

Incompetent or Too Competent? Negotiating Everyday Cycling Identities in a Motor Dominated Society

RACHEL ALDRED

Senior Lecturer in Sociology, School of Law and Social Sciences, University of East London, London, UK

ABSTRACT *This article uses the concept of stigma to explore cycling identities in the UK. Drawing on interview data, it argues that people who cycle are caught between two threats: appearing too competent as a cyclist (a ‘proper cyclist’), and appearing not competent enough (a ‘bad cyclist’). Strategies of identity management are discussed, which can include elements of negotiation, disavowal and challenge. The article aims to show that transport modes can produce disadvantaged and stigmatised social identities: like other forms of stigma these are mediated both by social environments and by other social identities. Implications for policy and advocacy are suggested.*

KEY WORDS: cyclist; cycling; identity; inequality; stigma

Introduction

This article draws from work on deviance and identity to analyse how it is that after 20 years of pro-cycling policy discourse cycling is *still* not ‘normal’ in the UK. At practitioner forums for the Cycling Cultures project,¹ on the blogosphere, in workshops, people ask: how can we increase the level of cycling, and why is it still so low? This is a pressing policy problem, given the need (a) to reduce CO₂ emissions from transport and (b) to encourage physical activity among sedentary populations (Davis *et al.* 2007). This article analyses one contributory factor to the ongoing policy impasse: despite 20 years of pro-cycling policy discourse, the ‘cyclist’ identity remains problematic and, in Goffman’s terms, stigmatised.

Why use the concept of stigma, which has been criticised as a poorly theorised ‘catch-all’ concept conflating different processes? I follow Deacon (2006, p. 418) in limiting its use to ‘othering, blaming and shaming (often called symbolic stigma)’ and hence generally focus upon perceptions of cyclists and cycling identities. While touching on issues of discrimination, the article concentrates on how symbolic

Correspondence Address: Rachel Aldred, Senior Lecturer in Sociology, School of Law and Social Sciences, University of East London, London, UK. Email: R.E.Aldred@uel.ac.uk

A second lesson for advocates might be that the popularity of cycle sport events and personalities will not necessarily make everyday utility and leisure cycling more attractive, given the negative associations of being a 'proper cyclist'. 'Everyday cyclists' and potential everyday cyclists are unlikely to see the accoutrements of sports cycling (helmets, Lycra, bright clothing) as representing an image that they want to portray on their way to the shops, despite a 'toned down' version of this kit being associated with 'good cycling'. However, activists may find cause for optimism in the fact that 'everyday cyclists' expressed little hostility towards cycle campaigners. This suggests that perhaps, despite the complex and double stigma associated with being a cyclist, scope remains for advocacy and activism to grow and in the process challenge the stigmas associated with cycling.

Acknowledgements

I would like to thank my colleagues Katrina Jungnickel, who worked on the project with me, and Justin Spinney, who provided extensive comments. I would also like to thank all the participants, the anonymous peer reviewers, and the journal editors for their input.

Notes

1. See www.cyclingcultures.org.uk/.
2. This in itself perpetuates the perception of deviance in assuming that there is a hypothesized 'road tax' and that cyclists are uninsured.
3. As the authors of the DfT report point out, the workshop format may shape the data in specific ways; hence, our use of a contrasting methodology may illuminate different points, making it potentially more likely that respondents might admit to stigmatised behaviour or challenge stigma.
4. Around one in four Cambridge residents cycle to work (10 times the England and Wales average).
5. All information from the UK Census; the most recent data referred to is from 2001.
6. Cambridge has a large, relatively well resourced, active Cycling Campaign, while Hull currently does not, although several local CTC (formerly the Cyclists' Touring Club) members are involved in advocacy.
7. Thanks to a Hull stakeholder for pointing this out.
8. For example, arriving by bicycle with or without a helmet can both provoke approval or disapproval, depending on the person's views.
9. Her analysis of the age ordering of clothes also applies to discussions around Lycra clothing; and for example, pejorative gendered and aged labels such as MAMIL – 'Middle aged man in Lycra'.
10. Police also target cyclists riding at night without lights, but unlike in Cambridge this offence does not seem to provoke popular anger.
11. During later fieldwork in Bristol I interviewed a film maker who is also a hand cyclist: she spoke eloquently of how disabled cyclists might feel marginalised within two already marginalised communities – and of her joint transport identity, being a driver as well as a hand-cyclist.
12. Note the pressure to 'get out of the way' of motorists, as expressed by some interviewees.
13. Here there is a contrast with Skinner and Rosen's research in Cambridge; which suggests different maintenance scripts are given in different situations – perhaps interviewer gender is important here.

