



**ESTIMATION OF THE SAFETY OUTCOMES
OF LEGALISING FOOTPATH CYCLING**

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INTRODUCTION

The Monash University Accident Research Centre conducted a study on behalf of the Road Traffic Authority and the State Bicycle Committee to establish, amongst other things, the relative risks of cycling on the road and footpath. This was to provide an empirical basis for policy decisions on the possible legalisation of footpath cycling.

Given the results of the risk analyses, this report deals with the subsequent issue of estimating the safety outcomes of legalised footpath cycling.

As noted throughout this report, modelling outcomes should only be regarded as both indicative and tentative, reflecting the different data sources and methods, the difficulty of combining actual with estimates of intended behaviour and, in some cases, dealing with small sample sizes (the telephone survey generated some apparently odd findings as a consequence). This was a particular problem in the modelling of additional accident involvements through the attraction of current non-cyclists to cycling.

Accordingly, this report provides an estimate of the accident involvement savings due to exposure transfer of current cyclists but is unable to provide a similar estimate (with any confidence) of disbenefits derived from additional exposure. In these circumstances, a trial of legalised footpath cycling in one or more municipalities to obtain empirical behavioural outcomes is recommended as the only way in which valid and reliable estimates of total accident involvement effects can be calculated.

THE MODELLING PROCESS

Safety outcomes of legalised footpath cycling will be determined by the effect that such a change has on cycling exposure. There are three basic ways in which exposure could be affected;

- . the transfer of exposure from more dangerous cycling (on the road) to less dangerous cycling (on the footpath) by current cyclists
- . the generation of additional cycling exposure as a result of current non-cyclists commencing cycling as a result of the legislative change (i.e. non-cyclists may perceive cycling as a more desirable, safer activity if they were legally allowed to ride on the footpath and, hence, start riding a bicycle)
- . the generation of additional cycling exposure as a result of current cyclists cycling more as a result of the legislative change (i.e. for the same reasons as above,

current cyclists may start riding their bicycle more than they do now).

A decision was taken to only incorporate the first two mechanisms in the modelling process as they were agreed to be by far the more important and the study was, by necessity, restricted in scope to a concentration on major issues. The possibility that positive safety outcomes could be diluted by the third mechanism should be kept in mind (the potential for this is discussed in the results section).

Further, exposure generation from current non-cyclists has been restricted to the arterial environment as cycling risk is much higher in this environment and the legality issue as a determinant of participating in cycling is likely to be much less important for cycling in the non-arterial environment.

RISK ANALYSIS AND EXPOSURE SUMMARY

The table below summarises the results of the risk analysis work required for the modelling process.

TABLE 1

RISK ANALYSIS AND EXPOSURE SUMMARY BY AGE GROUP, ROAD CLASS AND ROAD/FOOTPATH

AGE GROUP	ROAD CLASS			
	ARTERIAL		NON-ARTERIAL	
	ROAD	FOOTPATH	ROAD	FOOTPATH
<11 YEARS				
RISK*	48.3	23.7	3.5	2.3
EXPOSURE**	217.3	442.2	5925.6	4201.1
11 - 17 YEARS				
RISK	126.8	25.4	11.1	3.0
EXPOSURE	765.0	1024.0	7029.1	2655.8
>18 YEARS				
RISK	43.6	11.6	8.1	1.2
EXPOSURE	1868.6	473.8	3072.5	1280.6

* PER BILLION SECONDS OF CYCLING

** UNITS OF A MILLION SECONDS

Thus, the product of the figures in any given cell (with exposure converted to comparable units to risk) will result in the current number of Police reported casualty accident involvements in the study area. Potential changes to the current exposure pattern as a result of legalised footpath cycling, derived from responses from the telephone survey, can then be used to calculate revised accident numbers in any cell and overall.

SURVEY METHOD

Overview

For the modelling to proceed, estimates of exposure in a legal footpath cycling context are required. There is a number of ways in which these could have been obtained;

- . conducting a further observational study at sites where footpath cycling is already legal and comparing these exposure patterns with the rest of the network (using data from the exposure survey)
 - after discussions, it was considered that current legal footpath cycling sites were not representative of the network (for a variety of reasons) and that the level of bias was unacceptably high
- . conducting a controlled before/after study at a small number of sites (i.e. legalising footpath cycling at representative sites and obtaining direct observational information of changes in cycling behaviour on a before/after basis)
 - investigation showed this to be too expensive and unable to be accomplished in the specified time frame
- . the third approach was to obtain estimates of behavioural intentions (i.e. how people say they would behave if footpath cycling was legalised) and, for current cyclists, comparing this intended behaviour with current exposure patterns.
 - in the time frame, a telephone survey was the only realistic choice of survey method.

