

Encouraging Sustainable Campus Travel: Self-Reported Impacts of a University TravelSmart Initiative

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Abstract

At the start of the 2004 and 2005 academic years, a voluntary travel behavior change program targeted incoming first-year students at the Clayton Campus of Monash University in Melbourne, Australia. Analysis of before and after travel surveys identified a significant effect in terms of reducing single occupant commuting and increasing public transport use. Nearly one in four of the students who participated in the TravelSmart initiative indicated it had influenced them to the extent of thinking about using, trying, or regularly using alternatives to solo driving to campus. The information provided about public transport services was the most valued element of the program. A range of barriers to further behavior change are identified to overcome a number of those impediments and thereby increase the use of environmentally friendly modes for commuting to campus.

Introduction

Voluntary travel behavior change programs, an emerging category of the Travel Demand Management (TDM) initiative, are “designed to enable individuals to become more aware of their travel options and, where possible, exercise choices that reduce the use of private motor vehicles (Rose and Ampt 2003). These

programs go beyond simple awareness-raising to deliver sustainable change in individual's travel behavior.

Consistent with TDM initiatives underway in a number of Australian states, the Victorian Department of Infrastructure (DOI) initiated a TravelSmart program (DOI 2004) to "reduce the negative impacts of car travel through a reduction in vehicle trips and kilometers traveled, achieved through voluntary changes by individuals, households and organizations towards more sustainable travel choices." The Victorian TravelSmart program does not rely on the provision of additional transport or other infrastructure, or improvements in the level of service of public transport services. Rather, the program seeks to facilitate change within the existing urban transport and land-use systems. The program involves initiatives targeted at educational institutions, workplaces, and communities. Universities cut across these application contexts since they are workplaces for large numbers of academic, research, and general staff and centers of learning for students. They act as large traffic generators with travel patterns dominated by commuting trips (Tolley 1996).

This article focuses on a TravelSmart initiative run at Monash University's Clayton Campus, the largest of the eight Monash campuses with a total student and staff population of about 30,000. The campus is located in the outer suburbs of Melbourne (a city of about 3.5 million), approximately 18 km (11 miles) from the city center. Described by one commentator as Australia's first "drive-in university" (Davidson 2004), the campus is close to the Monash Freeway, a major radial facility, and is served by a number of bus routes. Connecting buses provide a link to two nearby suburban railway stations that are located on the same radial train line. The TravelSmart initiative promoted use of "green" travel modes (walking, cycling carpooling, and public transport) and reduced reliance on single occupant vehicles for access to campus.

The article provides insight into the impact of the initiative run at the start of the 2004 and 2005 academic years and identifies remaining barriers to change in the context of travel to campus. This study complements other research focused on university campuses that primarily explores the scope for pricing, infrastructure, and service improvements to promote more sustainable travel choices (Toor and Havlick 2004; Shannon et al. 2006).

The TravelSmart initiative run at the campus is described in the next section, followed by an outline of the methodology used in this study. Results from travel surveys conducted in 2003, 2004, and 2005 are then used to obtain insight into the

impacts of the TravelSmart program and remaining barriers to behavior change. The final section summarizes the conclusions and identifies implications for programs targeting university students.

The Campus TravelSmart Initiative

The Monash University TravelSmart initiative focused on first-year students. This is an important target market for a travel behavior change program since these students, by necessity, are going through a process of travel behavior change in the transition from secondary to tertiary education (Cooper and Meiklejohn 2003). The program is a variant of “individualised marketing” (Brög and Schadler 1998), in that tailored travel information is provided to program participants, although in this case it involves face-to-face contact and interaction rather than mail delivery. The program is delivered at the time of first contact and does not involve interaction over time or tailored feedback on the basis of a detailed travel survey as in the travel blending travel behavior change program (Rose and Ampt 2001).

Since this program is delivered at a single point in time, it could be regarded as a “one-shot” travel behavior change program (Taniguchi and Fujii 2007). However, unlike the approach taken by Taniguchi and Fujii, participants do not complete a travel survey in advance; there is only a verbal indication given by students of their likely travel mode to campus. In addition, participants are not asked to make a behavioral plan as a basis for changing their travel behavior. The Monash TravelSmart program does have parallels with the EcoTravel Coordinator Program described by Nakayama and Takayama (2005) in that both programs are delivered through personal interaction although the EcoTravel coordinators interacted through a series of meetings to help participants reduce their car use.

The TravelSmart program was delivered as part of the enrollment process, conducted in late January,¹ which involves incoming first-year students completing an on-campus enrollment process. As students proceed through the enrollment hall, they complete necessary paperwork, have photos taken, and receive their ID cards. The last section of the enrollment hall is organized by student associations and it was here that the incoming first-year students were exposed to TravelSmart.

