A COMPARATIVE STUDY OF BIKE-USERS, NON-BIKE-USERS AND CASUAL BIKE-USERS IN A MEDIUM-SIZED AUSTRALIAN CITY

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abstract: The patronage of bicycle has been found to be related to socio-economic factors. Bike-users are predominantly males, students, younger age, lower income, and with lower car access. The casual bike-users and non-bike-users have similar characteristics - higher income, staff, high car availability, and low proportion of younger respondents. The modal distributions of non-bike-users and casual bike-users are dependent on car ownership. Casual bike-users ride an average of 40 km per week while bike-users travel about 110 km per week by bicycle. There is insignificant difference in the perception of respondents from the various groups towards motivating or distrssing factors. All groups had similar suggestions for encouraging bike use.

1. INTRODUCTION

1.1 Background to the Study

A survey of the staff and students at the Townsville campus of James Cook University was conducted in March 1996 with a view to assessing their attitude towards the bicycle mode and identifying limitations in the mode and network characteristics.

The questionnaires were sent to departmental secretaries for distribution among staff and students. Some publicity about the survey was given through Campus Review - a fortnightly publication of the university. It is hard to assess as to how many students and staff were given the questionnaires, and how widespread the information about the survey was. Over 450 valid responses were received over a period of four weeks, although it is not possible to determine the precise response rate.

The respondents have been classified into three groups based on the extent of bicycle usage. The bike-user group includes respondents whose usual mode of transport is bicycle. This group uses bicycle as the normal mode for travel to and from the university as well as some other trip purposes. A substantial number of respondents form the non-bike-user group. These people do not use bicycle at all. The final group comprises of those respondents who use bicycle some of the time for some purposes. They may use bicycle to go to work on some days or they may ride for recreation or other purposes. This group is designated as "casual" bike-user group.

This paper is concerned with a comparative analysis of the attitudes and characteristics of the respondents from the three groups identified in this study. It documents (i) the characteristics of the respondents in terms of their proximity to the university, gender, age, income and status (staff/student), and car ownership; (ii) the travel mode and its relationship to car ownership, (iii) the amount of travel undertaken on bicycle for work and other purposes, (iv) the reasons/motivation for using the bicycle mode if bike is used on regular or casual basis, (v) factors discouraging the use of bicycle for non-bike-users, and (vi) specific limitations of the mode and the network as *perceived* by the respondents.

The casual bike-user and non-bike-user groups have rather similar socio-economic characteristics which are significantly different from the bike-user group. The bike-user group is comprised of higher proportion of males, students, younger age band, low income, and those without sole access to car. Significant associations have been observed between the socio-economic characteristics and the extent of bicycle patronage. However, there are many similarities in the attitudes of respondents from the various groups. All groups have fairly identical perceptions on the advantages as well as reasons for deterrence of cycling.

1.2 Sampling and Extrapolation

It is presumed that the questionnaires were collected by all those who wanted to provide their views on cycling, whether they actually cycled or not. In other words, the response rate can be assumed to be high. It is interesting to note that although the survey was popularly known as bicycle survey, just under half of the respondents were non-bike-users. It must be added that both users and non-users of bicycle mode were encouraged to participate in the survey. In view of the above, the sample can be considered as random, as the respondents represented all socio-economic groups within the university community.

The patterns of commuter bicycle journeys are concentrated to specific land-use or economic activities such as schools, shopping centres, and other major employment centres (down-towns, universities, army bases, etc.). The potential commuters are those living within 10 km of the destination. The study of commuter cyclists to a university campus is considered to be typical to any major economic activity and its results can, therefore, be transported to other locations.

1.3 Related Studies

The definitions of bicycle facilities such as bikeway, bike route, bike path, bike lane etc. used in this study are taken from NAASRA (1987) and AUSTROADS (1993). The detailed findings of this study are being reported in a series of articles by the author (1996). This is essentially a qualitative study based on the perceptions and conditions experienced by the respondents of a survey which has been used to prescribe solutions to the bicycle network development in a medium-sized city in Australia. For quantitative analysis, reference may be made to Navin (1994) for bicycle capacity and facility design by applying the traditional vehicular flow characteristics to the stream of bicycles; and to Landis (1996) for numerical justification of bicycle facilities.