References

- Act on CO₂, 2010. *Try walking and cycling on short journeys*. Available from: <http://actonco2.direct.gov.uk/home/what-you-can-do/On-the-move/Walking-and-cycling.html> [Accessed 26 October 2010].
- Aldred, R., 2010. 'On the outside'? Constructing cycling citizenship. *Social and Cultural Geography*, 11 (1), 35–52.
- Aldred, R. and Woodcock, J., 2008. Transport: challenging disabling environments. *Local Environment*, 13 (6), 485–496.

Adults' attitudes towards child cycling: a study of the impact of infrastructure

Rachel Aldred¹

Department of Planning and Transport, University of Westminster, UK.

Research on cycle infrastructure preferences generally suggests a preference for off-road cycle infrastructure and segregation from motor traffic, among both existing cyclists and non-cyclists. However, studies have so far not explored how the presence of children might shape adults' attitudes to cycle infrastructure. Similarly, studies on the determinants of child cycling have not as yet looked in depth at the impact of parental attitudes to specific infrastructure types. This paper reports on an online survey about how people's preferences might vary, depending on whether they were making a cycle journey alone, travelling with a child, or considering whether to let an older child travel alone. Respondents were also asked whether they thought each of ten infrastructure scenarios were suitable for 'most people'. The paper discusses findings from the online survey, identifying changes in preferences and investigating subgroup variation. The presence of children makes a major difference to people's willingness to cycle in the more challenging situations. There is substantial consensus across subgroups over the extent to which the various examples are suitable for cycling with children.

Keywords: Britain, Children, Cycle Infrastructure, Cycling, Gender, Survey.

1. Introduction

While cycling in the UK remains very low in a European context, some cities are investing more in cycling and seeking to develop better infrastructure standards (Butcher 2012, GLA 2013). However, as in other traditionally low-cycling countries, cities are struggling in the face of political obstacles and the persistence of inherited approaches now widely criticised. Britain's national cycle design guidance (known as LTN, Local Transport Note, 2/08) contains a general presumption against segregating cyclists from motor traffic, based partly on experience with often poor-quality 'segregated' designs (Aldred 2012).

Child cycling is often cited as a policy goal, with perceived benefits related to health, congestion reduction, and the promotion of lifelong sustainable travel habits. The Scottish Government's 2010 Cycling Action Plan stated (2010:4) that 'we want to increase [cycling to school] and to encourage those children to become cycling adults'; the current (2013) plan repeats this aspiration saying that 'Children and Young People are a core group of cyclists' (Annex G). England's nationally funded cycle training scheme ('Bikeability'), while available to adults, is largely aimed at getting children cycling through on-road training. However, increasing child cycling has proved particularly challenging. While some metropolitan areas in the UK have seen an uptake in adult commuting between 2001 and 2011 (Goodman 2013), rates of children cycling to school have barely shifted (DfT 2012).

¹ A: Faculty of Architecture and the Built Environment, University of Westminster, Marylebone Campus, 35 Marylebone Road, London NW1 5LS. T: +44 (0)20 7911 5021 E: r.aldred@westminster.ac.uk



Investigating the rates and impacts of near misses and related incidents among UK cyclists



Rachel Aldred^{a,*}, Sian Croweller^b

^a Department of Planning and Transport, Faculty of Architecture and the Built Environment, University of Westminster, Marylebone Campus, 35 Marylebone Road, London NW1 5LS, UK

^b School of Earth Sciences, University of Bristol, Wills Memorial Building, Queens Road, Bristol BS8 1RJ, UK

ARTICLE INFO

Article history:

Received 23 March 2015
 Received in revised form
 10 May 2015
 Accepted 18 May 2015
 Available online 12 June 2015

Keywords:

Cyclists
 Near misses
 UK
 Risk

ABSTRACT

The paper investigates the occurrence of non-injury incidents among cyclists in the UK, seeking to (i) generate a rate that can be compared with injury rates, (ii) analyse factors affecting incident rates, and (iii) analyse factors affecting the impact of incidents on cyclists.

