Bicycle helmet promotion among low income preschool children

John Britt, Ilene Silver, Frederick P Rivara

Abstract

Objective—To evaluate the effectiveness of a multifaceted bicycle helmet promotion program for low income children attending preschool enrichment programs throughout Washington State.

Study sample—Preschool Head Start programs that conducted routine home visits among their enrolled families at least five times during the school year were eligible. Eighteen sites and 880 children met this criterion and were able and willing to carry out evaluation activities. Two hundred children were from control sites where no helmet promotion activities were carried out.

Intervention—Classroom activities with children, education of parents during school meetings and home visits, fitting and distribution of helmets, a bicycle skills and safety "rodeo" event, and requiring children to wear helmets while riding on school grounds.

Evaluation methods—Regularly scheduled home visits were used to observe helmet use of enrolled preschool children before and after the promotion program. Home visitors requested parental permission for enrolled children to ride, and then noted whether the child wore a helmet.

Results—Helmet use in the intervention group more than doubled, from 43% to 89%, while use in the control group increased from 42% to 60% ($p < 0.05$ for intervention group changes *v* control group changes).

Conclusions—This multifaceted helmet promotion program successfully increased helmet use. Similar home visit protocols may be useful to evaluate the impact of other injury intervention programs.

(*Injury Prevention* 1998;4:280-283)

Keywords: bicycle; helmet; evaluation

One group that has received little attention in prior helmet promotion studies are preschool children. While not at high risk for serious bicycle injuries because of their minimal exposure, many preschool children make the transition from front yard tricycle riding to more risky bicycle riding by the time they enter school. Moreover, the pattern of injuries that are sustained by this age group are comparable with those of older children.¹² There may also be added benefit to having children develop the habit of helmet wearing from the time when they first begin to ride. This report describes our evaluation of the effectiveness of an intervention to increase helmet use in the preschool age group.

Methods

STUDY POPULATION

Head Start is a federally funded preschool enrichment program that provides health, education, and social service support to approximately 20 000 at-risk children from low income families each year in Washington State. The Early Childhood Educational Assistance Program is the state funded version of the federal program and serves approximately 8000 children. Eligible families in either program must have incomes at or below the federal poverty level and children must be 3 or 4 years old. Washington State has a multilingual and multi-ethnic population; a language other than English is primary for 18% of enrollees. Half of the children are from single parent households, and 75% of the parents have a high school education or less. In this paper, the term "Head Start" is used to refer to both programs, because eligibility criteria are similar and both programs participated in the bicycle helmet promotion program.

INTERVENTION PROGRAM

The program provided free helmets to any Head Start program in the state that agreed to meet certain requirements. These helmets were made available to enrolled preschool children, as well as to their older siblings up to the age of 14. Video conference technology that allowed live face-to-face interaction was used to train participating Head Start staff on program activities.

In order to participate, Head Start programs had to: (1) provide classroom instruction to children regarding the necessity and desirability of helmets; (2) educate parents about the risks of head injury from bicycle crashes, the effectiveness of helmets, strategies to fit helmets and encourage their use, and the importance of establishing the helmet wearing

Harborview Injury Prevention and Research Center, Seattle
J Britt

Injury Prevention Program, Department of Health, State of Washington
I Silver

Harborview Injury Prevention and Research Center and the Departments of Pediatrics and Epidemiology, University of Washington, Seattle
F Rivara

Correspondence to:
Professor Fred Rivara,
Harborview Injury Prevention and Research Center, Box 359960, 325 Ninth Ave, Seattle, WA 98104-2499, USA.

Although it is generally accepted that bicycle helmets are an effective strategy to reduce bicycle related head injuries,¹⁻⁴ and significant strides have been made in their promotion,^{5,6} helmet use rates remain lower and bicycle related injury rates remain higher among children compared with adults.^{4,5,7,8} Injury data also suggest that children from lower income neighborhoods are at greater risk of bicycle related injury, probably because of lower rates of helmet use, limited areas for safe riding, and greater exposure to motor vehicle traffic in high density urban settings.^{3,7,9-11}

habit while their children were still young; (3) obtain and fit helmets for each child; (4) conduct bicycle rodeos that allowed the children to practice safe riding skills and to see other children wearing helmets; and (5) require that children wear helmets when riding on school grounds and provide helmets for every bicycle and tricycle on site.