2. THE STUDY AREA

The main campus of the James Cook University is located in Townsville, Queensland. The urban area of twin cities of Townsville and Thuringowa form the largest provincial centre north of Brisbane with a population in excess of 130,000. This coastal tropical area serves as the main transportation hub for North Queensland and has a diverse economy with major employment in tourism, defence services, the university, copper and nickel refineries, export meat and prawn industry, and light manufacturing. Although the urban area is surrounded by hills, it has a relatively flat terrain, making it ideal for bike users. The location of the study area is shown in Figure 1.

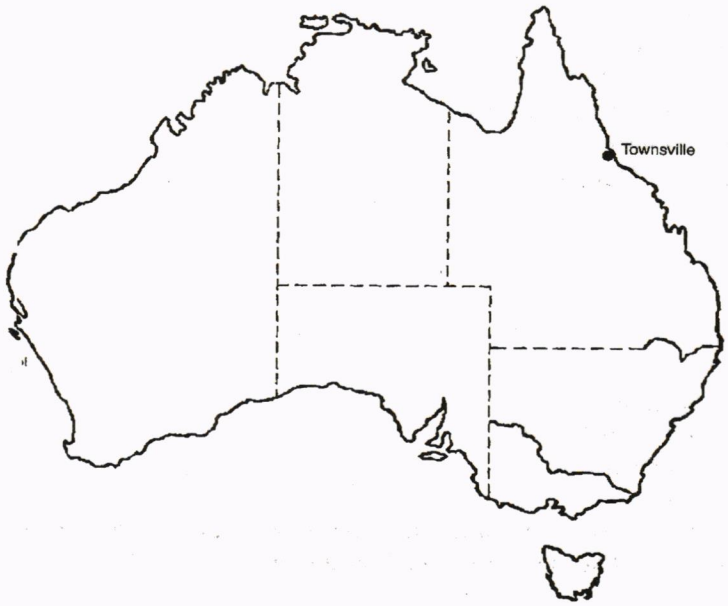

Figure 1: Location of the Study Area

3. NUMBER OF RESPONSES

The number of valid responses received are shown in Table 1, and are classified into three groups as identified above.

Table 1: Number of Respondents by Groups

Respondent Group	No. of Respondents	Per cent of Total Responses
Bike-users	120	26.6
Non-bike-users	204	45.1
Casual bike-users	128	28.3

In addition, few late responses were received which could not be included in the analysis. These were insignificant compared to the responses analysed and would not have affected the results of this study considerably.

4. DATA FIELDS

The information collected from the survey has been entered in EXCEL worksheets with the following fields:

a) Suburb of residence
b) Staff / Student
c) Full time / Part time
d) Gender
e) Age group
f) Car ownership
g) Income group
h) Usual mode of travel
i) Motivation for using bicycle
j) Reasons for not patronising bicycle
k) Amount of bike travel
l) Bike travel characteristics
- frequency
- origin
- destination
- distance
- time taken
- route taken

m) Limitations of bicycle mode
n) Limitations of bicycle network
o) Suggested improvements

Pivot tables were constructed to analyse the data and to investigate the variation in travel characteristics as a function of socio-economic characteristics.

The respondents were asked to present comments on the quality and quantity of bike infrastructure in Townsville with special consideration to the routes traversed by them in travelling to and from the university. Factors causing agony and measures for encouraging bike use were invited from the respondents. All in all, the survey produced useful qualitative and quantitative data.

5. PROXIMITY

Of all the responses received, 443 were valid responses in respect of the suburb of residence. The respondents had stated widely different distances to the university from the same suburb. This was modulated by using the average distance from any suburb to the university. For the purpose of this survey, the various residential suburbs of the city were then divided into five groups based on their average distance from the university, in increments of five kilometers.

The overall distribution of respondents with respect to the distance from the university is shown in Table 2.

