BRIEF REPORT

Demographic, socioeconomic, and attitudinal associations with children's cycle-helmet use in the absence of legislation

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The association of demographic, socioeconomic, and attitudinal factors with children's cycle-helmet use was investigated using self-reported data from 9775 children aged 8–12 in England, where there are currently no legal requirements that cyclists (of any age) wear helmets. The results suggest that demographic factors, socioeconomic status, and attitudes influence whether children wear bicycle helmets but that attitudinal factors are most important.

Wearing a helmet when cycling can reduce mortality related to collisions¹ and lowers the risk of head, brain, and face injuries.^{2–6} The protective effect of helmets is greatest in children, who have most cycling-related head injuries.^{5,7} Legislation has proved highly effective in increasing helmet use,⁸ and interventions have been identified that significantly improve helmet-wearing.^{9,10} In the absence of either legislation or intervention, helmet use has been found to be associated with parental encouragement,¹¹ peer influences,^{11,12} children's attitudes,^{13–16} and levels of neighborhood deprivation.^{10,17,18}

In this study, I assessed the combined effects of demographic, socioeconomic, and attitudinal factors on cycle-helmet wearing in children aged 8–12 in the absence of legislation or local ordinances on helmet wearing. I used nationally representative cross-sectional data to compare the effects of demographic, socioeconomic, and attitudinal factors, and to assess the strength of their relationship with children's cycle-helmet use.

METHODS

Study population and design

Data for this study came from consecutive waves of the Health Survey for England (HSE) from 1997 to 2004. The HSE is a nationally representative survey of individuals aged 2 and over living in households in England, the aim of which is to provide information about health and to assess progress towards health targets. HSE data are publicly accessible from the Data Archive of the UK Economic and Social Data Service (www.esds.ac.uk). From 1997 to 2004, 13 985 children aged 8–12 participated in the HSE and were asked questions relating to cycle-helmet use. I used data on 9775 of these children in this study. Figure 1 gives a flow chart showing how respondents were selected for inclusion.

Demographic, socioeconomic, and attitudinal measures

I classified explanatory variables into three categories: demographic, socioeconomic, and attitudinal. Demographic variables were: age (in years); gender; degree of urbanization (urban, suburban, rural; categorized by interviewers when visiting households). Socioeconomic variables were occupational social class of the head of household in six categories (professional; managerial and technical; skilled non-manual; skilled manual;

semi-skilled manual; unskilled) and standardized equivalized household income split by deciles (categories: £34 211 and above; £24 595–34 210; £19 439–24 594; £15 690–19 438; £12 466–15 689; £10 196–12 465; £7685–10 195; £5532–7684; £4160–5530; £0–4159).

As part of the HSE, children were asked to respond to six statements about cycle helmets, and the attitudinal variables are the results of these (all answered yes/no):

- “Wearing a helmet makes me feel safer when I ride a bike”;
- “Bicycle helmets cost too much money”;
- “Helmets look good”;
- “It is difficult to get helmets to fit”;

Figure 1 Flow chart showing inclusion in study of children aged 8–12 in Health Surveys for England 1997–2004. “Schedule not obtained” refers to children whose legal guardians were not present at the outset and who were not permitted to participate in the survey. SES, socioeconomic status.

Table 1 Demographic and socioeconomic characteristics of respondents (n = 9775)

Characteristic	n (%)
Age	
8	2040 (20.9)
9	1920 (19.6)
10	2013 (20.6)
11	1923 (19.7)
12	1879 (19.2)
Gender	
Male	5005 (51.2)
Female	4770 (48.8)
Degree of urbanization	
Urban	1798 (18.4)
Suburban	5935 (60.7)
Rural	2042 (20.9)
Social class of household reference person	
Professional	685 (7.0)
Managerial/technical	2999 (30.7)
Skilled non-manual	1690 (17.3)
Skilled manual	2402 (24.6)
Semi-skilled manual	1601 (16.4)
Unskilled	398 (4.1)

Percentages may not sum to 100 because of rounding.

- “Helmets can protect you if have an accident”;
- “Wearing a helmet makes me feel like a proper cyclist.”

Outcome variables

Respondents who did not own, or who never rode, a bicycle were excluded from analysis (fig 1). Those who cycled were asked whether they wore a helmet when they rode; possible responses were “always”, “sometimes”, and “never”. A subsequent question asked respondents whether they sometimes forgot to put their helmet on. I constructed a binary outcome coded 1 for those who reported that they always wore a helmet and never forgot to put it on, and 0 for those who sometimes or never wore a helmet, or sometimes forgot their helmet.

Statistical analysis

Logistic regression was used to estimate the odds ratios of always wearing a helmet associated with the explanatory variables. Because the aim was to compare the effects of groups of variables (socioeconomic and attitudinal) rather than assess the explanatory value of individual independent variables, I entered variables into the model in blocks to enable comparison of their effects and explanatory value. I controlled for clustering within households and within each round of the survey and conducted all analyses using Stata SE V9.2.