The Survey

The telephone survey was conducted by AGB:Spectrum using a questionnaire devised by the Centre and approved by the RTA. The list of questions comprised three basic components, viz:

. Defining Questions

It was necessary to classify respondents into age groups and discriminate between current cyclists and non-cyclists to ensure adequate numbers in each category for analysis purposes

. Current Non-Cyclists

There were five questions asked of this group, designed to establish how much, if any, cycling they would do as a result of legalised footpath cycling and how it would be distributed in the arterial environment

. Current Cyclists

There were three questions asked of this group, designed to establish the proportion of their cycling on the footpath in both the arterial and non-arterial environment if footpath cycling was made legal

The first question asked of both groups was whether riding a bicycle on the footpath was legal. If the respondent answered yes, the interview was terminated as there was no reason for their current behaviour to change.

A copy of the questionnaire is attached for information.

Sample Characteristics

Table 2 presents the characteristics of the final sample.

TABLE 2
CHARACTERISTICS OF SAMPLE

	MALE		FEMALE		TOTAL
	11-17	18+	11-17	18+	
CYCLISTS	92	73	88	68	321
NON-CYCLISTS	17	102	27	149	295
TOTAL	109	175	115	217	616

RESULTS

Introduction

Although the results section presents a straight quantitative analysis, it is strongly emphasised that, for a variety of reasons, the actual quantitative outcomes should be treated cautiously. Once the survey approach had been agreed, it was never intended that this exercise be a predictive one (the 'after' data are not of sufficient quality to support such an aim); rather, the analysis should be treated at an indicative level.

Given this, the results section is provided for those wishing to follow the procedure; the interpretation of results is to be found in the discussion section.

It should be noted that the data represent the number of Police reported bicyclist accident involvements in the study area during the non-holiday part of the year.

Perceived Legality of Footpath Cycling

In general, cycling on the footpath was currently recognised as against the law by a substantial majority of respondents. Interestingly, when compared to current non-cyclists, a smaller percentage of teenage cyclists stated that footpath cycling was currently illegal, as Table 3 shows.

TABLE 3

PERCEIVED LEGALITY OF FOOTPATH CYCLING (%)
BY AGE GROUP AND CYCLING STATUS

RESPONSE	AGE GROUP			
	11 - 17 YEARS		18+ YEARS	
	CYCLISTS	NON-CYCLISTS	CYCLISTS	NON-CYCLISTS
LEGAL	23	18	11	10
ILLEGAL	69	80	82	86
DON'T KNOW	7	2	6	4

Current Non-Cyclists

If footpath cycling was legalised, 17% of current non-cyclists indicated that they would start riding a bicycle. A slightly higher proportion of adults (18%) indicated that they would commence cycling in these circumstances compared to teenagers (14%), not surprising in the context of the high current cycling participation rate of teenagers (although another consequence of the high participation rate is that this cell has a sample size of 6 respondents). However, 44% of these respondents are already doing some cycling (but less than once a month) so the actual increase in exposure is slightly less than that suggested below.

In terms of additional exposure, respondents were given the option of 'only an hour or so per week' and 'several hours per week'. For the purposes of this analysis, these options have been set at 1.0 hours and 3 hours per week respectively. Table 4 presents the relevant data for estimating additional exposure.

TABLE 4

ESTIMATION OF ADDITIONAL METROPOLITAN EXPOSURE FROM CURRENT NON-CYCLISTS COMMENCING CYCLING

AGE GROUP	METROPOLITAN POPULATION	% INTENDING TO CYCLE (HRS/WK):		ADDITIONAL EXPOSURE (hrs/week)
		1.0	3.0	
11 - 17 YEARS	236,465	7	7	66,210
18+ YEARS	1,378,180*	10	8	468,581

* this figure represents the 18-49 year age group on the assumption that the vast majority of beginning cyclists would be drawn from this group.

