

# Influence of Socioeconomic Status on the Effectiveness of Bicycle Helmet Legislation for Children: A Prospective Observational Study

Patricia C. Parkin, MD; Amina Khambalia, MSc; Leanne Kmet, MSc; and Colin Macarthur, MBChB, PhD

**ABSTRACT.** *Objective.* To evaluate the influence of average family income in a geographic area on the effectiveness of helmet legislation on observed helmet use by children (5–14 years).

*Methods.* The study was conducted in East York, a health district of Metropolitan Toronto, in collaboration with the East York Health Unit. In 1996, the total population was 107 822, 11 340 of which were children 5 to 14 years. Census data were used to group the 21 census tracts in East York into 7 geographically distinct areas. The boundaries of these areas are natural barriers to travel, such as expressways, ravines, railway tracks, and hydroelectric power lines. The areas were also ranked according to average family income (based on Statistics Canada data). For analytical purposes, areas were defined as low-, mid-, and high-income areas. Census data profiles of the areas have been previously described. For each consecutive year from 1990 to 1997 inclusive, direct observations of children riding bicycles in East York during the months of April through October were made. In 1995, observations were completed before the introduction of the law on October 1, 1995. Only children who were between 5 and 14 years of age and riding a 2-wheeled bicycle were included in the study. In total, 111 sites across all 7 areas were selected for observation. Observational sites included school yards of all elementary and middle schools (kindergarten to grade 8) and all parks in East York. In addition, 5 major intersections and 5 residential streets from each area were randomly selected. Observers were trained and used a standardized data collection form. A pilot study showed that the data collected by observers were reliable and valid. Observers remained at each site for 1 hour and collected data on helmet use and sex. Ethical approval for the study was obtained from the Hospital for Sick Children Research Ethics Board, the East York Board of Education, and the Metropolitan Separate School Board. The proportion of children who were wearing a bicycle helmet was estimated by year (1990–1997, inclusive), sex (male, female), location (school, park, major intersection, residential street), and income area (low, mid, high). For estimating the effect of legislation on helmet use, data from the year immediately after legislation (1996) were compared with data from the year preceding legislation (1995). The rel-

ative risk (RR) of helmet use (after vs before legislation) was calculated along with a 95% confidence interval (CI). Logistic regression analysis was used to adjust for potential confounding variables (sex and location).

*Results.* During the 8-year study period, 9768 observations were made (range: 914–1879 observations per year). The proportion of child cyclists who wore a bicycle helmet increased steadily during the first 4 years of the study period, from 4% in 1990 (34 of 914), to 16% in 1991 (303 of 1879), to 25% in 1992 (383 of 1563), and to 45% in 1993 (438 of 984). During 1994 (460 of 1083) and 1995 (568 of 1227), helmet use remained relatively stable at approximately 44%. Helmet use rose markedly in 1996 (the first year after helmet legislation was introduced) to 68% (818 of 1202) and remained stable at 66% (609 of 916) in 1997. Throughout the study period, girls were consistently more likely to wear helmets than were boys. In total, 47% (1420 of 3047) of girls wore helmets, compared with 33% (2193 of 6721) of boys (RR: 1.43; 95% CI: 1.36–1.50). In addition, children who were riding to school were more likely to use helmets, compared with children who were riding on residential streets, major intersections, and parks. Overall, 48% (1497 of 3129) of children who were riding to school wore bicycle helmets, compared with 32% (2116 of 6639) of children who were riding at other locations (RR: 1.50; 95% CI: 1.43–1.58). Children in the high-income areas were consistently more likely to wear helmets, compared with children in the mid- and low-income areas. Helmet legislation was associated with a significant increase in helmet use by children in East York. In 1995, 46% (568 of 1227) of children wore bicycle helmets, compared with 68% (818 of 1202) of children in 1996 (RR: 1.47; 95% CI: 1.37–1.58). The effect of legislation, however, varied by income area. In low-income areas, helmet use increased by 28% after legislation, from 33% (213 of 646) in 1995 to 61% (442 of 721) in 1996 (RR: 1.86; 95% CI: 1.64–2.11). In mid-income areas, helmet use increased by 29% after legislation, from 50% (150 of 300) in 1995 to 79% (185 of 234) in 1996 (RR: 1.58; 95% CI: 1.39–1.80). In high-income areas, helmet use increased by only 4%, from 73% (205 of 281) in 1995 to 77% (191 of 247) in 1996 (RR: 1.06; 95% CI: 0.96–1.17). This finding of a significant increase in helmet use after legislation in low- and mid-income areas but not in high-income areas remained even after logistic regression analysis adjusted for sex and location.