Table 2: Proximity Level and Distance

Proximity	Distance	Number of Respondents	Per cent
1	< 5 km	42	9.3
2	5-10 km	226	50.0
3	10-15 km	123	27.2
4	15-20 km	30	6.6
5	> 20 km	22	4.9
Not stated		9	2.0

In comparing the three groups on the basis of proximity, the bike-users group had a much higher proportion of respondents living in near proximity (14.2%) compared to all respondents (9.5%). Users also had a significantly smaller proportion living over 15 km from the university (3.3%) compared to non-users (15.4%) and all respondents (11.7%). The comparison is shown in Table 3.

Table 3: Comparison on the basis of Proximity

Group	Prop. in proximity 1 <5 km	Prop. in proximity 4 & 5 >15 km
Users	14.2	3.3
Non-users	9.4	15.4
Casual users	4.7	13.3
All Respondents	9.5	11.7

6. SOCIO-ECONOMIC CHARACTERISTICS

A comparative analysis of socio-economic characteristics of the three groups of respondents is provided in this section. Table 4 gives some salient statistics.

Table 4: Key Socio-Economic Characteristics of Respondents by Group

	Bike-users	Casual Bike - users	Non-bike-users
Females to males ratio	1:3	3:2	2:1
Proportion below 50 years of age	92.5	87	79
Proportion with income > $A50,000	12.5	20	18.8
Proportion with income < $A20,000	44	24	23
Weighted average income, $A	29,195	35,125	35,200
Proportion staff, %	64	75	86
Proportion students, %	36	25	14
Proportion of staff on full-time	73	85	87
Proportion of students on full-time	96	72	79
Car ownership, %	60	75	86

6.1 Proportion of Females

As expected, the proportion of females was much higher in casual and non-bike-users groups, with males dominating the bike-user group. This is shown in Figure 2.

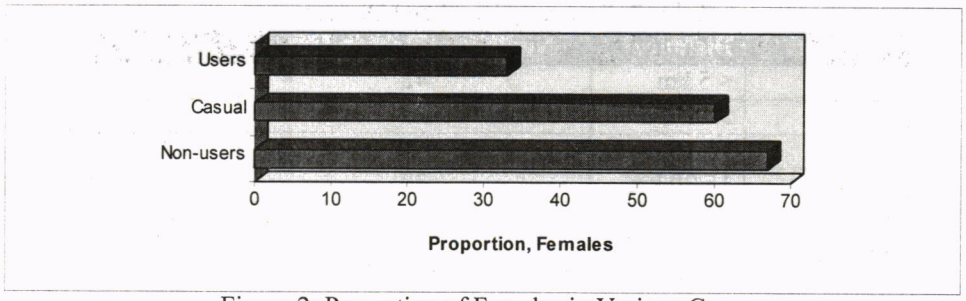

Figure 2: Proportion of Females in Various Groups

The ratio of females to males varied between 1:3 for bike-users to 3:2 for casual bike-users and a high of 2:1 for non-bike-users

6.2 Age

The proportion of respondents in various groups was compared by calculating the proportion of respondents below 50 years of age. Figure 3 shows that younger age group is dominant in the bike-user group. The use of bicycle decreases with increase in age.