It is apparent that the estimates of additional exposure are wildly inaccurate (the forced choice nature of the question may have contributed to this), although the population proportions also seem large (the interpretation of results expands these points). Reported additional exposure for the non-holiday part of the year equates to some 21 million hours, compared to just over 8 million hours (including cyclists under 11 years of age) derived from the observational survey of actual cycling.

In an attempt to estimate additional exposure more reliably, a proportional increase in current exposure has been estimated. It is not known what proportion of the population contributed to observed cycling exposure so these figures have been

extracted from another source (State Bicycle Committee, 1987). Applying these data, current exposure (Table 1) and the population proportions of additional cyclists (Table 4), it is estimated that;

- . 11-17 year old beginning cyclists will generate an additional 2.68 billion seconds of cycling
- . cyclists aged 18 years or more will generate an additional 4.02 billion seconds of cycling

To estimate the safety disbenefit of this additional exposure, it is essential to know the proposed locations of this cycling in order to apply the appropriate risk level. As mentioned previously, questions were restricted to the arterial environment as cycling risk is much higher and thus there is a much greater potential to increase accident involvement numbers (per unit exposure). While exposure in the non-arterial environment can be derived by subtraction, it is not possible to allocate this exposure to road or footpath cycling.

Figures 1 and 2 show the proportion of this additional exposure intended to be spent in the arterial environment by age group.

FIGURE 1

PROPORTION OF ADDITIONAL EXPOSURE INTENDED
IN THE ARTERIAL ENVIRONMENT, 11 - 17 YEAR OLDS

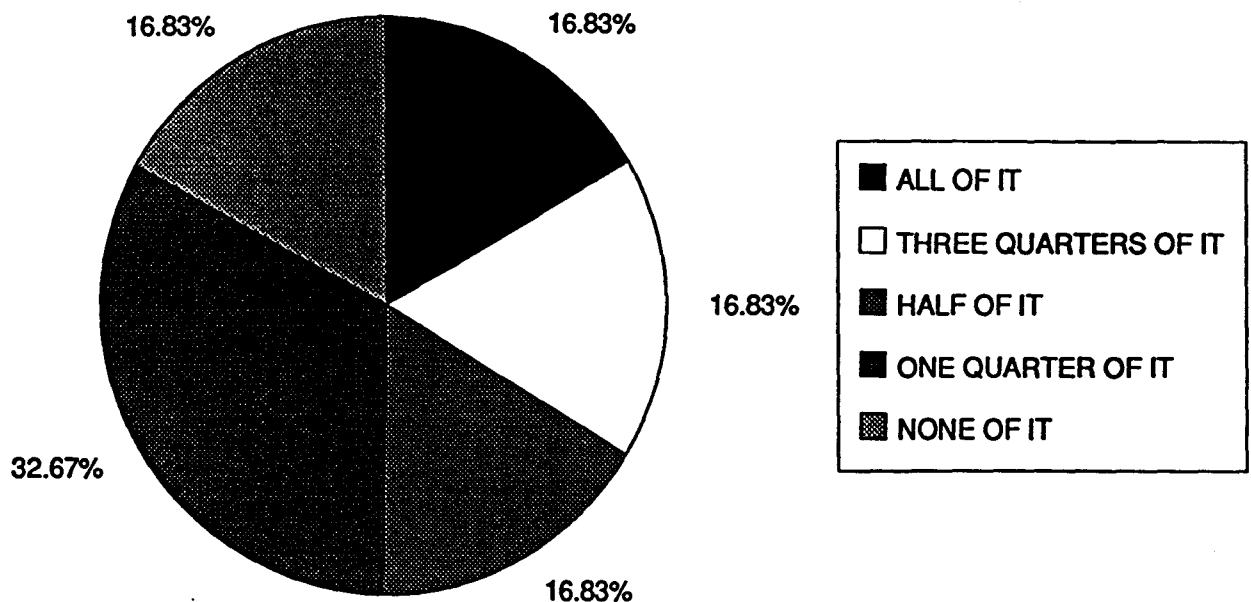
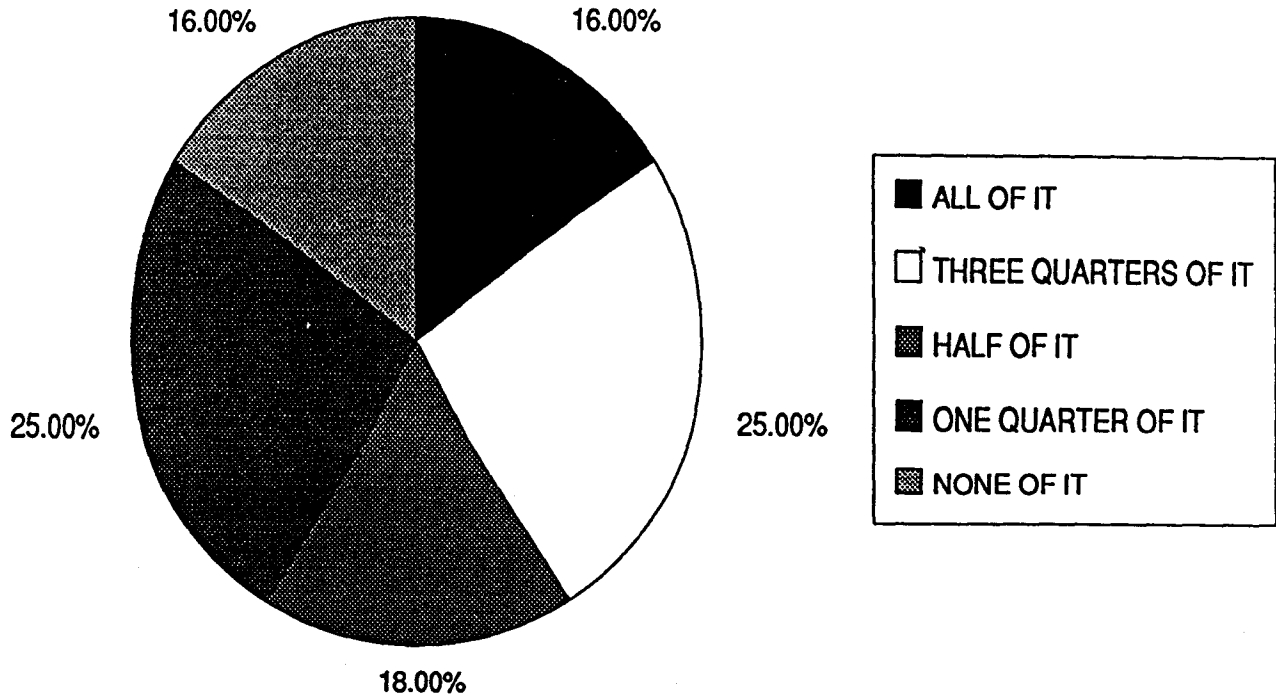