Once the staff had been trained, classroom teachers used activity books, posters, games, stories, and other age appropriate curricula provided by the project, to persuade the children that helmets were both necessary and "cool". Staff worked with parents during regularly scheduled meetings at the school and also during home visits after the baseline assessment. A low literacy multilingual flyer with all the relevant information was created by the project to reinforce the teaching by staff. Children's heads were measured for their helmets in the classroom and the helmets were distributed to the children before the rodeo. This rodeo was the culminating event of the program, a bicycle skills and safety event that had been modified for younger children. Several stations monitored by staff or parents enabled the riding children to practice avoiding hazards or recognize when to stop. These events were well attended by members of the community as well as parents and reports from program directors indicated that the rodeo was considered by many to be the highlight of the year.

PROGRAM EVALUATION

"Street corner observations" of helmet use, developed by us to evaluate community based campaigns,⁶ were impractical for this project, since the program was Head Start center based and attracted children from a wide geographic area. However, home visits were routinely conducted by Head Start staff (at some sites as frequently as every month), and staff were willing to use these visits to observe helmet use.

A protocol for observing and recording helmet use was developed and piloted. Head Start staff were trained to use the evaluation protocol at any convenient time during the home visit. This involved the home visitor requesting permission from parents to observe the child while riding. The visitor recorded helmet use, riding location, vehicle type (tricycle or bicycle), and whether helmet use was preceded by verbal prompting. If the child did not spontaneously put on a helmet, the home visitor waited for a count of five to see whether the parent would prompt their child. If not, the home visitor did so, saying, "Don't you have a helmet to wear when you ride? "

Such observations were done before the helmet promotion campaign and then repeated during follow up home visits two to three weeks after the helmets were distributed. Head Start centers were paid \$5.00 for each completed observation if they achieved a 75% or greater completion rate and \$2.50 for any lower completion rate.

Control Head Start sites were identified in the 1996–97 school year among sites that decided not to conduct helmet promotion activities during that year. Home visit observations, however, were carried out in the same manner as in the intervention group. Control sites received the same evaluation training and reimbursement as did the intervention sites.

Results

During the 1995–97 school years, Head Start programs representing 13 378 preschool children participated in the free helmet program. Over 15 000 helmets were distributed to Head Start children and their siblings during this two year period. These programs were rural as well as urban, and included both small (<30 children) as well as large (75+ children) programs. Participation in the evaluation phase was restricted to those sites that met the specified evaluation criteria, and were able to carry out the necessary procedures.

To increase the likelihood that children could be observed while riding before the program began and again after the helmets were distributed, participation in the evaluation involved only programs that routinely provided home visits at least five times over the school year. During the study period, 14 sites representing 680 children met this criterion. The proportion of children in a center where two observations were completed ranged from 70% to 90% so that the intervention group consisted of 244 children in 1996 and 188 children for 1997. As the same evaluation methods were used for both cohorts, the data were pooled for subsequent analyses.

The control group (identified for the 1996–97 school year only) involved four sites with a total of 200 preschool children. Observation rates of 90–93% and enrollment changes resulted in 149 control children observed at both baseline and follow up (table 1).

Parent reports of helmet ownership by their children and the proportion who reported always wearing helmets at baseline and at follow up are shown in table 2. This information was obtained through a brief written parent questionnaire. The intervention resulted in a significant increase in reported helmet ownership and use.

During baseline home visits, 53% of intervention and 48% of control group children rode. At follow up, a significantly greater proportion of intervention group children were observed to ride than control group children (57% *v* 32%). The most frequent reasons given for not riding included poor weather conditions and children unable or unwilling to ride

Table 1 Number (%) of eligible children—home observations of helmet use

	Eligible children	Baseline observations	Follow up observations	Baseline and follow up observations
1996 Intervention	383	277 (72)	267 (70)	244 (64)
1997 Intervention	297	266 (90)	210 (71)	188 (63)
1997 Control	200	185 (93)	180 (90)	149 (75)
Total	880	728 (83)	657 (75)	581 (66)

Table 2 Parent reported helmet ownership and use among preschool children; values are number (%)

	Own helmet	Always wear
Baseline		
Intervention	184/417 (44)	89/349 (26)
Control	74/137 (54)	47/132 (36)
Follow up		
Intervention	364/378 (96)	225/389 (58)
Control	85/135 (63)	51/139 (37)
Relative risk (95% CI)	1.53 (1.34 to 1.79)	1.58 (1.25 to 1.99)
Risk difference (95% CI)	33.3% (25.0 to 41.7)	21.2% (11.8 to 30.6)

CI = confidence interval.