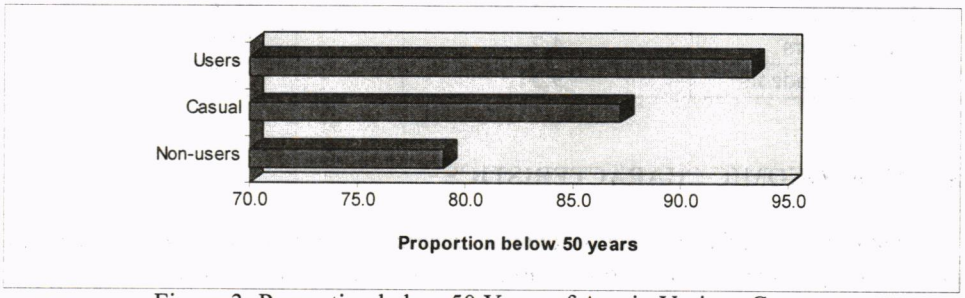

Figure 3: Proportion below 50 Years of Age in Various Groups

6.3 Status - Staff vs Student

Figure 4 shows that the proportion of staff is much higher in the casual and non-car-user groups. Although just over 60 per cent of bike-users were staff members, this proportion increased to 86 per cent for non-bike-user group. In other words, the proportion of students in the bike-user group is about two and a half times the proportion in non-bike-user group. These figures reveal that bicycle is used proportionately more by students. This may be related to income and access to car. These factors are discussed later in this section.

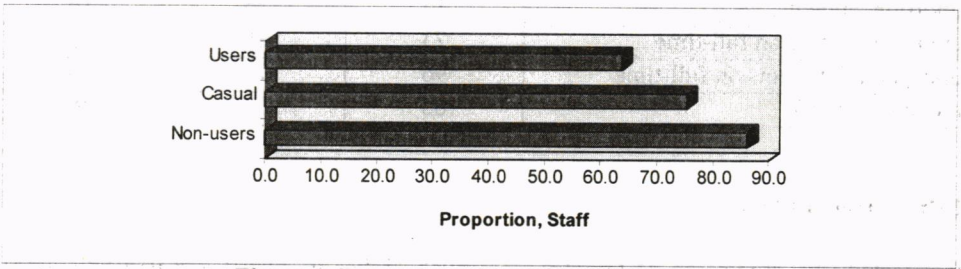

Figure 4: Proportion of Staff in Various Groups

Majority of the students as well as staff are on full-time basis, although there is a significant proportion (over a third) of staff in bike-user group who are part-time.

6.4 Income

Two measures of income variation among respondent groups are compared. Firstly, the proportion of respondents with income below A$20,000 and with incomes above A$50,000 p.a. are compared. This is shown below:

Table 5: Income Distribution of Respondents by Group

Income	Bike-users	Casual Bike-users	Non-bike-users
Proportion with income above 50,000	12.5	20	18.8
Proportion with income below 20,000	44	24	23

It is obvious that higher proportion of bike-users are in the lower income category while the income distribution appears to be similar for the other groups.

The other measure is the weighted average income for each respondent group. This is shown in Figure 5. Again, it is obvious that casual bike-users and non-bike-users have identical and higher income than the bike-user group.

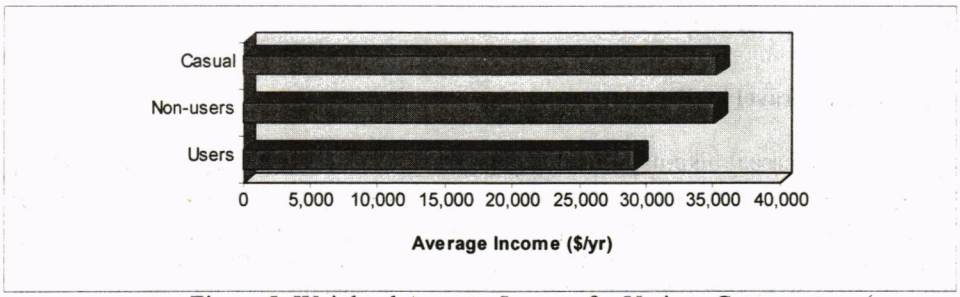

Figure 5: Weighted Average Income for Various Groups

6.5 Car Ownership

Only 60 per cent of the respondents in the bike-user group had sole access to a car but this proportion increased significantly for the other groups. This is shown in Figure 6. The level of sole access to car appears to be related inversely to the use of bicycle.