*Conclusions.* This study showed that bicycle helmet use by children increased significantly after helmet legislation. In this urban area with socioeconomic diversity and in the context of prelegislation promotion and educational activities, the legislative effect was most powerful among children who resided in low-income areas. *Pediatrics* 2003;112:e192–e196. URL: <http://www.pediatrics.org/cgi/content/full/112/3/e192>; *socioeconomic status, bicycle helmet, legislation, injury prevention.*

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Bicycling is a popular means of transportation, recreation, and exercise for children. The activity, however, is not without risk. Each year in Canada, approximately 40 children (5–15 years) die and 2500 are admitted to the hospital because of a bicycle-related injury.<sup>1</sup> In the province of Ontario, 212 bicycle injury deaths occurred between 1986 and 1991.<sup>2</sup> Of these, one third involved bicyclists under 15 years of age, and three quarters of the deaths resulted from head injuries.

There is compelling evidence that bicycle helmets are effective. A Cochrane Collaboration systematic review (based on 5 case control studies) showed that bicycle helmets reduce the risk of head and brain injury by 63% to 88% for cyclists involved in crashes.<sup>3</sup> Promotional strategies to increase bicycle helmet use by children have included education, subsidy, and legislation.

The majority of studies that have evaluated educational campaigns and helmet subsidies have demonstrated increased bicycle helmet use by children after the program.<sup>4</sup> Some studies, however, have shown that educational campaigns<sup>5,6</sup> and helmet subsidies<sup>7,8</sup> may increase helmet ownership but not necessarily helmet use.

Bicycle helmet legislation has been introduced and evaluated in Australia, Canada, New Zealand, and the United States.<sup>9–21</sup> The evaluative evidence suggests that helmet legislation is effective in increasing bicycle helmet use by children. None of the studies, however, has examined the influence of family income on observed helmet use by children after the introduction of legislation (probably because of limited statistical power). In this context, systematic reviews of the literature have highlighted the need for injury prevention research to assess the differential effectiveness of preventive strategies in different socioeconomic groups.<sup>22,23</sup>

In the province of Ontario, Canada, bicycle helmet legislation was introduced on October 1, 1995. The helmet law applies to children and youths younger than 18 years. Observational surveys of helmet use have been conducted annually in a single urban area in Ontario beginning in 1990. Before the law, health promotion activities to increase helmet use had been undertaken and evaluated in the same area.<sup>7,24</sup> The objective of this prospective observational study was to evaluate the influence of average family income on the effectiveness of helmet legislation on observed helmet use by children (5–14 years).

## METHODS

The study was conducted in East York, a health district of Metropolitan Toronto, in collaboration with the East York Health Unit. In 1996, the total population was 107 822, 11 340 of which were children 5 to 14 years. Census data were used to group the 21 census tracts in East York into 7 geographically distinct areas. The boundaries of these areas are natural barriers to travel, such as expressways, ravines, railway tracks, and hydroelectric power lines. The areas were also ranked according to average family income (based on Statistics Canada data). For analytical purposes, areas were defined as low-, mid-, and high-income areas. Census data profiles of the areas have been previously described.<sup>8,24</sup>

For each consecutive year from 1990 to 1997 inclusive, direct observations of children who were riding bicycles in East York during the months of April through October were made. In 1995, observations were completed before the introduction of the law on October 1, 1995. Only children who were between 5 and 14 years of age and riding a 2-wheeled bicycle were included in the study. In total, 111 sites across all 7 areas were selected for observation. Observational sites included school yards of all elementary and middle schools (kindergarten to grade 8) and all parks in East York. In addition, 5 major intersections and 5 residential streets from each area were randomly selected. Observers were trained and used a standardized data collection form. A pilot study showed that the data collected by observers were reliable and valid.<sup>25</sup> Observers remained at each site for 1 hour and collected data on helmet use and sex. Ethical approval for the study was obtained from the Hospital for Sick Children Research Ethics Board, the East York Board of Education, and the Metropolitan Separate School Board.