We collected data on non-injury cycling ‘incidents’ (near misses and other frightening and/or annoying incidents) from 1692 online diaries of cycle trip stages¹ and incidents, participants having signed up in advance for a specific day. Following data cleaning and coding, a dataset was created covering 1532 diary days and 3994 records of incidents occurring within the UK. Incident rates were calculated and compared to injury risks for cyclists. Cross-tabulation and regression were used to identify factors affecting incident rates and the effect an incident has on the cyclist.

Frightening or annoying non-injury incidents, unlike slight injuries, are an everyday experience for most people cycling in the UK. For regular cyclists ‘very scary’ incidents (rated as 3 on a 0–3 scale) are on average a weekly experience, with deliberate aggression experienced monthly. Per mile, non-injury incidents were more frequent for people making shorter and slower trips. People aged over 55 were at lower risk, as were those cycling at the weekend and outside the morning peak. Incidents that involved motor vehicles, especially those involving larger vehicles, were more frightening than those that did not.

Near miss and other non-injury incidents are widespread in the UK and may have a substantial impact on cycling experience and uptake. Policy and research should initially target the most frightening types of incident, such as very close passes and incidents involving large vehicles. Further attention needs to be paid to the experiences of groups under-represented among cyclists, such as women making shorter trips.

© 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Cyclists have a higher risk of death or serious injury, per mile, than users of motorised modes of transport except motorcycles (Dft, 2014). Despite higher mode-specific risks, public health researchers argue this is outweighed by societal health benefits (De Hartog et al., 2010). For an individual this depends on age, gender and background injury risk levels (Woodcock et al., 2009): for example, cycling risks in the UK are substantially higher than in countries such as the Netherlands (Mindell et al., 2012).

While it is government policy within UK member countries to support and increase cycling, at a national level cycling levels have barely changed. Perceived risk is a major barrier to uptake (Horton, 2007) and experiencing or even witnessing non-injury incidents may contribute. A study in the San Francisco Bay Area (Sanders, 2015) found 86% of those who cycled at least annually had experienced a near miss, with 20% having been hit. Near misses were more strongly associated than collisions with perceived traffic risk. Earlier research in Oxford, UK, by Joshi et al. (2001) highlighted near misses as a relatively common experience for cyclists.

Hence initial evidence suggests non-injury incidents may both be frequent and contribute to perceived safety, with potential impacts on uptake. However, both Sanders (2015) and Joshi et al. (2001) only examine one locality, and only Joshi et al.'s methods allow for a rate

* Corresponding author.

E-mail addresses: r.albred@westminster.ac.uk (R. Aldred), sian.croweller@bristol.ac.uk (S. Croweller).

¹ A cycle trip stage being a part of a trip made by cycle; for example, cycling to the train station.

Contents lists available at [ScienceDirect](#)

Journal of Transport & Health

journal homepage: www.elsevier.com/locate/jth

Diversifying and normalising cycling in London, UK: An exploratory study on the influence of infrastructure

Rachel Aldred ^{a,*}, John Dales ^b

^a Department of Planning and Transport, Faculty of Architecture and the Built Environment, University of Westminster, Marylebone Campus, 35 Marylebone Road, London NW1 5LS, UK

^b Urban Movement, Exmouth House, 3-11 Pine Street, London EC1R 0JH, UK

ARTICLE INFO

Article history:

Received 12 May 2016

Received in revised form

29 October 2016

Accepted 1 November 2016

Available online 30 November 2016

Keywords:

Cycling

Cycle infrastructure

Safety clothing

Perceptions

Gender

Age

ABSTRACT

This article examines the extent to which protected infrastructure is associated with greater diversity and normalisation of cycling. In the UK, cyclists are predominantly male and often wear distinctive cycle clothing rather than everyday clothes. This is not the case in higher-cycling countries such as the Netherlands and Germany. It has been argued that the UK's demographic skewing may be partly due to poor quality infrastructure which can be off-putting for many, but particularly for women, children and older people. Route choice studies tend to confirm that women are more likely than men to choose routes with greater levels of separation from motor traffic. Other work suggests that if cycling feels unsafe, cyclists may wear specialised cycle clothing such as helmets, which then may itself support a perception of cycling as dangerous.

This small-scale exploratory study examines age, gender, and use of specialist clothing in relation to infrastructure type, comparing a recently improved route with separate space for cyclists to parallel busy streets without protected cycle infrastructure. The separated route showed better, though still unequal, demographic balance and a reduced tendency for cyclists to wear helmets and sporty clothing, though not high-visibility items. Infrastructure type is only one factor in route choice, particularly if there is relatively little good infrastructure along key desire lines. However this paper suggests that infrastructure for cycling could help to improve perceptions of safety and the need to wear specialist cycle clothing. In turn this could promote a better demographic balance and normalise cycling.

© 2017 Elsevier Ltd. All rights reserved.

1. Background

Cycling has substantial potential to improve population health, with a [Public Health England/Local Government Association \(2013:4\)](#) report commenting: 'Creating an environment where people actively choose to walk and cycle as part of everyday life can have a significant impact on public health and may reduce inequalities in health.' Such environments help make physical activity more inclusive because many people lack time and/or money to participate in alternative, modified forms of exercise like attending a gym. Older people reap larger benefits from becoming more physically active, because they are at relatively high risk of developing inactivity-related diseases ([Woodcock et al., 2014](#)).

* Corresponding author.

E-mail addresses: r.aldred@westminster.ac.uk (R. Aldred), j.dales@urbanmovement.co.uk (J. Dales).

Cycling provision separated from motor traffic: a systematic review exploring whether stated preferences vary by gender and age

Rachel Aldred^a, Bridget Elliott^b, James Woodcock^{c*} and Anna Goodman^{d*}

^aFaculty of Architecture and the Built Environment, Department of Planning and Transport, London, UK;

^bPolicy Studies Institute, University of Westminster, London, UK; ^cUKCRC Centre for Diet and Activity Research (CEDAR), MRC Epidemiology Unit, School of Clinical Medicine, University of Cambridge, Cambridge, UK;

^dLSHTM, London, UK

ABSTRACT

In this paper, we represent a systematic review of stated preference studies examining the extent to which cycle infrastructure preferences vary by gender and by age. A search of online, English-language academic and policy literature was followed by a three-stage screening process to identify relevant studies. We found 54 studies that investigated whether preferences for cycle infrastructure varied by gender and/or by age. Forty-four of these studies considered the extent of separation from motor traffic. The remainder of the studies covered diverse topics, including preferred winter maintenance methods and attitudes to cycle track lighting. We found that women reported stronger preferences than men for greater separation from motor traffic. There was weaker evidence of stronger preferences among older people. Differences in preferences were quantitative rather than qualitative; that is, preferences for separated infrastructure were stronger in some groups than in others, but no group preferred integration with motor traffic. Thus, in low-cycling countries seeking to increase cycling, this evidence suggests focusing on the stronger preferences of under-represented groups as a necessary element of universal design for cycling.

ARTICLE HISTORY

Received 4 November 2015
Accepted 5 June 2016

KEYWORDS

Cycling; gender; age; equity; systematic review

Introduction

Within countries with a low cycling mode share (approximately 5% mode share or less, herein referred to as low-cycling countries), cycling is demographically unequal, notably by gender and age (Pucher & Buehler, 2008). A policy concern to diversify cycling has been accompanied by a growth in academic literature on this issue. Aldred, Woodcock and Goodman (2015) explored whether increasing cycle commuting (between 2001 and 2011) was associated with greater age and gender diversity in England and Wales.