RESULTS

Table 1 shows the demographic and socioeconomic characteristics of the children involved in this analysis. Table 2 shows percentages of children who reported that they always wore a

Table 2 Numbers of children aged 8–12 who reported that they always wore a cycle helmet when riding a bike in relation to demographic, socioeconomic, and attitudinal variables

Variable	Always wears a helmet	Doesn't always wear a helmet	Unadjusted odds ratio (95% CI)
Total	1658 (17.0)	8117 (83.0)	–
Age			
8	396 (19.4)	1644 (80.6)	1.00
9	366 (19.1)	1554 (80.9)	0.98 (0.83 to 1.15)
10	365 (18.1)	1648 (81.9)	0.92 (0.79 to 1.08)
11	311 (16.2)	1612 (83.8)	0.80 (0.68 to 0.94)
12	220 (11.7)	1659 (88.3)	0.55 (0.46 to 0.66)
Gender			
Male	761 (15.2)	4240 (84.8)	1.00
Female	897 (18.8)	3877 (81.2)	1.29 (1.16 to 1.43)
Degree of urbanization			
Urban	227 (12.6)	1571 (87.4)	1.00
Suburban	974 (16.4)	4961 (83.6)	1.36 (1.16 to 1.59)
Rural	457 (22.4)	1585 (77.6)	2.00 (1.68 to 2.37)
Social class of household reference person			
Professional	195 (28.5)	490 (71.5)	1.00
Managerial/technical	646 (21.5)	2353 (78.5)	0.69 (0.57 to 0.83)
Skilled non-manual	269 (15.9)	1421 (84.1)	0.48 (0.39 to 0.59)
Skilled manual	333 (13.9)	2069 (86.1)	0.40 (0.33 to 0.50)
Semi-skilled manual	180 (11.2)	1421 (88.8)	0.32 (0.25 to 0.40)
Unskilled	25 (8.8)	363 (91.2)	0.24 (0.16 to 0.36)
Equalized household income in deciles			
Highest	283 (26.1)	800 (73.9)	1.00
2	236 (22.4)	816 (77.6)	0.82 (0.67 to 1.00)
3	205 (20.6)	789 (79.4)	0.73 (0.60 to 0.90)
4	218 (20.8)	830 (79.2)	0.74 (0.61 to 0.91)
5	168 (16.5)	849 (83.5)	0.56 (0.45 to 0.69)
6	154 (15.4)	845 (84.6)	0.52 (0.41 to 0.64)
7	111 (12.1)	806 (87.9)	0.39 (0.31 to 0.50)
8	108 (11.8)	806 (88.2)	0.38 (0.30 to 0.48)
9	84 (9.7)	781 (90.3)	0.30 (0.23 to 0.40)
Lowest	91 (10.3)	795 (89.7)	0.32 (0.25 to 0.42)
Wearing a helmet makes me feel safer when I ride a bike			
Yes	1469 (27.8)	3807 (72.2)	8.80 (7.52 to 10.3)*
No	189 (4.2)	4310 (95.8)	
Bicycle helmets cost too much money			
Yes	50 (4.4)	1095 (95.6)	0.20 (0.15 to 0.27)*
No	1608 (18.6)	7022 (81.4)	
Helmets look good			
Yes	400 (23.1)	1330 (76.9)	1.62 (1.43 to 1.84)*
No	1258 (15.6)	6787 (84.4)	
It is difficult to get helmets to fit			
Yes	251 (9.6)	2361 (90.4)	0.43 (0.38 to 0.50)*
No	1407 (19.6)	5756 (80.4)	
Helmets can protect you if you have an accident			
Yes	1227 (17.6)	5737 (82.4)	1.18 (1.05 to 1.33)*
No	431 (15.3)	2380 (84.7)	
Wearing a helmet makes me feel like a proper cyclist			
Yes	709 (29.2)	1720 (70.8)	2.78 (2.49 to 3.10)*
No	949 (12.9)	6397 (87.1)	

Values are number (%). Percentages may not sum to 100 because of rounding.

*Odds ratios for attitudinal variables represent the odds of reporting always wearing a helmet associated with responding “Yes” to each statement, compared with response of “No”.

helmet in relation to demographic, socioeconomic, and attitudinal variables, plus the associated unadjusted odds ratios (ORs). Overall, 17.1% (95% CI 15.7% to 18.6%) reported that they always wore a helmet when they rode a bike. In unadjusted models, all six attitudinal variables were statistically significantly associated with helmet wearing.