The proportion of children who wore a bicycle helmet was estimated by year (1990–1997, inclusive), sex (male, female), location (school, park, major intersection, residential street), and income area (low, mid, high). For estimating the effect of legislation on helmet use, data from the year immediately after legislation (1996) were compared with data from the year preceding legislation (1995). The relative risk (RR) of helmet use (after vs before legislation) was calculated along with a 95% confidence interval (CI). Logistic regression analysis was used to adjust for potential confounding variables (sex and location).

## RESULTS

During the 8-year study period, 9768 observations were made (range: 914–1879 observations per year). The proportion of child cyclists who wore a bicycle helmet increased steadily during the first 4 years of the study period, from 4% in 1990 (34 of 914), to 16% in 1991 (303 of 1879), to 25% in 1992 (383 of 1563), and to 45% in 1993 (438 of 984). During 1994 (460 of 1083) and 1995 (568 of 1227), helmet use remained relatively stable at approximately 44%. Helmet use rose markedly in 1996 (the first year after helmet legislation was introduced) to 68% (818 of 1202) and remained stable at 66% (609 of 916) in 1997.

Throughout the study period, girls were consistently more likely to wear helmets than boys. In total, 47% (1420 of 3047) of girls wore helmets, compared with 33% (2193 of 6721) of boys (RR: 1.43; 95% CI: 1.36–1.50). In addition, children who were riding to school were more likely to use helmets, compared with children who were riding on residential streets, major intersections, and parks. Overall, 48% (1497 of 3129) of children riding to school wore bicycle helmets, compared with 32% (2116 of 6639) of children riding at other locations (RR: 1.50; 95% CI: 1.43–1.58). As shown in Fig 1, children in the high-income areas were consistently more likely to wear helmets, compared with children in the mid- and low-income areas.

Helmet legislation was associated with a significant increase in helmet use by children in East York. In 1995, 46% (568 of 1227) of children wore bicycle helmets, compared with 68% (818 of 1202) of children in 1996 (RR: 1.47; 95% CI: 1.37–1.58). The effect of legislation, however, varied by income area. In low-income areas, helmet use increased by 28% after legislation, from 33% (213 of 646) in 1995 to 61% (442 of 721) in 1996 (RR: 1.86; 95% CI: 1.64–2.11). In mid-income areas, helmet use increased by 29% after legislation, from 50% (150 of 300) in 1995 to 79% (185 of 234) in 1996 (RR: 1.58; 95% CI: 1.39–1.80). In high-