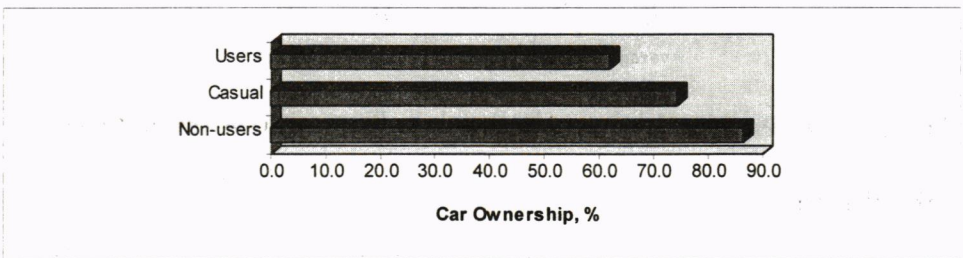

Figure 6: Car Ownership Levels in Various Groups

6.6 Socio-Economic Characteristics of the University Community

For the purpose of comparison of various bicycle user groups, some key socio-economic characteristics of the staff and students at the university are given in Table 6.

Table 6: Some Socio-Economic Characteristics of the University Community

Characteristic	Students	Staff
Total (%)	85	15
Proportion, females	61.1	46.1
Proportion, full-time	69.1	84.6
Proportion below 25 years	57.0	5.6
Proportion below 50 years	96.8	81.0

It is obvious that the proportion of female students at the university is quite high which is reflected in the non-bike-users and casual bike-users. The patronage of bicycle is very low among female students and staff compared to their male counterparts. The proportion of staff on full-time is significantly higher than students. As expected, the student age distribution shows over half of the students to be under 25 years of age whereas there are just 5% of staff in this category. Again 19% of staff are over 50 compared to only about 3% of the students. These have significant implication for cycling among staff and students.

7. MODAL CHOICE ANALYSIS

7.1 Amount of Travel by Bicycle

It was found that casual bike-users travelled an average of 40 km per week by bike which could be for a few work trips during the week, for recreation and pleasure, or other purposes. The bike-users travelled to the university (for work or education purposes) by bike and traversed an average of 80 km per week by bicycle. The bike-users also did an average of extra 30 km per week for other purposes. The total distance travelled by bicycle for various groups is shown in Figure 7.

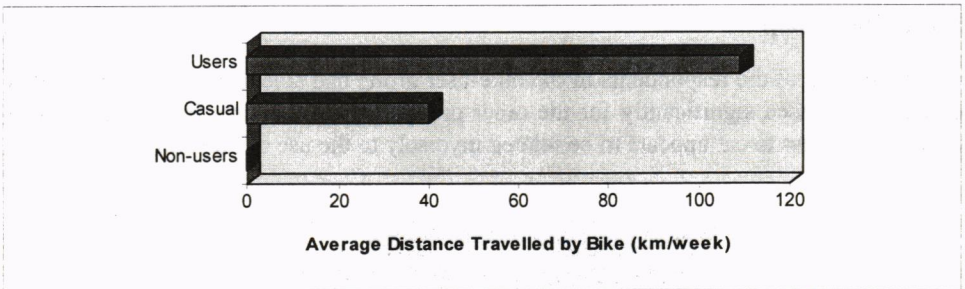

Figure 7: Average Distance Travelled by Bicycle by Respondents in Various Groups

7.2 Modal Shares

The usual mode of travel for non-bike-users and casual bike-users are analysed in Table 7. Of course, the usual mode of travel by bike-users is bicycle. It is obvious that solo driving is the most common mode for the casual and non-bike-user groups.

Table 7: Modal Distribution for Casual Bike-users and Non-bike-users

Mode	Non-bike-users		Casual Bike-users	
	Car available	Car not available	Car available	Car not available
Solo	84	18	63	13
Sharing	14	54	18	55
Car with other modes	2	10	15	16
Other modes only	0	18	4	16

Some of the salient observations from Table 7 are:

- Non-bike-users with sole access to car use the car (solo and sharing) for almost all of their travel.
- Over half of the non-bike-users without sole access to a car travel by car as a sharing passenger.
- It is surprising to note that some respondents without sole access to car also travel by car as solo drivers.
- As expected, the use of non-car modes is several times higher for those without access to a car compared to the car owning group, although the patronage of non-car modes is not high in absolute terms.
- Casual bike-users combine bike travel with car and other modes which is independent of car availability.