The TravelSmart desk was staffed by up to seven trained TravelSmart officers. Students who agreed to be involved were asked to complete a brief intercept survey that formalized their enrollment in the TravelSmart program. The TravelSmart officers then provided students with their TravelSmart pack containing:

- generic cover letter;
- local area map showing bus, walking, and cycling routes;
- Melbourne public transport map;
- student public transport concession card application form (applicable to domestic students who are eligible for the card on payment of an annual fee of about \$AUD80 [\$USD66] in 2004, which then entitled them to the standard concession fares on public transport that are half the regular fares. The fee was reduced to \$AUD8 [\$USD6] in 2005 when it was only intended to cover the administrative cost to the public transport authority of issuing the card.); and
- carpool postcard providing information on the benefits of carpooling and links to further information including the carpool matching service.

After a conversation with the student, the TravelSmart officer also added to the pack:

- appropriate bus and/or train timetables;
- a daily public transport ticket, appropriate for a journey from home to the university (this component was included in 2004 but not in 2005); and
- other information as required (e.g., cycling information).

This active dialogue with the students (see Figure 1) meant that the information was tailored to the needs of the individuals. Importantly, the staff delivering the program had participated in a one-day training session, involving extensive role-play exercises, which emphasized the use of persuasion principles developed in psychology when discussing travel options with students. This training exercise drew on the six psychological principles of persuasion (reciprocation, commitment and consistency, authority, social proof, liking, and scarcity), which have been found to be effective in encouraging uptake of other TravelSmart initiatives (Seethaler and Rose 2006).

Study Methodology

This study draws on a series of travel surveys, some conducted as part of the TravelSmart initiative and others undertaken independently. Each survey was undertaken over the Internet using an announcement email that explained the purpose of the study and provided a link to the website where students could complete the survey.



Figure 1. Delivery of the Monash University Campus TravelSmart Program to Enrolling First-Year Students

The first component of the study draws on general travel surveys conducted in 2003 (before TravelSmart was run) and again in 2004 (after the TravelSmart initiative). These two databases provide an opportunity to quantify changes in mode choice over a period where TravelSmart was the primary intervention affecting travel to campus. The general travel survey sought information on travel to campus on each day of a one-week survey period. The general travel surveys conducted in 2003 and 2004 asked respondents to indicate how they traveled to campus each morning of the survey week. Respondents who used more than one method of transport, were asked to indicate the mode used for the longest (distance) part of their journey. Since the survey obtained information on linked trips, it is likely to underestimate the extent of walking and cycling (which can be, for example, used for some legs of a linked public transport trip). This represents a trade-off in survey methodology with the linked trip format producing a simpler survey instrument, and most likely higher response rates, while not providing the same rich data that could be obtained from a detailed travel and activity survey.

The analysis of this data focuses on first-year students since they were the target of the TravelSmart initiative. The “before” travel survey was conducted in second semester 2003 (October 2003) at a time when it could be expected that the travel patterns of the first-year students would have stabilized. The 2004 “after” survey was conducted in the first semester (May 2004) just after there had been an expansion of car parking capacity in one campus precinct. It is therefore possible that the 2004 survey may reflect higher car use as a result of the improvement in car parking availability. No major revisions to regular public transport services occurred during the 2003 to 2004 period apart from changes in frequency of the free intercampus shuttle bus that runs between the Clayton and Caulfield campuses (a distance of about 8 km or 5 miles). That service was operated with 24-seat minibuses and the headway was halved from 30 minutes in 2003 to 15 minutes in 2004. The capacity increase was undertaken to overcome problems with students being left behind when the bus was full and consequently having to wait for the next service.

The second component of the study relies on a special-purpose evaluation questionnaire distributed to those students who received the TravelSmart initiative. The records made at enrollment enabled the students who had received the TravelSmart pack to be identified. A free drawing for movie tickets was used as an incentive to participate in the survey. When the survey was designed, the recom-

recommendations of the Tapestry project in Europe (Tapestry 2003) were considered in detail and the survey included travel, demographic, and enrollment status questions covering:

- current travel patterns;
- assessment of the impact of the TravelSmart program on travel behavior;
- value of individual components of the TravelSmart program;
- barriers to travel by walking, cycling, public transport, and carpooling;
- home-suburb and postcode details;
- enrollment status;
- age;
- gender; and
- whether the respondent held a current student concession card for public transport.

Profiling the Survey Respondents

Before considering the travel behavior dimensions of the survey responses, it is appropriate to highlight the sociodemographic characteristics of the respondents. Table 1 summarizes information on the number of responses and the response rates for the general travel surveys for first-year students who were the target group for TravelSmart. The response rate from first-year students was higher in 2004 than 2003 (21% vs. 15%). Female response rates are marginally higher than male response rates. The international student response rate doubled from 2003 to 2004 (from 10% to 19%).