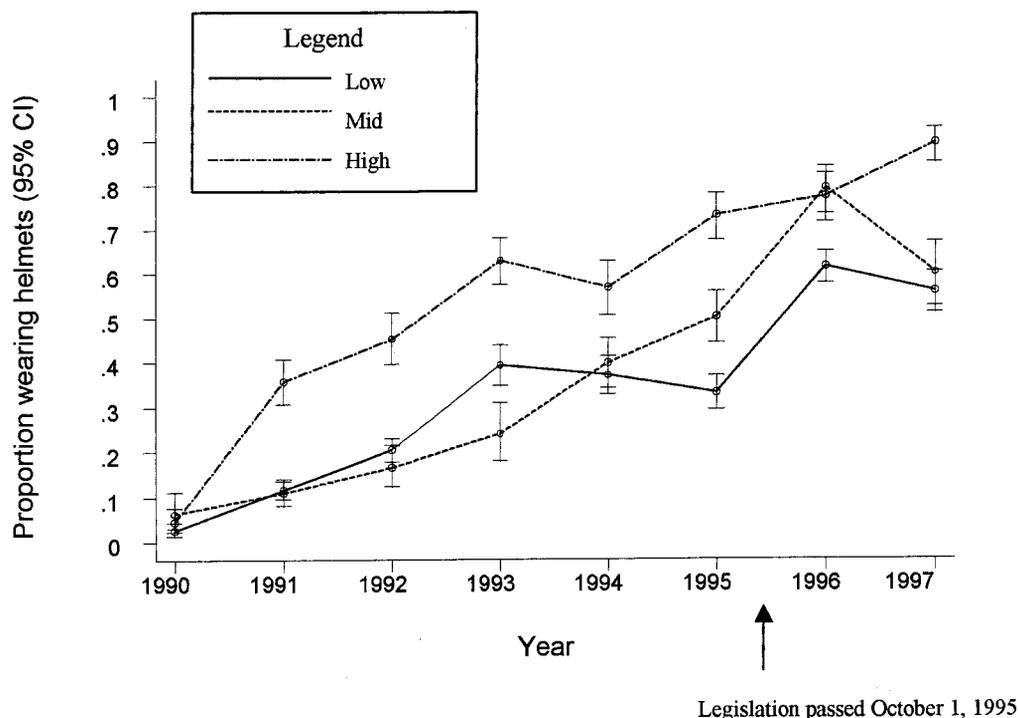


Fig 1. Proportion of bicyclists in East York observed wearing a bicycle helmet, by year and income area. Vertical bars denote 95% CIs.

income areas, helmet use increased by only 4%, from 73% (205 of 281) in 1995 to 77% (191 of 247) in 1996 (RR: 1.06; 95% CI: 0.96–1.17). This finding of a significant increase in helmet use after legislation in low- and mid-income areas but not in high-income areas remained even after logistic regression analysis adjusted for sex and location.

### DISCUSSION

This study showed that bicycle helmet use by children increased significantly after helmet legislation. In addition, the sampling frame, observational method, and prospective longitudinal nature of the study allowed us to evaluate the influence of average family income in a geographic region on the effectiveness of helmet legislation on helmet use by children. In all study years, helmet use was lowest for children who were observed cycling in low-income areas and highest for children who were observed cycling in high-income areas. After legislation, however, helmet use rates almost doubled in low-income areas, whereas rates in high-income areas remained essentially unchanged. This suggests that in an urban area with socioeconomic diversity, in the context of prelegislation promotion and educational activities, the legislative effect is most powerful among children who reside in low-income areas.

The strengths of our study include direct observation of helmet use, prospective data collection, prelegislation and postlegislation data of 8 years' duration, and large sample size (10 000 observations). In addition, sampling bias was minimized by using population-based, random sampling of observation sites. Information bias was reduced by using trained observers and a standardized data collection form. Last, confounding bias was minimized by us-

ing logistic regression analysis to adjust for potential confounding variables.

The main weakness of our study is that categorization of income areas was based on census tract data, as individual-level family income data were not available. Studies have shown, however, that socioeconomic measures based on census data may be a valid proxy for individual socioeconomic status.<sup>26,27</sup> The likelihood of misclassification (eg, children from 1 income level riding in another area with a different income level) was considered unlikely for 2 reasons. First, studies show that the majority of children in this age group ride their bicycles close to home.<sup>28</sup> Second, the boundaries of the 7 areas—expressways, ravines, railway tracks, and hydroelectric power lines—were natural barriers to travel by children on their bicycles.

The study may also be limited by the use of a time series design without a concurrent control group. In other words, the temporal trend in bicycle helmet use in an area without helmet legislation was not examined. The primary analysis, however, focused on the effect of helmet legislation on bicycle helmet use in 3 socioeconomic areas (low, mid, and high), rather than the overall trend in helmet use. Last, helmet use was higher in high-income areas before legislation. There was no overlap, however, of 95% CIs around the RRs for helmet use (after vs before legislation), between the high-income area and low- or mid-income areas.

Previous studies examining the effectiveness of helmet legislation in children have differed in their determination of sampling frame, survey methods, length of observation before legislation, existence of prelegislative promotional strategies, and duration of follow-up after legislation. For example, the sur-

vey methods used in several studies used reported helmet use rather than the determination of helmet use through direct observation.<sup>10,13,16,21</sup> In general, observational surveys have been considered the best method to measure helmet use, given that self-report is prone to recall bias and social desirability bias.<sup>29</sup>

Of the studies that have used observational survey methods, the duration of prelegislation data collection has been limited to 1 to 9 months before legislation, and postlegislation data collection has been as short as 1 to 10 months.<sup>9,14,15</sup> In addition, sample sizes have been small (50–300 children); thus, the CIs around the point estimates of helmet use have been wide.<sup>9,12,14</sup> In our study, we collected data for 6 years before legislation and for 2 years after legislation. A total of 9768 observations were made, and for each year of observation, the sample size ranged from 914 to 1879.