FIGURE 2

PROPORTION OF ADDITIONAL EXPOSURE INTENDED
IN THE ARTERIAL ENVIRONMENT, 18+ YEAR OLDS



From the above graphs, it can be calculated that;

- 11 -17 beginning cyclists intend to spend 47% of their cycling exposure in the arterial environment
- adult beginning cyclists intend to spend 50% of their cycling exposure in the arterial environment

The final analysis step prior to estimating accident outcomes for this (potential) cyclist group is to determine how much of the above exposure is intended to be spent on the footpath. This information is presented in Table 5.

TABLE 5

INTENDED ARTERIAL EXPOSURE (%) BY ROAD/FOOTPATH
AND AGE GROUP

AGE GROUP	ARTERIAL ROAD	ARTERIAL FOOTPATH
11 - 17 YEARS	51	49
18+ YEARS	59	41

Applying these proportions to the proportion of arterial cycling (0.47 and 0.50 for teenage and adult cyclists respectively), the additional exposure estimates (page 7) and the appropriate risk estimates from Table 1, it can be estimated that legalising footpath cycling would generate;

- . an additional 96 accident involvements from beginning cyclists aged 11-17 years in the (arterial) metropolitan area
- . an additional 61 accident involvements from beginning adult cyclists in the (arterial) metropolitan area.

Current Cyclists

Estimates of the current exposure pattern by age group, road class and road/footpath were derived from the cycling exposure survey (and shown in Table 1). Current and intended exposure patterns following legalised footpath cycling by road class and road/footpath are shown in Figures 3 and 4 (it is assumed that the average exposure per cyclist in each category is the same).