CONTACT Rachel Aldred  r.albred@westminster.ac.uk  Faculty of Architecture and the Built Environment, Department of Planning and Transport, Marylebone Campus, 35 Marylebone Road, London NW1 5LS, UK

 Supplemental data for this article can be accessed at [10.1080/01441647.2016.1200156](http://dx.doi.org/10.1080/01441647.2016.1200156).

*Joint senior authors.

© 2016 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Exposure-Based, 'Like-for-Like' Assessment of Road Safety by Travel Mode Using Routine Health Data

Jennifer S. Mindell^{1*}, Deborah Leslie², Malcolm Wardlaw³

1 Research Department of Epidemiology and Public Health, UCL (University College London), London, United Kingdom, **2** Centre for Physical Activity and Nutrition Research, Deakin University, Burwood, Australia, **3** Edinburgh, United Kingdom

Abstract

Background: Official reports on modal risk have not chosen appropriate numerators and denominators to enable like-for-like comparisons. We report age- and sex-specific deaths and injury rates from equivalent incidents in England by travel mode, distance travelled and time spent travelling.

Methods: Hospital admissions and deaths in England 2007–2009 were obtained for relevant ICD-10 external codes for pedestrians, cyclists, and car/van drivers, by age-group and sex. Distance travelled by age-group, sex and mode in England (National Travel Survey 2007–2009 data) was converted to time spent travelling using mean trip speeds. Fatality rates were compared with age-specific Netherlands data.

Results: All-age fatalities per million hours' use (f/mhu) varied over the same factor-of-three range for both sexes (0.15–0.45 f/mhu by mode for men, 0.09–0.31 f/mhu for women). Risks were similar for men aged 21–49 y for all three modes and for female pedestrians and drivers aged 21–69 y. Most at risk were: males 17–20 y (1.3 f/mhu (95% CI 1.2–1.4)) for driving; males 70+ (2.2 f/mhu(1.6–3.0)) for cycling; and females 70+ (0.95 f/mhu (0.86–1.1)) for pedestrians. In general, fatality rates were substantially higher among males than females. Risks per hour for male drivers <30 y were similar or higher than for male cyclists; for males aged 17–20 y, the risk was higher for drivers (33/Bn km (30–36), 1.3 f/mhu (1.2–1.4)) than cyclists (20/Bn km (10–37), 0.24 f/mhu (0.12–0.45)) whether using distance or time. Similar age patterns occurred for cyclists and drivers in the Netherlands. Age-sex patterns for injuries resulting in hospital admission were similar for cyclists and pedestrians but lower for drivers.

Conclusions: When all relevant ICD-10 codes are used, fatalities by time spent travelling vary within similar ranges for walking, cycling and driving. Risks for drivers were highest in youth and fell with age, while for pedestrians and cyclists, risks increased with age. For the young, especially males, cycling is safer than driving.

Citation: Mindell JS, Leslie D, Wardlaw M (2012) Exposure-Based, 'Like-for-Like' Assessment of Road Safety by Travel Mode Using Routine Health Data. PLoS ONE 7(12): e50606. doi:10.1371/journal.pone.0050606

Editor: Hamid Reza Baradaran, Tehran University of Medical Sciences, Iran (Republic of Islamic)

Received: June 27, 2012; **Accepted:** October 24, 2012; **Published:** December 5, 2012

Copyright: © 2012 Mindell et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Funding: This study received no funding.

Competing Interests: The authors have declared that no competing interests exist.

* E-mail: j.mindell@ucl.ac.uk

Introduction

Travel can provide many health benefits through access to facilities, goods, and people. Active travel, i.e. walking and cycling, can make additional large contributions to population health: daily repetitive and necessary physical activity, such as commuting, can have the greatest health benefits as these are more successful and durable over long periods [1]. Cycling as a mode of commuting has additional advantages for society, including reducing carbon emissions, noise levels, and congestion on roads and other public transport systems [2,3]. Increasing active travel in England and Wales is estimated to save £17 bn in healthcare costs alone [4]. Despite these documented benefits and some increases in cycling in several cities with specific interventions [5,6], the UK has no nationwide cycling revival.