Three studies have described prospective, longitudinal data on helmet use, ranging from 2 to 8 years before legislation and from 1 to 3 years after legislation.<sup>11,18,20</sup> All of these studies have included observations of large numbers of cyclists of all ages, adults and children. In 2 studies<sup>11,18</sup> there are insufficient data to estimate the number of children observed, and in 1 study<sup>20</sup> the number of children observed is small (<100 children in each observational year).

Previous studies by our group suggest limited effectiveness of nonlegislative bicycle-related injury prevention strategies (education, subsidy) in low-income groups.<sup>7,24</sup> In addition, we have shown that the bicycle-related head injury rate declined significantly in provinces where legislation had been adopted compared with provinces and territories that did not adopt legislation.<sup>30</sup> Furthermore, we have not demonstrated a reduction in children's bicycling rates before and after legislation.<sup>31</sup>

The relationship between childhood injury and socioeconomic status has been examined in 2 recent systematic reviews.<sup>22,23</sup> Both reviews concluded that there is a paucity of well-conducted studies on this topic. However, both reviews provided data that indicate a differential uptake of safety measures in different socioeconomic groups. There is a need for data on this issue to better inform health promotion programs and health policy.

## CONCLUSIONS

The results of our study along with the published evidence suggest that helmet legislation is effective in increasing helmet use by children (particularly those in low-income areas). In addition, legislation is associated with a decrease in bicycle-related head injuries. Last, children's cycling habits seem to be unaffected by legislation. Therefore, these data support the adoption of legislation as an effective tool in the prevention of bicycle-related head injuries.