FIGURE 3
CURRENT AND INTENDED ARTERIAL EXPOSURE PATTERN
BY AGE GROUP AND ROAD/FOOTPATH
- CURRENT CYCLISTS

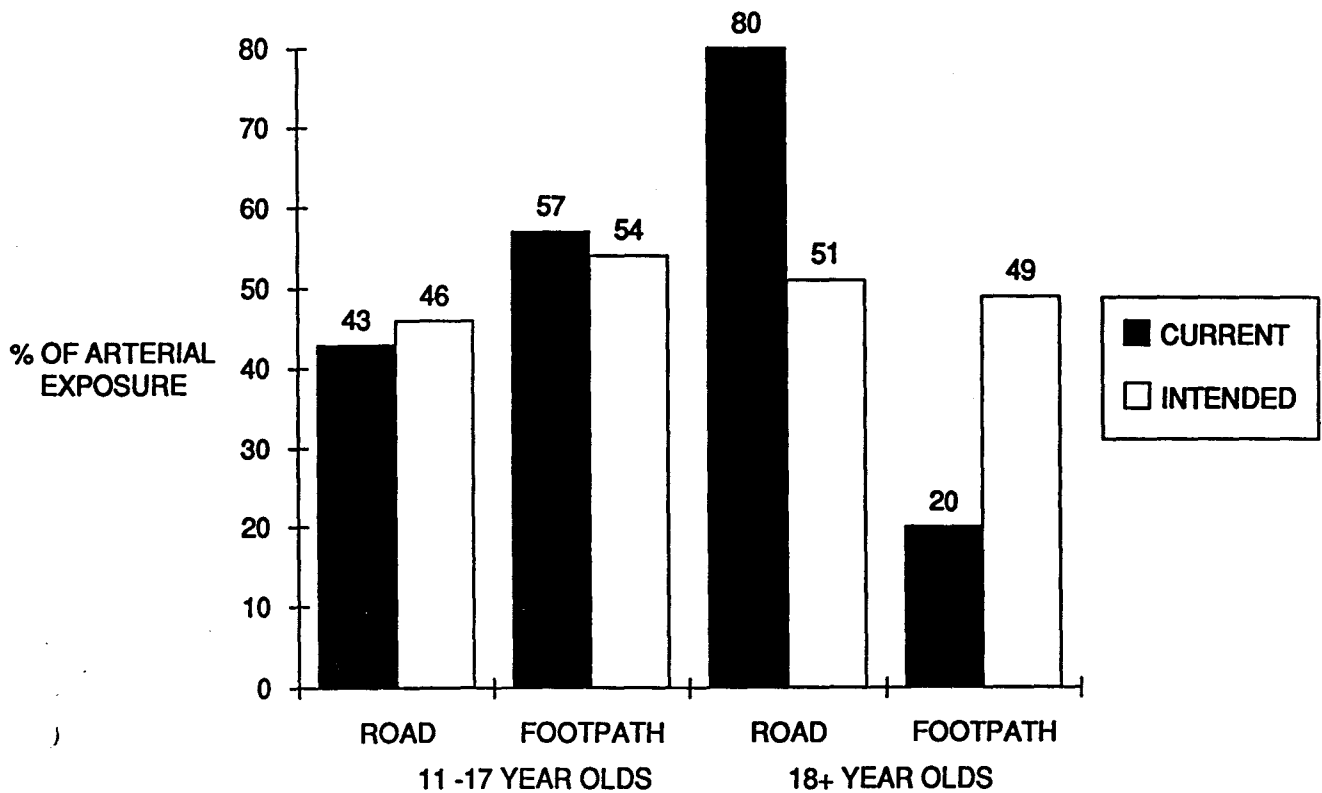
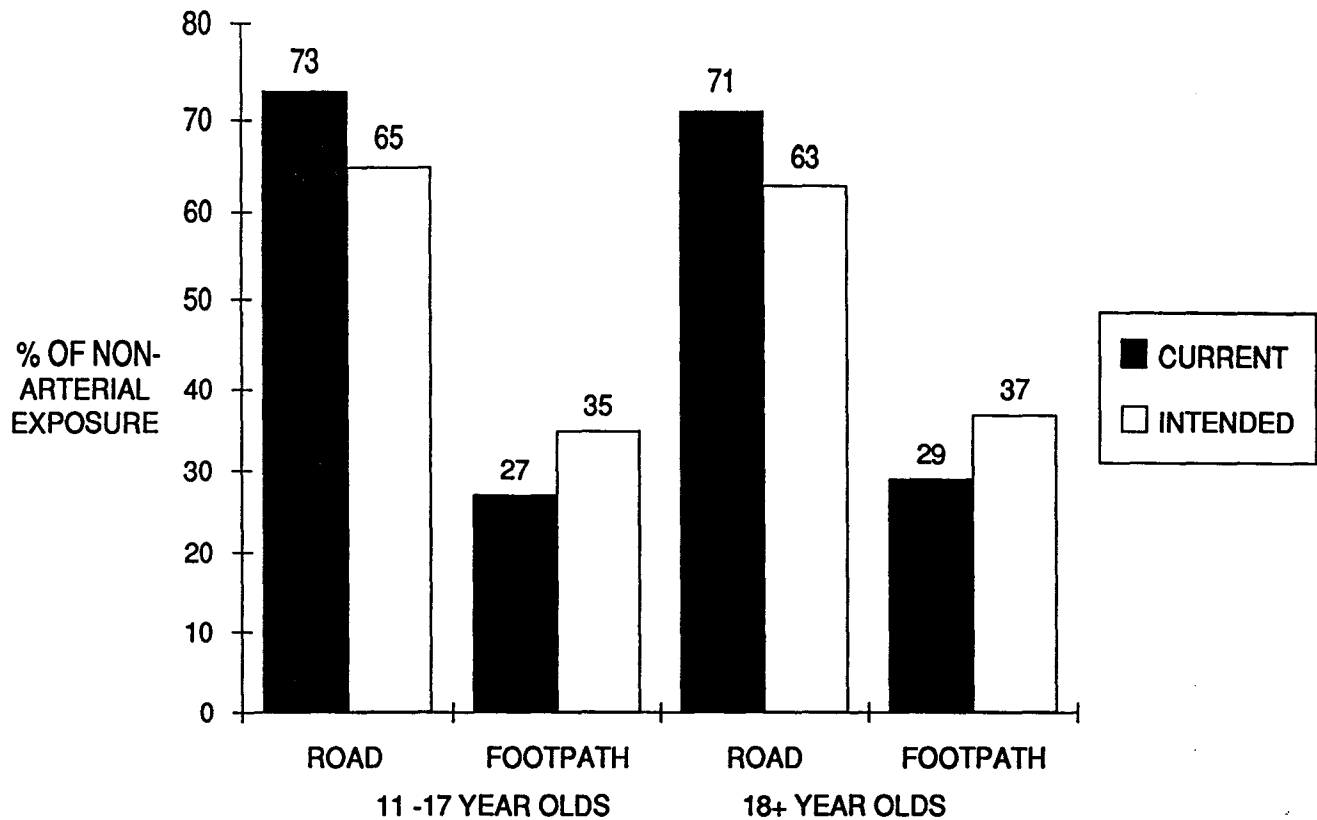