Perceived road danger is a strong disincentive to cycling [7]; many cyclists do not ride on the road due to safety concerns [8]. However, research regarding the safety of cycling tends to be distorted by a number of substantial errors which are found

repeatedly in published papers and policy documents. These fall into three main categories:

- not accounting for different types of journey undertaken in each mode, notably long-distance car travel, which has no comparison in walking or cycling, unless train travel is included;
- choice of a misleading denominator, such as comparing cycling fatality rates internationally using population size as the denominator [9,10];
- not selecting comparable numerators, that is, failing to include all transport casualties and exclude non-transport casualties.

Concerning the first two errors, the importance of using the most appropriate measure of exposure has been demonstrated in inter-country comparisons [10,11]. Risk by distance travelled does not capture large differences in average speed, which enable differential mobility for drivers, cyclists, and pedestrians. As the speed differential between cars and bicycles is not great for local

Protected Bicycle Lanes in NYC



Protected Bicycle Lane Analysis

Overview

Since 2007, the New York City Department of Transportation has installed over 30 miles of protected bicycle lanes throughout the city, including several parking protected bicycle lanes on various avenues in Manhattan. The following report contains an analysis of how some of these Manhattan routes have impacted safety, mobility, and economic vitality. Routes were chosen for inclusion if they had at least three years of “after” safety data available.



Safety

- Crashes with injuries have been reduced by 17%
- Pedestrian injuries are down by 22%
- Cyclist injuries show a minor decrease even as bicycle volumes have dramatically increased
- Total injuries have dropped by 20%
- 75% decrease in average risk of a serious injury to cyclists from 2001 to 2013
- Cyclist injury risk has generally decreased on protected bicycle lane corridors within this study as cyclist volumes rise and cyclist injuries decrease

Mobility

- Travel speeds in the Central Business District have remained steady as protected bicycle lanes are added to the roadway network
- Vehicle volumes on Columbus Ave were maintained
- Average peak hour taxi speeds on Columbus Ave improved by 17%, while average peak midday speeds decreased by 8%
- First Ave travel speeds remained level through project area
- Travel times on 8th Ave improved post-implementation by an average of 14%
- Daily vehicle speeds on 8th Ave improved except during the AM peak
- Bicycle volumes on corridors within the study increased by an average of 59%

Economic Vitality & Quality of Life

- When compared to similar corridors streets that received a protected bicycle lane saw a greater increase in retail sales
- 110 trees have been added to projects within this study area, enhancing the neighborhood through which they run
- Crossing distances have been shortened anywhere between 17' and 30'

Pedal Cyclist Fatalities in London: Analysis of Police Collision Files (2007-2011)

Report Authors:

**Rachel Talbot, Steve Reed, Jo Barnes, Pete Thomas,
Transport Safety Research Centre, Loughborough University**

**Nicola Christie,
Centre for Transport Studies, University College London**



EXECUTIVE SUMMARY

The objective of this research report is to support the development of the forthcoming Cycle Safety Action Plan being prepared by Transport for London to be published in 2014. TfL wished to improve the understanding of the factors which lead to collisions involving fatally injured cyclists and those with life-changing injuries. The research focussed on an in-depth analysis of collisions that occurred between 2007 – 2011 when there were 79 fatal and life threatening collisions involving cyclists of which 53 were available for analysis.

This report presents an analysis of the key risk factors that contributed to the collisions and it identifies a set of countermeasures to improve cyclist safety. These were then evaluated according to the number of applicable crashes and evidence found in effectiveness studies. The availability of robust effectiveness studies was found to be limited, partly due to the lack of exposure data and partly due to the difficulties in evaluating some kinds of measures. The main recommendations are below. These are mainly based on the evidence available from the analysis of the sample of fatal and life threatening crashes and additional evidence from effectiveness studies was taken into account where available. The recommendations included are for various parties to take forward. These organisations include central Government, Transport for London, local authorities, the police, vehicle manufacturers and cycle training organisations.