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## REFERENCES

1. Beaulne G, ed. *For the Safety of Canadian Children and Youth: From Injury Data to Preventive Measures*. Ottawa, Ontario, Canada: Health Canada; 1997
2. Rowe BH, Rowe AM, Bota GW. Bicyclist and environmental factors associated with fatal bicycle-related trauma in Ontario. *Can Med Assoc J*. 1995;152:45–53
3. Thompson DC, Rivara FP, Thompson R. Helmets for preventing head and facial injuries in bicyclists. *Cochrane Database Syst Rev*. 2000;(2): CD001855
4. Rivara FP, Thompson DC, Patterson MQ, Thompson RS. Prevention of bicycle-related injuries: helmets, education, and legislation. *Annu Rev Public Health*. 1998;19:293–318
5. Morris B, Trimble N. Promotion of bicycle helmet use among schoolchildren: a randomized clinical trial. *Can J Public Health*. 1991;82: 92–94
6. Towner P, Marvel K. A school-based intervention to increase the use of bicycle helmets. *Fam Med*. 1992;24:156–158
7. Kim AN, Rivara FP, Koepsell TD. Does sharing the cost of a bicycle helmet help promote helmet use? *Inj Prev*. 1997;3:38–42
8. Parkin PC, Hu X, Spence LJ, Kranz KE, Shortt LG, Wesson DE. Evaluation of a subsidy program to increase bicycle helmet use by children of low income families. *Pediatrics*. 1995;96:283–287
9. Cote TR, Sacks JJ, Lambert-Huber DA, et al. Bicycle helmet use among Maryland children: effect of legislation and education. *Pediatrics*. 1992; 89:1216–1220
10. Dannenberg AL, Gielen AC, Beilenson PL, Wilson MH, Joffe A. Bicycle helmet laws and educational campaigns: an evaluation of strategies to increase children's helmet use. *Am J Public Health*. 1993;83:667–673
11. Cameron MH, Vulcan AP, Finch CF, Newstead SV. Mandatory bicycle helmet use following a decade of helmet promotion in Victoria, Australia—an evaluation. *Accid Anal Prev*. 1994;26:325–337
12. Mackniin ML, Medendorp SV. Association between bicycle helmet legislation, bicycle safety education, and use of bicycle helmets in children. *Arch Pediatr Adolesc Med*. 1994;148:255–259
13. Schreiber RA, Kresnow MJ, Sacks JJ, Pledger EE, O'Neil JM, Toomey KE. Effect of a state law on reported bicycle helmet ownership and use. *JAMA*. 1996;276:1968–1973
14. Abularrage JJ, DeLuca AJ, Abularrage CJ. Effect of education and legislation on bicycle helmet use in a multiracial population. *Arch Pediatr Adolesc Med*. 1997;151:41–44
15. Ni H, Sacks JJ, Curtis L, Cieslak PR, Hedberg K. Evaluation of a statewide bicycle helmet law via multiple measures of helmet use. *Arch Pediatr Adolesc Med*. 1997;151:59–65
16. Borglund ST, Hayes JS, Eckes JM. Florida's bicycle helmet law and a bicycle safety educational program: did they help? *J Emerg Nurs*. 1999; 25:496–500
17. Puder DR, Visintainer P, Spitzer D, Casal D. A comparison of the effect of different bicycle helmet laws in 3 New York City suburbs. *Am J Public Health*. 1999;89:1736–1738
18. Scuffham P, Alsop J, Cryer C, Langley JD. Head injuries to bicyclists and the New Zealand bicycle helmet law. *Accid Anal Prev*. 2000;32:565–573
19. Kanny D, Schieber RA, Pryor V, Kresnow MJ. Effectiveness of a state law mandating use of bicycle helmets among children: an observational evaluation. *Am J Epidemiol*. 2001;154:1072–1076
20. LeBlanc JC, Beattie TL, Culligan C. Effect of legislation on the use of bicycle helmets. *Can Med Assoc J*. 2002;166:592–595
21. Rodgers GB. Effects of state helmet laws on bicycle helmet use by children and adolescents. *Inj Prev*. 2002;8:42–46
22. MacKay M, Reid DC, Moher D, Klassen T. Systematic review of the relationship between childhood injury and socio-economic status. Health Canada, H39-473/1999E; 1999. Available at: [http://www.hc-sc.gc.ca/hppb/childhood-youth/cyfh/safe\\_and\\_supportive/resources/Injury.pdf](http://www.hc-sc.gc.ca/hppb/childhood-youth/cyfh/safe_and_supportive/resources/Injury.pdf)
23. Dowswell T, Towner E. Social deprivation and the prevention of unintentional injury in childhood: a systematic review. *Health Educ Res*. 2002;17:221–237
24. Parkin PC, Spence LJ, Hu X, et al. Evaluation of a promotional strategy to increase bicycle helmet use by children. *Pediatrics*. 1993;91:772–777
25. Parkin P, Morris B, Chipman M, Miller C, Hu X, Wesson D. Measurement of bicycle helmet use by direct observation: accuracy of a measurement methodology [abstract]. *Paediatr Perinat Epidemiol*. 1991;5: A22–A23
26. Krieger N. Overcoming the absence of socioeconomic data in medical

- records: validation and application of a census-based methodology. *Am J Public Health*. 1992;82:703-710
27. Mustard CA, Derksen S, Berthelot JM, Wolfson M. Assessing ecologic proxies for household income: a comparison of household and neighbourhood level income measures in the study of population health status. *Health Place*. 1999;5:157-171
28. Agran PF, Winn DG. The bicycle: a developmental toy versus a vehicle. *Pediatrics*. 1993;91:752-755
29. Schieber RA, Sacks JJ. Measuring community bicycle helmet use among children. *Public Health Rep*. 2001;116:113-121
30. Macpherson AK, To TM, Macarthur C, Chipman ML, Wright JG, Parkin PC. Impact of mandatory helmet legislation on bicycle-related head injuries in children: a population-based study. *Pediatrics*. 2002;110(5). Available at: <http://www.pediatrics.org/cgi/content/full/110/5/e60>
31. Macpherson AK, Parkin PC, To TM. Mandatory helmet legislation and children's exposure to cycling. *Inj Prev*. 2001;7:228-230

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