FIGURE 4

CURRENT AND INTENDED NON-ARTERIAL EXPOSURE PATTERN
 BY AGE GROUP AND ROAD/FOOTPATH
 - CURRENT CYCLISTS



These data can now be used to estimate the safety benefits of legalised footpath cycling accruing from transfer of exposure of current cyclists from the road to the footpath. Applying the relevant data from Table 1 and Figures 3 and 4, it can be estimated that legalising footpath cycling would produce;

- . 1 fewer accident involvement for current 11-17 year old cyclists in the metropolitan area
- . 24 fewer accident involvements for current adult cyclists in the metropolitan area.

DISCUSSION

There are a number of issues which should be outlined before proceeding to a general interpretation of results. These include;

- . the study did not cover child cyclists/non-cyclists (i.e below the age of 11 years). Assuming all arterial road exposure and 50% of non-arterial road exposure of current cyclists was transferred to the footpath, a saving of less than a dozen involvements would result.

It is not known whether any benefit would remain once additional exposure is taken into account. However, even an optimistic assessment would indicate that safety benefits for this age group, if any, would be small.

- . the modelling procedure did not address the population of bicyclist involvements; it used data from the study area (over 60% of total involvements) for the non-holiday part of the year (approximately 40% of total involvements).

In terms of absolute numbers, additional benefits could be expected from the other 60% of involvements; this issue is addressed in the interpretation section.

- . the modelling process assumes that the same levels of risk will apply in a post legalised footpath cycling environment. Current risk estimates are weighted averages; should more dangerous road cyclists transfer to the footpath, footpath risk would increase (and road risk decrease). If the converse happened, the relative safety of footpath cycling would be enhanced.
- . following on from the above, increased footpath cycling risk may occur as a result of greater than expected increases in specific behaviours. For example, more cyclists on the footpath may increase the rate of midblock rideout behaviour above current levels (with negative safety consequences).
- . accident involvement risks by land use have not been calculated. The modelling process assumes that exposure transfer (and additional footpath cycling) can take place at any location on the road network. Should a policy decision be taken to restrict footpath cycling to only a proportion of the network, the estimated safety outcomes would be attenuated to an extent which cannot be currently determined.
- . given the current very low numbers of pedestrians injured following a collision with a cyclist on the footpath and the limited increase in footpath cycling, any increase in pedestrian casualties would be very small.
- . the modelling process has of necessity assumed that point estimates from both surveys are of equal reliability; given the different methods and sample sizes, this is highly unlikely.

This is the single strongest reason for interpreting results at a very general, indicative level rather than on a predictive basis.

INTERPRETATION OF RESULTS

Bearing in mind the above, the results of this study are interpreted in the following way;

Additional Exposure (Involvement Disbenefits)

- . the estimation of additional exposure (and hence involvements) due to current non-cyclists commencing cycling has been based on small sample sizes (5 and 37 respectively).

Secondly, it is difficult to accept that, if the legalisation of footpath cycling provides the motivation to commence cycling, these cyclists would do 4-44% more cycling on the road in the arterial environment.

Thirdly, the proportion of cycling intended to be spent in the arterial environment (47% and 50% for teenage and adult cyclists respectively) is much greater than current allocations (16% and 35%)

Fourthly, it is difficult to accept that legalising footpath cycling would increase cycling participation by over 20% for teenage cyclists and 60% for adult cyclists.

Accordingly, it is concluded that, while legalised footpath cycling may indeed provide an incentive to commence cycling, the disbenefits cannot be estimated using these data with any confidence at all.

Transfer of Exposure of Current Cyclists (Accident Involvement Benefits)

- . the safety benefits for current teenage cyclists have been attenuated as the data indicate a greater proportion of arterial cycling on the road following legalised footpath cycling.

This is considered to be a spurious finding and the consequent safety benefits are likely to be slightly greater. However, there is no evidence for substantial transfer for this age group and thus no indication for a significant positive outcome.

- . the evidence for safety benefits for current adult cyclists does not appear to have the logical shortcomings of the other two components.

Accordingly, it can be reasonably assumed (taking 50% either way) that the safety benefit for this group (in the study area) would be between 12 and 36 involvements in the non-holiday part of the year.

There are four other issues which impact on the overall safety outcome;

- . benefits for current cycling and reduced disbenefits from additional exposure have been estimated for the entire network. If, for whatever reason, footpath cycling is not legalised in certain types of locations, the nett overall benefit (due to exposure transfer of current cyclists) will be reduced.
- . there are benefits to be derived from legalised footpath cycling in the study area during holiday times and for the whole year outside the study area.

Given similar outcomes to those reported above, a conservative assessment suggests that benefits would approximately equal those for the study area.

- . a small benefit from child cyclists could be reasonably expected.
- . given a nett positive outcome, the overall saving is likely to be several (perhaps 5-10) times larger than that reported above, due to the problem of underreporting.

Overall, the following result is derived from the above discussion;

SAVINGS IN STUDY AREA:	16 - 45 INVOLVEMENTS
ESTIMATED STATEWIDE SAVINGS (X 2 TO SCALE UP FROM STUDY AREA TO STATE, X 5 TO CONTROL FOR UNDERREPORTING)	160 - 450 INVOLVEMENTS

However, the extent to which these benefits will be offset due to additional exposure by current non-cyclists commencing cycling is not known (the attempt to estimate this feature has not been successful). In order to estimate the overall safety outcome of legalising footpath cycling, empirical estimates of additional, and transfer of, exposure are required. These could be obtained from a trial of legalised footpath cycling in a limited area of metropolitan Melbourne.