Table 3 Observed helmet use among intervention and control group; values are number (%)

	Intervention		Control	
	Baseline (n=230)	Follow up (n=247)	Baseline (n=71)	Follow up (n=48)
No of helmet wearing children	99 (43)	219 (89)	30 (42)	29 (60)

Relative risk of helmet use at follow up: 1.47 (95% confidence interval (CI) 1.16 to 1.85).

Risk difference between intervention and control group for helmet use at follow up: 28.3% (95% CI 13.9% to 42.6%).

or bicycles in disrepair. These reasons were similar for intervention and control groups.

Changes in observed helmet use are shown in table 3. The proportion observed to wear helmets increased from 43% to 89% in the intervention group and from 42% to 60% in the control group.

Discussion

The provision of a multifaceted educational program and the distribution of free bicycle helmets, individually fitted and distributed by Head Start staff to preschool children, resulted in a doubling of observed helmet use. Although a much smaller proportion of children owned helmets at baseline, 42 of the 99 children observed to put on helmets at baseline (42%) did so spontaneously with no prompting. This proportion increased to 60% at follow up, suggesting that many preschool children from low income families will wear bicycle helmets even without reminders from parents.

A variety of programs to increase helmet use among children have been described in the literature. These consist of school programs,¹³⁻¹⁵ emergency department interventions,¹⁶ health department programs,¹⁷ community interventions,^{3 6 18} and legislation.¹⁹ The majority of these programs, although not all,¹⁰ have shown substantial increases in helmet use. The most successful appear to be multifaceted community based interventions. Nearly all studies, however, have focused on school aged children; to our knowledge, no studies exclusively of preschool children have been reported. The success of our program is probably due to elimination of financial barriers (that is, free helmets), education received in multiple venues (Head Start and home), and peer interaction at school. The use of home visitors may have been a critical component of the evaluation.

Our study used an innovative evaluation strategy, that of home visitors directly observing helmet use. Community observations of helmet use, such as those used in the evaluation of an

earlier community-wide campaign,⁶ were not feasible in this instance because the intervention was at the level of the individual Head Start programs. Observation at the Head Start sites was not possible, since not every site had a place for the children to ride, and there were many more children than there were bicycles.

Potential limitations of the study must be considered. The sample was not randomly selected and the possibility that selection bias favored helmet wearing over non-helmet wearing children must be considered. All programs used the same eligibility criterion of low income for enrollment of children into Head Start, and children attended programs based on where they lived. The choice of sample revolved largely around eligibility and interest of individual Head Start programs; within programs 83% of children completed the baseline evaluation and 75% the follow up.

These observations involve only two instances of riding behavior over several months. Although this program clearly demonstrated a short term success, the duration of program effects for similar samples remains to be evaluated. The presence of adults, even without prompting, may have predisposed children to use helmets. If true, however, this nevertheless suggests that they have incorporated a message that helmet wearing is expected. It must be acknowledged that the riding situation studied in this sample is only one of many and that these children might have displayed different behaviors had there been no adults present.

Implications for prevention

This project demonstrated that a multifaceted helmet promotion program substantially increased bicycle helmet ownership and use among low income preschool children. While the risk of bicycle related injuries is low in this age group, the initiation of the helmet wearing habit may lead to long term use, at least through childhood. The design and implementation of a protocol for assessing helmet use through regularly scheduled home visits provides a helpful tool for programs to use when "street corner" observations are not appropriate.

The enthusiasm and commitment of Washington State Head Start and Early Childhood Educational Assistance Program staff was critical to the success of this project. Their support, their dedication, and their excellent ongoing relationships with families overcame many difficult barriers during the program implementation and evaluation. The positive results of this program are a tribute to their efforts. This project was funded through a grant from the National Center for Injury Prevention and Control, Centers for Disease Control and Prevention to the Washington State Department of Health.

- 1 Thompson RS, Rivara FP, Thompson DC. A case-control study of the effectiveness of bicycle safety helmets. *N Engl J Med* 1990;320:1361-7.
- 2 Thompson RS, Thompson DC, Rivara FP, et al. Cost-effectiveness analysis of bicycle helmet subsidies in a defined population. *Pediatrics* 1993;91:902-7.
- 3 Rivara FP, Thompson DC, Thompson RS, et al. The Seattle children's helmet campaign: changes in helmet use and head injury admissions. *Pediatrics* 1994;93:567-9.
- 4 Centers for Disease Control and Prevention. Injury control recommendations: bicycle helmets. *Morb Mortal Wkly Rep* 1995;44:No RR-1.
- 5 Rodgers GB, Tinsworth DK, Polen C, et al. *Bicycle use and hazard patterns in the United States*. Washington, DC: US Consumer Product Safety Commission, June, 1994.
- 6 DiGuiseppi CG, Rivara FP, Koepsell TD, et al. Bicycle helmet use by children: evaluation of a community-wide helmet campaign. *JAMA* 1989;262:2256-61.