While these response rates (along with response rates of a similar magnitude reported below for the targeted TravelSmart surveys) are not unusual for transport surveys (Richardson et al. 1995), caution should be used in interpreting the results due to the risk of nonresponse bias. Recent research conducted at the University of Western Australia (Shannon et al. 2006) achieved response rates close to 50 percent by using a hardcopy letter for recruitment and inviting participants to access an on-line questionnaire. Alternative recruitment methods could provide scope to lift response rates in surveys conducted at Monash or other tertiary institutions.

Table 1. Number of Respondents and Response Rates for General Travel Surveys

	2003			2004		
	DOM	INT	Subtotal	DOM	INT	Subtotal
Male	211 (14%)	49 (10%)	260 (13%)	311 (18%)	89 (21%)	400 (19%)
Female	338 (19%)	58 (11%)	396 (17%)	433 (24%)	83 (17%)	516 (22%)
Subtotal	549 (17%)	107 (10%)	656 (15%)	744 (22%)	172 (19%)	916 (21%)

Note: DOM = Domestic, INT = International

Table 2 profiles the respondents to the surveys that targeted TravelSmart students. The response rate was lower in 2005 than 2004 (15% vs. 22%). This most likely reflects the poorer targeting of the survey recruitment email in 2005. In 2004 it was sent to only those students who had participated in the TravelSmart initiative. In 2005 it was sent to all students and by matching IDs to the records kept at enrollment, it was possible to identify those students who had participated in the TravelSmart initiative at the start of that year. The response rate at Monash University was, however, higher than the 8 percent and 11 percent values recorded at two other universities in Melbourne at the same time, using the same survey methodology and questionnaire. The low response rates, however, caution about generalizing the results of the surveys across the target population. Table 2 highlights that in each year, females were slightly overrepresented since they comprised 60 percent of the responses but represent about 51 percent of first-year enrollments. The proportion of respondents with a concession card was 20 percent higher in 2005 than in 2004. This no doubt reflects the removal of the fee for the card, which came into effect at the start of 2005.

Table 2. Respondent Profile for 2004 and 2005 TravelSmart Surveys

	2004	2005
Target population	2,616	2,977
No. of respondents	573	458
Response rate	22%	15.4%
Purchased a public transport concession card	49%	69%
Male/Female	40%/60%	40%/60%

Before and After Evaluation

Figure 2 shows the changes in mode shares from 2003 to 2004 for all first-year students. The results reflect weighted mode shares with the weights calculated as the inverse of the response rates for demographic groupings (based on gender and domestic vs. international student enrollment status) for five residential zones defined as concentric rings radiating out from campus (Rose 2005). The weights were used to expand the sample to reflect the population of first-year students.

Figure 2 highlights that the number of students driving alone to campus dropped from 40 percent in 2003 to 31 percent in 2004. The number traveling as a passenger in a car, either as part of a carpool or dropped off at the university, increased from 7.7 percent to 11.9 percent. Bus use was also up, from 19.5 percent in 2003 to 25.4 percent in 2004. These changes in mode share were subjected to statistical analysis by testing the hypothesis that there was no difference in the mode share between 2003 and 2004. The difference in mode share proportions was tested using a Z test (Montgomery et al. 1998). As shown in Table 3, the results indicate a statistically significant reduction of 9.2 percent in car driver mode share along with statistically significant increases in car passenger drop off (up 2.8%) and bus (up 5.9%).