Table 3 shows logistic regression results. Model 1 contains demographic and socioeconomic variables and shows a statistically significant reduction in the OR of wearing a helmet associated with age, and a statistically significant increase associated with being female (compared with male) or living in a rural area (compared with an urban one). The OR of wearing a helmet decreased as the occupational social class of the household reference person declined. Compared with a child in a household with a professional head of household, the estimated OR for a child who lives in a household where the head of household was unskilled was 0.38 (95% CI 0.25 to 0.57). Each 10% reduction in equivalized household income was associated with a 9% reduction in the chances of reporting always wearing a helmet (OR 0.91, 95% CI 0.90 to 0.93).

Model 2 includes demographic, socioeconomic, and attitudinal variables. In this model, the effect of age was no longer statistically significant. In this adjusted model, statistically significant differences in the ORs of reporting wearing a helmet were associated with all attitudinal variables except "Helmets look good". The largest effect was associated with the statement "Helmets make me feel safer when I ride a bike", to which an answer "Yes" compared with "No" was associated with an OR of 7.37 (95% CI 5.42 to 10.03).

The difference in χ^2 (and pseudo- R^2) between model 1 and model 2 was markedly greater than that between model 1 and the null model, suggesting that attitudinal variables provide more explanatory power than demographic and socioeconomic variables alone, and that this additional explanatory power is

additional to that of the demographic and socioeconomic variables. This is the case when controlling for the demographic and socioeconomic variables, as in table 3, and when the attitudinal variables are entered separately (results not shown).

DISCUSSION

These findings suggest that, in the absence of relevant legislation, there are demographic, socioeconomic, and attitudinal factors associated with whether children aged 8–12 report wearing helmets when cycling. However, it appears that the largest proportion of the differences in helmet use is explained by attitudinal variables. These findings are in keeping with previous findings that helmet use is less common in children from deprived neighborhoods,¹⁰ and with observations in smaller populations that children's attitudes are important determinants of helmet wearing.^{14–16} I have built on these previous studies by comparing the effects of demographic, socioeconomic, and attitudinal variables in a single model, using data from repeated waves of a large-scale nationally representative survey.

Some methodological issues should be borne in mind. I used self-reports of helmet wearing, and both the independent and dependent variables are based on what children (or their guardians, for the socioeconomic variables) reported about themselves. In general, children and adolescents have been found to be good informants on their behaviors, including problem behaviors.¹⁹ Studies of helmet wearing rely on either self-reported or observed behavior,⁹ and there is little published information about which of these measures has greater reliability and validity. Nevertheless, I cannot exclude the possibility that children who over-report risk-averse attitudes may also over-report risk-averse behaviors.

Because the findings are from cross-sectional data, caution must be exercised in drawing causal inferences. Longitudinal

Table 3 Odds ratios (95% CI) of reporting always wearing a cycle helmet when riding a bike in relation to demographic, socioeconomic, and attitudinal variables

Variable	Model 1	Model 2
<i>Demographic</i>		
Age (reference category = 8)	0.87 (0.83 to 0.91)	0.97 (0.92 to 1.02)
Gender		
Female	1.20 (1.15 to 1.26)	1.16 (1.11 to 1.22)
Area (reference category = urban)		
Suburban	1.17 (0.98 to 1.40)	1.26 (1.03 to 1.53)
Rural	1.56 (1.31 to 1.86)	1.65 (1.34 to 2.02)
<i>Socioeconomic</i>		
Social class of household reference person (reference category = professional)		
Managerial/technical	0.74 (0.62 to 0.89)	0.70 (0.60 to 0.81)
Skilled non-manual	0.68 (0.56 to 0.81)	0.64 (0.53 to 0.78)
Skilled manual	0.54 (0.44 to 0.66)	0.52 (0.40 to 0.67)
Semi-skilled manual	0.49 (0.39 to 0.61)	0.49 (0.37 to 0.66)
Unskilled	0.38 (0.25 to 0.57)	0.35 (0.23 to 0.52)
Equivalized household income (deciles)	0.91 (0.90 to 0.93)	0.91 (0.89 to 0.94)
<i>Attitudinal</i>		
Attitudes—Helmets... (results relate to answer "Yes" to each statement)		
...make me feel safer when I ride a bike		7.37 (5.42 to 10.03)
...cost too much		0.35 (0.23 to 0.54)
...look good		0.96 (0.86 to 1.07)
...don't fit well		0.48 (0.39 to 0.59)
...protect you in an accident		0.66 (0.55 to 0.80)
...make me feel like a proper cyclist		1.85 (1.40 to 2.45)
Log-likelihood	−4268.9	−3621.2
Degrees of freedom	18	24
χ^2	362.9	1658.3
χ^2 change	211.5	1295.4
AIC	8551.8	7256.4
Pseudo- R^2	0.041	0.186

AIC, Akaike information criterion.

Model 1, demographic and socioeconomic variables; model 2, demographic, socioeconomic, and attitudinal variables.