- 7 Baker SP, Li G, Fowler C, *et al.* *Injuries to bicyclists: a national perspective*. St James, New York: Johns Hopkins University Injury Prevention Center, Snell Memorial Foundation, 1993.
- 8 Thompson DC, Thompson RS, Rivara FP. Incidence of bicycle-related injuries in a defined population. *Am J Public Health* 1990;**80**:1388–90.
- 9 Baker SP, O'Neill B, Ginsburg MJ, *et al.* *The injury fact book*. 2nd Ed. New York: Oxford University Press, 1992: 220–7.
- 10 DiGuiseppi CG, Rivara FP, Koepsell TD. Attitudes toward bicycle helmet ownership and use by school-age children. *Am J Dis Child* 1990;**144**:83–6.
- 11 Dannenberg AL, Gielen AC, Bielensohn PL, *et al.* Bicycle helmet laws and educational campaigns: an evaluation of strategies to increase children's helmet use. *Am J Public Health* 1993;**83**:667–74.
- 12 Powell EC, Tanz RR, Discala C. Bicycle-related injuries among preschool children. *Ann Emerg Med* 1997;**30**:260–5.
- 13 Farley C, Haddad S, Brown B. The effects of a 4-year program promoting bicycle helmet use among children in Quebec. *Am J Public Health* 1996;**86**:46–51.
- 14 Parkin PC, Hu X, Spence LJ, *et al.* Evaluation of a subsidy program to increase bicycle-helmet use by children of low-income families. *Pediatrics* 1995;**96**:283–7.
- 15 Morris BA, Trimble NE. Promotion of bicycle helmet use among school children: a randomized clinical trial. *Can J Public Health* 1991;**82**:92–94.
- 16 Cushman R, Down J, MacMillian N, *et al.* Helmet promotion in the emergency room following a bicycle injury: a randomized trial. *Pediatrics* 1991;**88**:43–7.
- 17 Kim A, Rivara FP, Koepsell TD. Does sharing the cost of a bicycle helmet help promote helmet use? *Inj Prev* 1997;**3**:38–42.
- 18 Morris BA, Trimble NE, Fendley SJ. Increasing bicycle helmet use in the community: measuring response to a wide-scale, 2-year effort. *Can Fam Physician* 1994;**40**:1126–31.
- 19 Dannenberg AL, Gielen AC, Beilenson PL, *et al.* Bicycle helmet laws and educational campaigns: an evaluation of strategies to increase children's helmet use. *Am J Public Health* 1993;**83**:667–74.

ISCAIP: Injury Prevention

ISCAIP and the BMJ Publishing Group are committed to working together to provide a high calibre journal to the injury prevention community. To improve our service in delivering *Injury Prevention* to ISCAIP members, the society and the publisher have jointly agreed to change their procedures for administering members' subscriptions to the journal. From January next year, as ISCAIP memberships become due for renewal, members will receive from the BMJ Publishing Group an invitation to continue their subscription to *Injury Prevention* and will need to pay the subscription fee directly to the publisher. New recruits to ISCAIP will also need to advise the publisher directly to start a subscription.

ISCAIP members will continue to enjoy a special subscription rate (1999: £57 ISCAIP members, £75 personal, non-member rate)—in an exclusive arrangement between the society and the publisher.

We thank all ISCAIP members for their understanding during this transition. From next year, all transactions relating to membership will be dealt with solely by ISCAIP and subscription matters by the publisher.

Remember: if you are an ISCAIP member already, you need do nothing until the renewal date of your membership, when full details of the available options will be provided to you.

Please address queries about ISCAIP membership to Angela Seay, Administrator, ISCAIP, c/o Child Accident Prevention Trust, 4th Floor, Clerks Court, 18-20 Farringdon Lane, London EC1R 3HA, UK (tel: +44 (0)171 608 3828; fax: +44 (0)171 608 3674; e-mail: ASeay@compuserve.com or iscaip@capt.demon.co.uk).

Please address queries about subscriptions to *Injury Prevention* to the Subscriptions Department, BMJ Publishing Group, PO Box 299, London WC1H 9TD, UK (tel: +44 (0)171 383 6270; fax: +44 (0)171 383 6402; e-mail: subscriptions@bmjgroup.com).