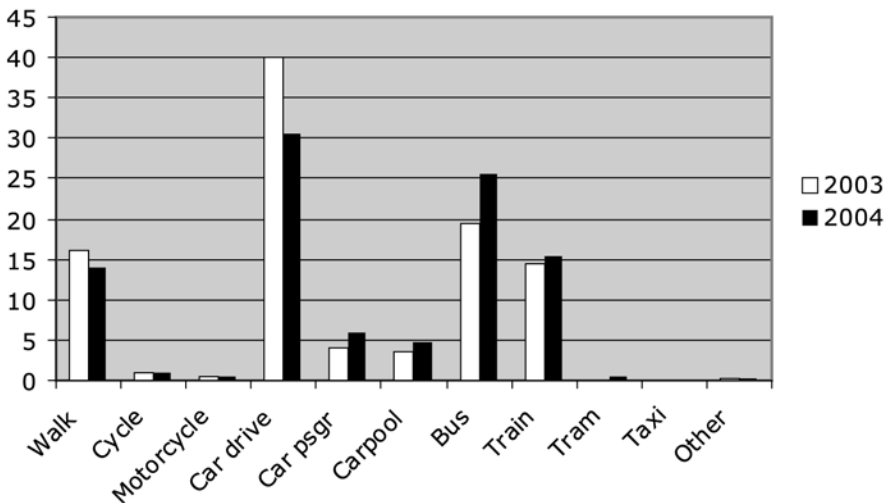


Figure 2. Mode Shares for All First-Year Students

Table 3. Statistical Testing of Change in Mode Share 2004 vs. 2003

Mode	<i>All Students</i>		<i>Domestic Students</i>		<i>International Students</i>	
	Mode Share Difference*	Z Score	Mode Share Difference*	Z Score	Mode Share Difference*	Z Score
Walk	- 2.3 %	- 1.25	-0.1	- 0.05	-5.7	- 0.94
Bicycle	+ 0.3 %	0.41	+ 0.2	0.4	+ 0.3	0.18
Motorcycle	- 0.2 %	0.54	-0.2	- 0.60	NA	NA
Car driver	- 9.2 %	- 3.8	-12.5	- 4.51	-2.3	- 0.60
Car passenger drop off	+ 2.8 %	2.4	+ 3.1	2.24	+ 1.6	0.72
Carpool	+ 1.4 %	1.37	+ 1.9	1.55	-1.0	- 0.92
Bus	+ 5.9 %	2.8	+ 2.9	1.23	+ 15.5	3.16
Train	+ 0.06 %	0.34	+ 3.8	2.05	-8.6	- 1.62
Tram	+ 0.4 %	1.42	+ 0.5	1.46	NA	NA
Taxi	+ 0.1 %	0.55	+ 0.1	0.69	+ 0.1	- .39

Note: Mode share difference is mode share in 2004 minus mode share in 2003. Dark shading indicates a statistically significant difference at the 95 percent confidence level, Z critical = 1.64. Light shading indicates one result that is significant at a 94 percent level.

When domestic and international students are considered separately, some subtle differences emerge. In general, the lower number of responding international students means that it is more difficult to reject the null hypotheses of no change in mode shares between 2003 and 2004. The exception is the 15 percent increase in bus use and the 9 percent reduction in train use, which, even with the small sample size, are statistically significant at the 95 percent level (or almost so in the case of the reduction in train mode share). For international students the small reduction in car driver mode share (down 2.3%) is not statistically significant. In contrast, a statistically significant drop in use of the car driver mode occurs for the domestic students along with a statistically significant increase in train use. Recall that the survey sought information on linked trips with students asked to indicate the mode used for the longest distance part of the journey. The increases in domestic students using the train would also mean increased bus use for the connecting shuttle services between the station and Clayton campus. Since international students are not eligible for the public transport concession card, they find the free intercampus shuttle bus (connecting the Caulfield and Clayton campuses) attractive. A review of that service conducted in mid-2004 (TNK Consultants 2004) found that international students made up about two thirds of the users of

the intercampus bus with over half of the riders using that service to get to their home campus (i.e., it was used for commuting). As noted earlier, that shuttle bus operated on an improved frequency in 2004. The increased bus mode share for international students may be partly attributable to those service changes rather than the TravelSmart program. That would be less of an issue for the domestic students who account for only a third of the intercampus bus users.

These results imply a statistically significant change in the modes used by first-year students to travel to campus in 2004, after the TravelSmart initiative had been run, compared to 2003. Apart from changes in the service level of the intercampus bus, no other major changes were made to public transport services of relevance to this study. The intercampus bus service changes may have impacted the behavior of international students, however, overall the results suggest that the TravelSmart program had reduced the use of solo driving to campus and increased use of alternative travel modes.

Exploring Travel Behavior Impacts

This section examines in greater detail the behavior of students who had participated in the TravelSmart initiative. Survey results are reported for two groups. First, for all respondents (referred to as ALL) and secondly for those respondents who live close to campus (referred to as NEAR). The boundary for the latter grouping was taken as the boundary of the local government area for the City of Monash (roughly a 6-km, 3.7-mile, radius).

The student's current travel behavior was examined with a question that provided seven response alternatives, ranging from not considering use of environmentally friendly modes to always using those modes. The response categories, which reflect the modifications in behavior change increasingly being used in the field of voluntary travel behavior change research (Shannon 2006; Rose and Marfurt 2007), were defined as follows:

- I am not even considering using public transport, walking, cycling or carpooling to campus (Not considering).
- I am thinking about using public transport, walking, cycling, or carpooling to campus but I am not ready to give any of those options a go (Thinking about).
- I am doing things to get myself ready to try using public transport, walking, cycling, or carpooling to campus (Getting ready).

- Once or twice I have tried using either public transport, walking, cycling, or carpooling to campus (Have tried).
- I am an occasional (less than once a week) user of public transport, walking, cycling, or carpooling to campus (Occasional user).
- I am a regular (at least once a week) user of public transport, walking, cycling, or carpooling to campus (Regular user).
- I always use either public transport, walking, cycling, or carpooling to travel to campus (Always use).