Recommendations for cycling infrastructure

- Identify and implement best international practice in cycle infrastructure and work towards emulating it within the UK legal, regulatory and behavioural context
- Design road infrastructure with an emphasis on cyclists' needs and aim for a world leading provision
- In addition to providing for safer, more comfortable cycling on main roads, expand and connect the network of dedicated cycle routes away from heavily trafficked roads and ensure they connect to key destinations
- Establish criteria for when to separate cycle and motorised traffic. This guidance should include reference to traffic flows and speed and indicate where complete segregation in space or time is appropriate
- Establish guidance on carriageway and lane widths that avoid creating pinch points for cyclists
- Introduce advanced signal phasing or infrastructure for cyclists to give segregation in time or space at junctions

flow and the routes taken by road users using the existing infrastructure. It should also take into account how the proposed infrastructure links into what exists already and the implications for cyclists. This process should be used to identify measures that could be included to minimise the risk of cycling. Road safety auditors would have a valuable advisory role in the review however the review should not replace the road safety audit.

Additional guidelines for designing cycle infrastructure can be found in TfL's LCDS (TfL, 2005) and the Department for Transport report *Cycle Infrastructure Design* (DfT 2008).

4.2.2. On-road or segregated cycling facilities

The following sections addressing segregated cycling facilities (section 4.2.3) and on-road cycling facilities (section 4.2.5) aim to set out countermeasures to the factors identified as contributing to the fatal and serious crashes included in the sample.

4.2.3. Segregated cycling facilities

If the purpose of the road, e.g. promoting movement of strategic importance, or the physical restraints of the location make it too difficult to introduce on-road cycling infrastructure, then the cyclists' exposure to conflict points has to be reduced by using segregated cycle infrastructure:

Segregation can be used to reduce the likelihood of crashes between pedal cyclists and motorised vehicles occurring as it reduces the number of conflict points. However, most segregated infrastructure intersects roads without segregation and at these points the risk of crash can be high.

Two crashes in the sample occurred whilst the pedal cyclists was travelling on a segregated cycle track/path – at the point at which the track/path intersected a road/entrance without segregation. In a third crash the cyclist was travelling on the main carriageway alongside a segregated cycle path. During the case review process, suggestions for improvements in segregation were suggested for all three of these crashes.

For the remaining 50 sample crashes, the judgement about whether segregation would have reduced the likelihood of the crash is a complex one. If the segregation was to be complete then the majority of crashes could be avoided however practical constraints such as available space and the cost-benefit of implementation of this makes this option unrealistic. Segregation is most likely to be of value for 10 of the sample crashes where the traffic speed and/or flow was relatively high. The case review process identified the value of segregation at the particular location for a further 4 crashes.

Therefore, for 14 cases, segregation has been identified as an intervention that could mitigate future crashes and in a further three cases making improvements to existing segregation could have a similar effect. That is not to say that segregation would be of no value in the remaining cases, rather that there was insufficient information available to the researchers in order to make that judgement.

Route Infrastructure and the Risk of Injuries to Bicyclists: A Case-Crossover Study

Kay Teschke, PhD, M. Anne Harris, PhD, Conor C. O. Reynolds, PhD, Meghan Winters, PhD, Shelina Babul, PhD, Mary Chipman, MA, Michael D. Cusimano, MD, PhD, Jeff R. Brubacher, MD, MSc, Garth Hunte, MD, PhD, Steven M. Friedman, MD, MPH, Melody Monro, MPA, Hui Shen, PhD, Lee Vernich, MSc, and Peter A. Cripton, PhD

Bicycling is an active mode of transportation with a range of individual and public health benefits.¹⁻⁵ However, bicycling is underused for transportation in Australia, Canada, Ireland, the United States, and the United Kingdom, constituting an estimated 1% to 3% of trips, compared with 10% to 27% of trips in Denmark, Germany, Finland, the Netherlands, and Sweden.⁶⁻⁸ The reasons for low bicycle share of trips are multifaceted, but safety is one of the most frequently cited deterrents.⁹⁻¹¹ These concerns are well founded: bicycling injury rates are higher in countries where cycling for transportation is less common.^{8,12,13}