CONCLUSION

The safety outcomes of legalising footpath cycling have been estimated through the modelling of exposure transfer and additional exposure due to current non-cyclists commencing cycling.

The outcomes of the modelling process should be interpreted at a very general level, even though it has been undertaken primarily at a quantitative level, due to the nature of the data used. Given the data collected, it was not possible to

estimate the accident involvement disbenefits due to additional exposure from current non-cyclists commencing cycling.

Where current cyclists are concerned, it is estimated that a minimum reduction of approximately 160 cyclist involvements could be achieved if footpath cycling was legalised, due to the transfer of cycling from the road to the footpath. However, the savings reflected in Police reported accident data would be much smaller than this due to the significant underreporting of accidents involving bicyclists.

It is not known to what extent the estimated benefits to current cyclists would be offset by disbenefits as a result of additional exposure. It is recommended that consideration be given to a trial of legalised footpath cycling in a limited area of metropolitan Melbourne in order to collect the information required to more confidently predict the overall safety outcomes of legalised footpath cycling.

REFERENCE

State Bicycle Committee (1987) Survey of Cyclists
Characteristics and Cycling Patterns (prepared by
Spectrum Research), Ministry of Transport, Melbourne.

FOOTPATH CYCLING TELEPHONE SURVEY

Good afternoon/evening. I'm from AGB:Spectrum, the national market research company. We are conducting a survey on bicycle riding. We would like you to participate, it will only take 2-3 minutes.

QAGE ASK 'QAGE: Which of the following age groups applies to you? @'

RESP SP '11-17' / '18+'

QSEX ASK 'QSEX: RECORD SEX @'

RESP SP 'Male' / 'Female'

QA ASK 'QA: How frequently would you say you ride a bicycle ... (READ OUT)? @'

RESP SP 'Daily' /
'Weekly' /
'Fortnightly' /
'Monthly' /

A GO TO
Q5

'3-4 times a year' /
'Less Often' /
'Never'

B GO TO
Q1

QUOTA 1. Bicycle Rider (A) 11-17 18+ Total
 2. Not Bicycle Rider (B) 60 50 110
 15 25 40

ASK IF NOT A BICYCLE RIDER (B)

Q1 ASK 'Q1: Is riding a bicycle on the footpath legal? @'

RESP SP 'Yes' THANK RESPONDENT AND TERMINATE /
'No' DK

Q2A ASK 'Q2A: If footpath cycling was made legal, would you start riding a bicycle?'

RESP SP 'Yes' /
'No' THANK RESPONDENT AND TERMINATE

Q2B ASK 'Q2B: Would that be for an hour per week or several hours per week?@'

RESP SP 'Yes, but only for an hour or so per week' /
'Yes, for several hours per week'

Q3 ASK 'Q3: How much of this cycling would be on major roads or on the footpath along major roads? Would it be.....
...(READ OUT)...?@'

RESP SP 'All of it' /
'Three-quarters of it' /
'Half of it' /
'One-quarter of it' /
'None of it'

Q4 ASK 'Q4: How much of this cycling along major roads would be on the footpath? Would it be.....(READ OUT)...?@'

RESP SP 'All of it' /
'Three-quarters of it' /
'Half of it' /
'One-quarter of it' /
'None of it'

THANK RESPONDENT AND TERMINATE

ASK IF A BICYCLE RIDER (A)

Q5 ASK 'Q5: Is riding a bicycle on the footpath legal?@'

RESP SP 'Yes' THANK RESPONDENT AND TERMINATE /
/'No' DK

IF NO OR DK ASK Q6 AND Q7

Q6 ASK 'Q6: If footpath cycling was made legal, how much of your cycling along major roads would be on the footpath? Would it be.....(READ OUT).....?@'

RESP SP 'All of it' /
'Three-quarters of it' /
'Half of it' /
'One-quarter of it' /
'None of it'

Q7 ASK 'Q7: If footpath cycling was made legal, how much of your cycling along local streets would be on the footpath? Would it be.....(READ OUT)...?@'

RESP SP 'All of it' /
'Three-quarters of it' /
'Half of it' /
'One-quarter of it' /
'None of it'

Just in case you missed it, I'm from AGB:Spectrum
THANK RESPONDENT AND TERMINATE