Figure 3 presents the results for use of environmentally friendly modes from the 2004 and 2005 surveys. In both years students who had received the TravelSmart program material reported their travel. Since the 2005 survey was sent to all students, it is also possible to report travel behavior of students who did not receive the program material. The results presented in Figure 3 suggest that the majority of respondents who received the TravelSmart program material either always use environmentally friendly modes or are occasional or regular users. Students living near the university are more likely to be users of environmentally friendly modes. The Getting ready category had very few respondents, suggesting that there are essentially two groups of students: the users (right-hand side of Figure 3), reflecting those in the “action” or “maintenance” stage of behavior change); and the nonusers/thinking about it (left-hand side of the figure), reflecting the “precontemplation” and “contemplation stages” of behavior change). About 7 percent of students have tried traveling to campus on environmentally friendly modes but have not progressed to be even occasional (less than once per week) users.

While the 2005 responses exhibit a similar pattern to 2004, some differences exist. Students were more likely to indicate they always used environmentally friendly modes in 2005 compared to 2004 (up by about 10%). The stronger result in 2005 could also be due to the reduction in cost of the student concession card (from \$AUD80 to \$AUD8) although this was only available to domestic students. The comparison between the TravelSmart and non-TravelSmart students reveals a large difference in mode usage. In both the ALL and NEAR categories, the proportion of students who report regularly or always using environmentally friendly modes is about 15 percent higher for the TravelSmart group. A Z test (Book and Epstein 1982) on the 2005 data confirmed a statistically higher proportion of the TravelSmart students regularly or always use environmentally friendly modes (Z score for ALL students = 4.83, for NEAR students Z = 3.12, critical Z at a 5% significance level = 1.96) compared to the students who did not receive the TravelSmart

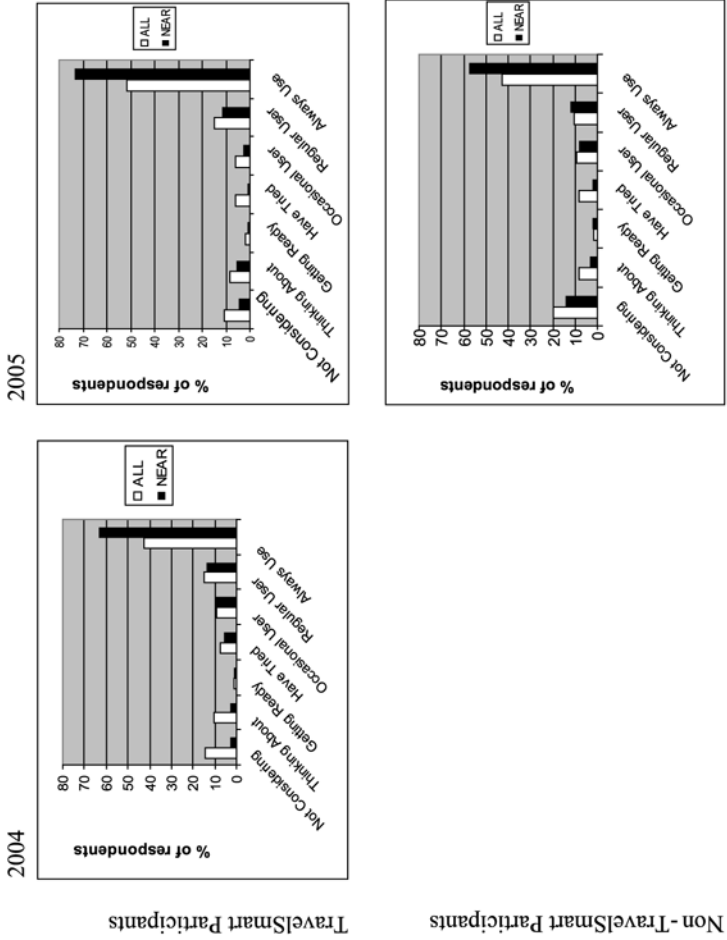


Figure 3. Use of Environmentally Friendly Modes

initiative. This reinforces the result reported in the previous section and provides further evidence that the TravelSmart program results in greater use of environmentally friendly modes to commute to campus.

To place these responses into perspective, the 2004 travel survey (described in the previous section) found that 61.7 percent of trips to campus during the survey week were on environmentally friendly modes (walk, bicycle, carpool, or public transport). By comparison, taking the Regular and Always use responses in Figure 3, the totals for ALL respondents is 58 percent and for those respondents living near to the University (NEAR) it is 77 percent. This suggests that the behavior reported by the responding registered TravelSmart students (at a 22% response rate as noted earlier) is representative of the first-year students.