To reduce bicycling injuries, the first step is to understand the determinants of risk. Studies in many English-speaking countries have focused on head injury reductions afforded by helmets.¹⁴⁻¹⁷ However, helmet use cannot explain the risk difference because helmets are rarely used in the European countries with lower injury rates.^{8,18,19} Typical route infrastructure (physical transportation structures and facilities) in countries with low bicycle share of trips differs from that in countries with high trip shares. In Germany, Denmark, and the Netherlands, bicycle-specific infrastructure is frequently available,²⁰ so this is a promising avenue for investigating injury risks. In a review of route infrastructure and injury risk,²¹ we found some evidence that bicycle-specific infrastructure was associated with reduced risk. However, the studies reviewed had problems that have compromised confidence in the results: grouping of route categories that may have different risks, unclear definitions of route infrastructure, and difficulty controlling for characteristics of cyclists and for exposure to various route types. Debates continue about the contribution of route design to safety and about the safety of various route types.^{12,13,20,21}

Objectives. We compared cycling injury risks of 14 route types and other route infrastructure features.

Methods. We recruited 690 city residents injured while cycling in Toronto or Vancouver, Canada. A case-crossover design compared route infrastructure at each injury site to that of a randomly selected control site from the same trip.

Results. Of 14 route types, cycle tracks had the lowest risk (adjusted odds ratio [OR] = 0.11; 95% confidence interval [CI] = 0.02, 0.54), about one ninth the risk of the reference: major streets with parked cars and no bike infrastructure. Risks on major streets were lower without parked cars (adjusted OR = 0.63; 95% CI = 0.41, 0.96) and with bike lanes (adjusted OR = 0.54; 95% CI = 0.29, 1.01). Local streets also had lower risks (adjusted OR = 0.51; 95% CI = 0.31, 0.84). Other infrastructure characteristics were associated with increased risks: streetcar or train tracks (adjusted OR = 3.0; 95% CI = 1.8, 5.1), downhill grades (adjusted OR = 2.3; 95% CI = 1.7, 3.1), and construction (adjusted OR = 1.9; 95% CI = 1.3, 2.9).

Conclusions. The lower risks on quiet streets and with bike-specific infrastructure along busy streets support the route-design approach used in many northern European countries. Transportation infrastructure with lower bicycling injury risks merits public health support to reduce injuries and promote cycling. (*Am J Public Health*. 2012;102:2336-2343. doi:10.2105/AJPH.2012.300762)

Here we present a study designed to overcome these limitations.²² We examined injury risk of 14 route types using a case-crossover design in which injured participants served as their own controls. The design compared route characteristics at the location where the injury event occurred to those at a randomly selected point on the same trip route where no injury occurred. By randomly selecting the control site in this way, the probability that a specific infrastructure type would be chosen was proportional to its relative length on the trip (e.g., on a 4-km trip, there would be a 25% chance of selecting a control site on a 1-km section that was on a bike path). Because comparisons were within-trip, personal characteristics such as age, gender, and propensity for risk-taking behavior were matched, as were trip conditions such as bicycle type, clothing visibility, helmet use, weather, and time of day. This allowed the comparisons to focus on between-site infrastructure differences.

METHODS

The study was conducted in the cities of Toronto and Vancouver, Canada. At the time of the study, Toronto had a population of about 2.5 million, 1.7% of trips by bicycle, 11 kilometers of bike lanes and paths per 100 000 population, snowy winter weather, and warm summer weather. Vancouver had a population of about 0.6 million, 3.7% of trips by bicycle, 26 kilometers of bike lanes and paths per 100 000 population, rainy winter weather, and mild summer weather.⁷ Although they do not cover the entire range of cycling infrastructure, together they include most route designs available in North America.

Participant Selection

The study population consisted of adults (≥ 19 years) who were injured during bicycle riding and treated within 24 hours in the emergency departments of the following