channels. There is no doubt that the information must be accompanied by activities encouraging the development of a positive attitude towards the desired behaviour, modification of the social norm and creation of conditions which encourage members of the target group to try and adopt the behaviour.

ACKNOWLEDGEMENT

We thank Mrs. Helene Kaufman for translation of this text from French.

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C O M I N G E V E N T S

ACTIVITÉS À VENIR

To be assured of publication in the next issue, announcements should be received by March 3, 1997 and valid as of April 30, 1997. Announcements received after March 3, 1997 will be inserted as space and time permit.

Pour être publiés dans le prochain numéro, les avis doivent parvenir à la rédaction avant le 3 mars 1997 et être valables à compter du 30 avril 1997. Les avis reçus après le 3 mars 1997 seront insérés si le temps et l'espace le permettent.

Breast Cancer: Myths and Realities
Sponsored by Continuing Education in the Health Sciences, The University of British Columbia
7-8 March 1997
Waterfront Centre Hotel, Vancouver, BC
Contact: Continuing Education in the Health Sciences
Tel: 604-822-2626 Fax: 604-822-4835

Second National Conference on Communicable Disease Control/Lutte contre les maladies transmissibles
Canadian Public Health Association/Association canadienne de santé publique
9-11 April/avril 1997 Toronto, ON
Pre-Conference Workshops/Ateliers pré-conférence: 8 April/avril 1997
Objectives: To review current and anticipated trends in communicable diseases in Canada and elsewhere; to discuss measures for prevention and control of communicable disease, including surveillance, screening and management of outbreaks; to highlight public health issues around emerging and re-emerging infections and growing antibiotic resistance; to focus on communicable disease problems, e.g., bloodborne, waterborne, and foodborne diseases.

Objectifs: Examiner les tendances actuelles et à venir dans les maladies transmissibles au Canada et ailleurs; discuter des mesures de prévention et de lutte contre les maladies transmissibles, y compris la surveillance, la dépistage et la gestion des épidémies; faire ressortir les questions de santé publique liées à l’émergence et à la réapparition d’infections et à la résistance croissante aux traitements antibiotiques.
Contact: CPHA Conference Department
400-1565 Carling Avenue
Ottawa, ON K1Z 8R1
Tel: 613-725-3769 Fax: 613-725-9826 E-mail/C. électron.: conferences@cpha.ca

VIIth Canadian Pharmacoepidemiology Forum/5e Forum canadien sur la pharmacopédiométrie
Canadian Association for Population Therapeutics/Association canadienne pour la thérapeutique des populations
28-29 April/avril 1997 Hamilton, ON
Contact: Kathryn Gaebel
Tel: 905-522-1155, ext. 4901 Fax: 905-522-6129

Preconceptional Health — More Than a Healthy Lifestyle
Presented by the Haldimand-Norfolk Regional Health Department
8-9 May 1997 Mississauga, ON
Featured speaker: Merry-K. Moos
Contact: Judith Hayman
Haldimand-Norfolk Regional Health Department
Tel: 519-426-6710, ext.221 Fax: 519-426-9974 E-mail: hayman@berv.com

II Congress of Health Municipalities Officers from Americas
Health and Municipalities, Challenges, Contributions and Realities at the Beginning of the XXI Century
Sponsored by CONASEMS, ALAMES, UNICEF, and Pan-American Health Organization
2-6 June 1997 Havana, Cuba
Goal: To improve the process of articulation and discussion among municipalities, health officials, local leaders, managers of health, etc., about health decentralization and to highlight the municipalities in the Americas.
Contact: Ministério de Saúde Publica
Republica de Cuba, Relaciones internacionales
Calle 23 y N - Vedado, Havana, Cuba
Fax: 00537-334341/3244685

VIIP Cours d’Été
Épidémiologie et Santé Publique
Organisé par l’UFR de Santé Publique de l’Université Victor Segalen Bordeaux 2 et l’INSERM U. 330
23 juin - 4 juillet 1997 Cours de Santé Publique, Université Victor Segalen Bordeaux 2
146, rue Léo Saignat
33076 Bordeaux Cedex
Tel: 05 57 57 14 81 Téléc.: 05 56 24 00 81

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