Respondents were asked about the extent to which TravelSmart had influenced their mode choice decisions. The results, as shown in Figure 4, highlight only slight differences in responses as a function of residential location and across years. Nearly one in four respondents (25%) indicated that the TravelSmart initiative had influenced them to the extent of thinking about using, trying, or regularly using environmentally friendly modes. The impact of the program was higher for students living close to campus with nearly one in three (30%), indicating it had influenced them to the extent of thinking about using, trying, or regularly using environmentally friendly modes. The analysis reported earlier in this section highlighted use of environmentally friendly modes was 15 percentage points higher for those students who participated in the TravelSmart program than for those who did not. It is possible, given the responses shown in Figure 4, that students underestimated the impact of the program on their travel behavior. A higher proportion of respondents in 2005 could not recall the initiative, up nearly 10 percent on the 2004 result. Since TravelSmart is presented at one point in time as part of enrollment at the start of the year, it is not surprising that a large proportion of students do not recall it when asked six months later. Other research in the context of one-off ride to work events (Rose and Marfurt 2007) has highlighted the need for reinforcement and maintenance activities to sustain travel behavior change.

It is important to consider the delivery costs of the program as well as its cost effectiveness. It cost about \$AUD30,000 p.a. (\$USD25,000) to run the TravelSmart initiative at Monash University. Since the program was delivered to almost 3,000 students that equates to a cost per student contacted of about \$AUD10 (\$USD8) per person. Table 4 summarizes a range of cost-effectiveness metrics drawing on the percentages shown in Figure 4(b) and allocating the costs to progressively smaller

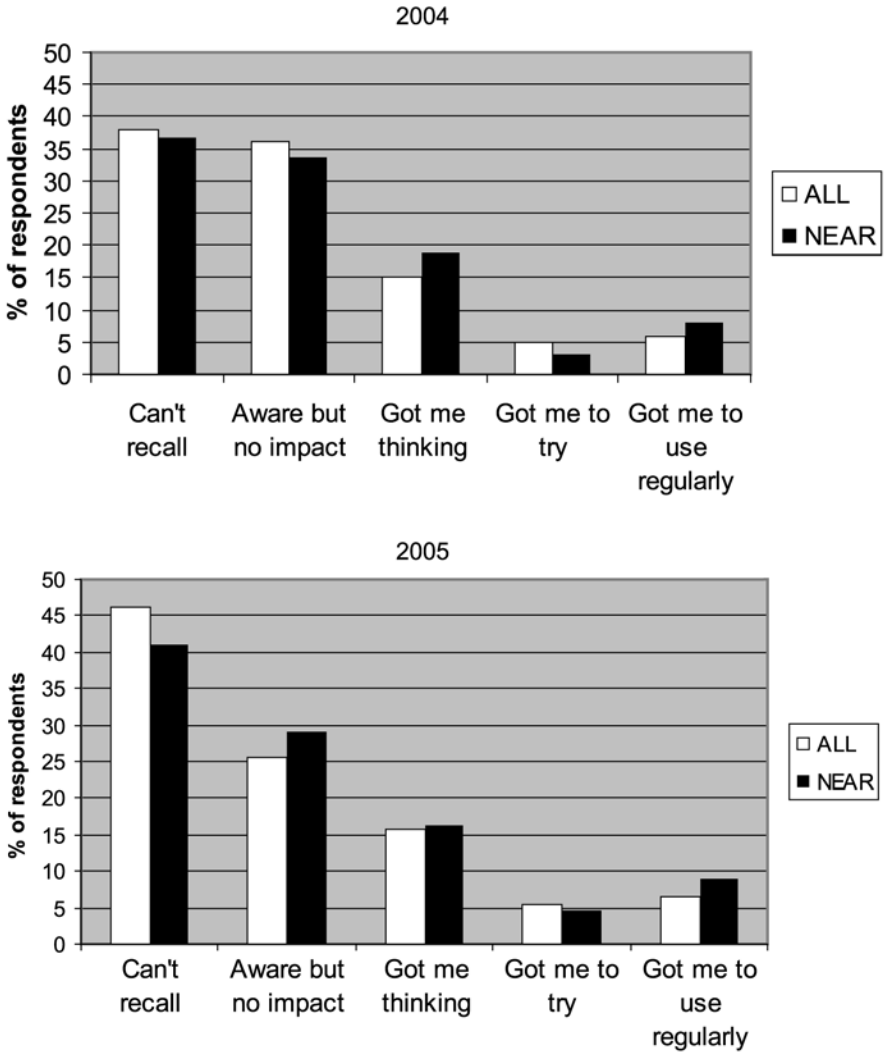


Figure 4. Perceptions of the Impact of TravelSmart on Use of Environmentally Friendly Modes

percentages of the student population depending on the program impact. When the program costs are allocated only to those students stimulated to use environmentally friendly modes (6.4% of the target population as shown in Figure 4b), the

cost is \$AUD157 (\$USD130) per person. That is a comparable cost to areawide delivery of community-based TravelSmart initiatives that target households.