8. ATTITUDES OF RESPONDENTS IN VARIOUS GROUPS

8.1 Reasons for Using Bicycle

Bike-users and casual bike-users responded to the question on what motivates them to use bicycle. The results for the two groups are reasonably identical as shown in Table 8.

Table 8: Ranking of Various Reasons for Using Bicycle

Reason	Bike-users	Casual Bike-users
Health considerations	1	1
Ecological considerations	3	2
Inexpensiveness	2	3
Only option	4	4

It is obvious that health benefits of cycling are considered by all respondents to be the major motivating stimulus for using bicycle, while ecological concerns and the inexpensiveness of bicycle mode are also given high ranking. It is quite plausible to see that inexpensiveness of the mode is given a higher ranking by regular bike-users than casual cyclists. The "only option" implying no or little access to other modes ranked last.

8.2 Reasons for Not Using Bicycle

This question was relevant to non-bike-users as well as casual bike-users. The casual bike-users presumably answered this question to reflect why they did not use bicycle as their usual mode of travel and only made some use of bicycle.

The results of this question are compared across the two logical groups. These are shown in Table 9.

Table 9: Ranking of Reasons for Not Using Bicycle

Reason	Non-bike-users	Casual Bike-users
Weather	1	2
Unsafe	1	2
Too far	3	1
Too slow	4	6
Too much effort / Uncomfortable	5	4
Compulsory helmet use	6	5

It is obvious that weather, safety and "too far" are the major reasons for not using bicycle, although their rankings vary marginally between the two groups. The other three reasons shown in Table 9 are also significant although their rankings are lower.

It may be important to point out that the rankings are not based on the perceptions of respondents regarding the relative order of the stated reasons. These are rather related to the number of respondents who considered these factors to be distressing. Some respondents did rank these reasons, others did not.

9. CONCLUSIONS

9.1 Bicycle Network

Although a degree of satisfaction has been expressed by most respondents on the quality and quantity of bikeway facilities in Townsville, the majority feels that there should be significant overall improvements in the standard of bike facilities. A number of respondents want specific deficiencies in the facilities on their traversed path be corrected as a matter of urgency. Some general comments include the following:

i. Cyclists would prefer a bike network independent of the vehicular routes.
ii. Dedicated bike paths should be provided rather than the dual use of pedestrian foot paths.
iii. Maintenance and cleaning of tracks is as important as their provision.
iv. Bike paths must not be longer otherwise the cyclists will use roads instead.
v. Bike routes must be free from overgrown thorny weeds and broken glass.
vi. Bike paths must be continuous. Discontinuities are common near intersections and near the meeting of bike paths with main roads.
vii. Proper finishing of road edges, and smoother riding surface are desirable.

viii. Cycle track along the river, parks and crossings over weirs with proper guard rails will encourage cycling.
ix. Overpass on busy roads and to shopping centres should be provided.
x. Bike routes should be adequately lighted.
xi. There should be continuous bike paths rather than in disjointed segments which happens to be the case in many areas in Townsville.

9.2 Comparative Analysis

The patronage of bicycle is related to the socio-economic status. Bike-user group has higher proportion of respondents who are males, students, are younger, and have lower incomes and lower car availability

The modal distribution of non-bike-users and casual bike-users are dependent on whether the respondent has sole access to car. The proportion of solo car users is very high for car owners. The combined share of solo and car sharing is, nonetheless, quite significant even for non-car-owners. Non-car-owners make more use (over 16 %) of non-car modes compared to those with access to car (less than 4 %).

Casual bike-users ride an average of 40 km per week while bike-users travel about 110 km per week by bicycle. Over 75 per cent of bicycle travel by bike-user group is for work or education (major activity) purpose.

There is insignificant difference in the perception of respondents from the various groups towards factors that motivate bicycle use and those which are found to be distressing. All groups had similar suggestions for encouraging bike use which suggests that all respondents understand the limitations of the mode and are able to suggest measures which will alienate the perceived problems.

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