Key points

- Wearing a helmet while cycling can protect children if they are involved in a collision, but the proportion of children who wear a helmet remains low.
- In the absence of relevant legislation, wearing a cycle helmet is influenced by age, socioeconomic status, and attitudes, but the relative contribution of each was previously unclear.
- Where there are no legal constraints, whether or not children wear helmets when cycling is more strongly associated with attitudes than socioeconomic factors.

data would enable us to assess whether changes in attitudes over time (which are implied by the differences in attitudes at different ages) bring about changes in behavior.

Implications for prevention

Legislation is a proven way of increasing rates of cycle-helmet use. As long as legislation remains politically unpalatable, as is currently the case in England, attempts to understand motivations for helmet wearing remain important. These findings suggest that promotion efforts should include consideration of how to bring about change in children's attitudes to cycle helmets and helmet-wearing.

Conclusions

It was found that reported cycle-helmet use by children aged 8–12 was more associated with their attitudes to cycle helmets than with socioeconomic factors. Age did not have a significant effect on helmet use when attitudes were controlled for. In the absence of appropriate legislation, interventions to promote cycle-helmet use by children should take into account their attitudes to helmets.

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REFERENCES

- 1 Davidson JA. Epidemiology and outcome of bicycle injuries presenting to an emergency department in the United Kingdom. *Eur J Emerg Med* 2005;**12**:24–9.
- 2 Cook A, Sheikh A. Trends in serious head injuries among English cyclists and pedestrians. *Inj Prev* 2003;**9**:266–7.
- 3 Attewell RG, Glase K, McFadden M. Bicycle helmet efficacy: a meta-analysis. *Accid Anal Prev* 2001;**33**:345–52.
- 4 Linn S, Smith D, Sheps S. Epidemiology of bicycle injury, head injury, and helmet use among children in British Columbia: a five year descriptive study. Canadian Hospitals Injury, Reporting and Prevention Program (CHIRPP). *Inj Prev* 1998;**4**:122–5.
- 5 Thompson RS, Rivara FP, Thompson DC. A case-control study of the effectiveness of bicycle safety helmets. *N Engl J Med* 1989;**320**:1361–7.
- 6 Thompson DC, Rivara FP, Thompson RS. Effectiveness of bicycle safety helmets in preventing head injuries: a case-control study. *JAMA* 1996;**276**:1968–73.
- 7 Chapman HR, Curran ALM. Bicycle helmets: does the dental profession have a role in promoting their use? *Br Dent J* 2004;**196**:555–60.
- 8 Karkhaneh M, Kalenga JC, Hagel BE, et al. Effectiveness of bicycle helmet legislation to increase helmet use: a systematic review. *Inj Prev* 2006;**12**:76–82.
- 9 Royal ST, Kendrick D, Coleman T. Non-legislative interventions for the promotion of cycle helmet wearing by children. *Cochrane Database Syst Rev*, 2005;(2), CD003985.
- 10 Kendrick D, Royal S. Cycle helmet ownership and use: a cluster randomised controlled trial in primary school children in deprived areas. *Arch Dis Child* 2004;**89**:330–5.
- 11 Cryer PC, Cole J, Davidson LL, et al. Rates of, and the factors affecting, cycle helmet use among secondary schoolchildren in East Sussex and Kent. *Inj Prev* 1998;**4**:106–10.
- 12 Liller KD, Morissette B, Noland V, et al. Middle school students and bicycle helmet use: knowledge, attitudes, beliefs, and behaviors. *J Sch Health* 1998;**68**:325–8.
- 13 Forjuoh SN, Fiesinger T, Schuchmann JA, et al. Helmet use: a survey of 4 common childhood leisure activities. *Arch Pediatr Adolesc Med* 2002;**156**:656–61.
- 14 Berg P, Westerling R. Bicycle helmet use among schoolchildren: the influence of parental involvement and children's attitudes. *Inj Prev* 2001;**7**:218–22.
- 15 Hendrickson SG, Becker H. Impact of a theory based intervention to increase bicycle helmet use in low income children. *Inj Prev* 1998;**4**:126–31.
- 16 Gielen AC, Joffe A, Dannenberg AL, et al. Psychosocial factors associated with the use of bicycle helmets among children in counties with and without helmet use laws. *J Pediatr* 1994;**124**:204–10.
- 17 Kendrick D, Royal S. Inequalities in cycle helmet use: cross sectional survey in schools in deprived areas of Nottingham. *Arch Dis Child* 2003;**88**:876–80.
- 18 Britt J, Silver I, Rivara FP. Bicycle helmet promotion among low income preschool children. *Inj Prev* 1998;**4**:280–3.
- 19 Verhulst FC, Van der Ende J. Agreement between parents' reports and adolescents' self-reports of problem behavior. *J Child Psychol Psychiatry* 1992;**33**:1011–23.