Table 4. Program Delivery Costs per Student (2005)

<i>Target Group</i>	<i>Number of Students Impacted</i>	<i>Cost per Student</i>
All students	2,977	\$AUD10 (\$USD8)
Those stimulated to think about, try, or use environmentally friendly modes	27.5 % of 2,977 = 818	\$AUD37 (\$USD30)
Those stimulated to try or use environmentally friendly modes	11.7 % of 2,977 = 348	\$AUD86 (\$USD70)
Those stimulated to use environmentally friendly modes	6.4 % of 2,977 = 190	\$AUD157 (\$USD130)

We next consider how respondents valued different parts of the TravelSmart program (Figure 5). Note that multiple responses were allowed since respondents were asked to indicate any items that were of value to them. Two items stand out in Figure 5 in relation to the 2004 initiative: the provision of information about public transport and the free public transport tickets. Tickets were not included in the 2005 initiative and yet the results presented in Figure 4 do not suggest that withdrawal of this incentive impacted the effectiveness of the program. Students living near the university also indicated that the information on walking and cycling to campus was of value with that information being identified as valuable by a higher proportion of respondents in 2005 compared to 2004. For students living further away from campus, the information on carpooling was valued. About 10 percent of the responses highlighted that value was obtained from “the publicity the initiative generates about using alternatives to the car” and “being part of an initiative which promotes alternatives to the car.”

Remaining Barriers to Behavior Change

We now examine the responses in relation to factors that discourage or prevent respondents from walking, cycling, taking public transport, or carpooling to the university more often. For each mode, respondents were asked to indicate the top three items from a predefined list. Only those barriers associated with at least 10 percent of the responses are considered here since they represent the major barriers.

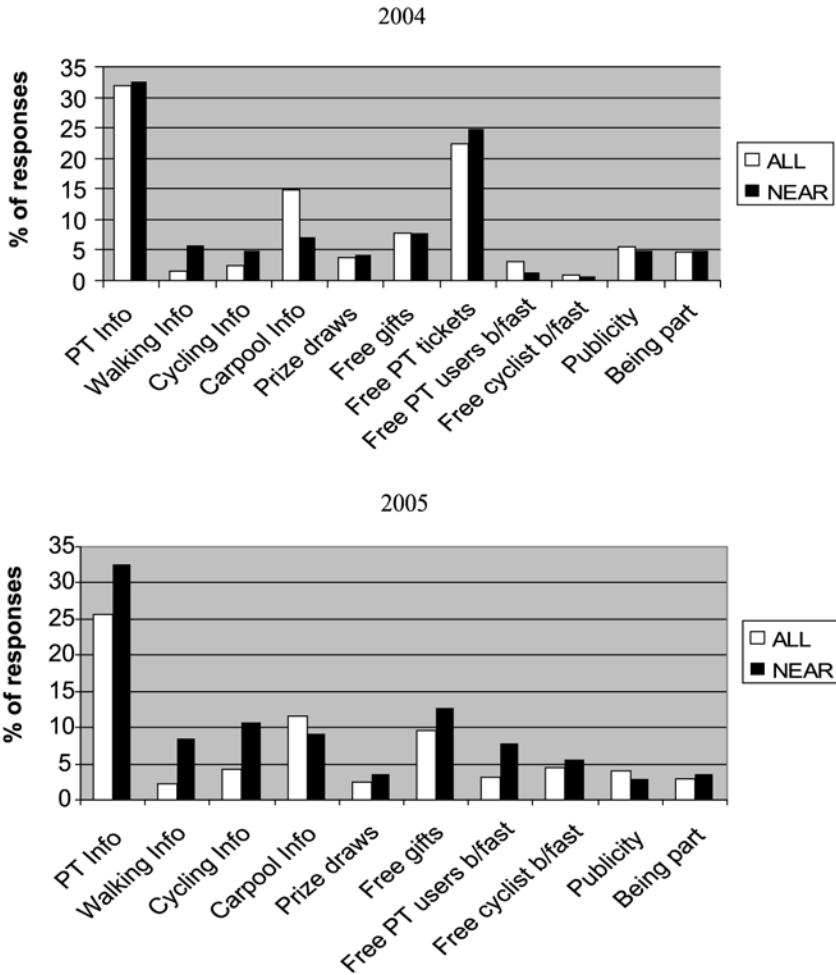


Figure 5. Elements of TravelSmart Program Valued Most by Respondents

ers nominated. The results presented relate to the 2005 responses since there was little difference in the pattern of responses from 2004 to 2005. While the results presented in these figures relate to all TravelSmart respondents, little difference was noticed in the pattern or relative importance of the barriers when the analysis was restricted to infrequent and nonusers of environmentally friendly modes.

In relation to walking (Figure 6), differences exist in the responses between ALL respondents and those who live NEAR the university with an obvious difference

being the perception of walking distance as a barrier. For respondents living near campus, there are two main barriers (both comprised about 20 percent of the responses): weather and need to carry materials/books and other things. Concerns about walking in the dark (about 15% of responses) could be addressed by improved footpath lighting. Lack of safe, convenient places to cross busy roads was only mentioned as a barrier in about 5 percent of the responses. While this barrier could be lowered with appropriate engineering treatments, it does not appear to be a major impediment to increasing walking to campus.

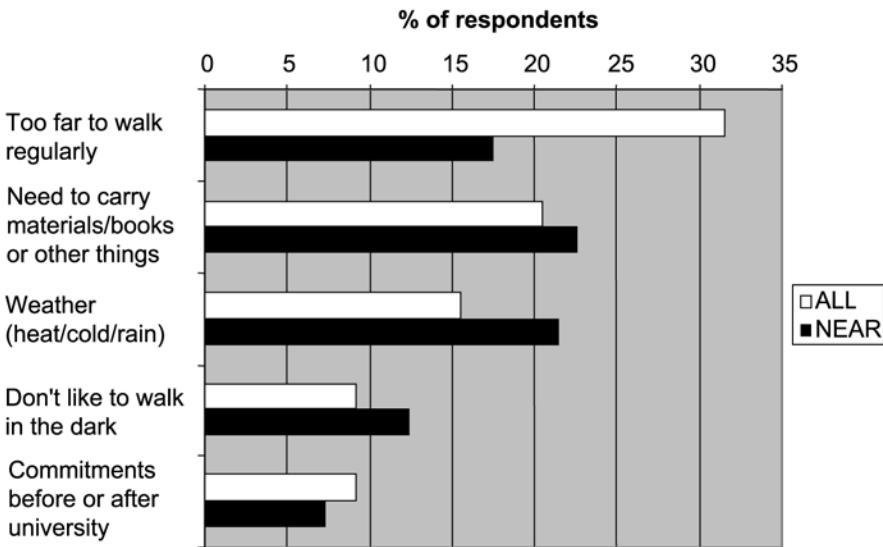


Figure 6. Walking Barriers

Less variation occurs in the responses of ALL and NEAR respondents to cycling barriers (Figure 7) except for the issue of riding distance, which is a greater barrier for those living further from campus. Not owning or having access to a bike was perceived as a major barrier particularly by respondents living near the university. This highlights the importance of initiatives such as the Bike Recycle project, now being funded as part of the University's Alternative Transport Fund, which makes low-cost bikes available for purchase by students at the start of the year. Other initiatives that increase ownership or access to a bike may also be worth considering.

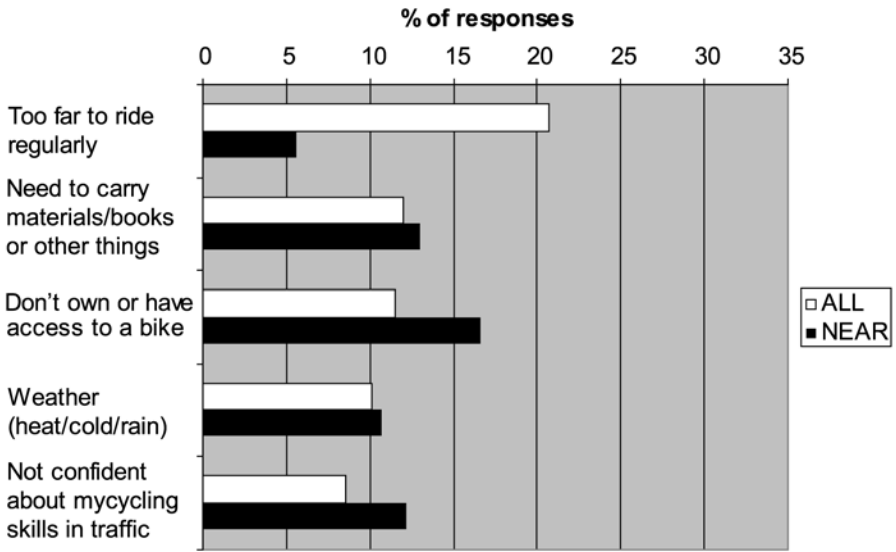


Figure 7. Cycling Barriers

Three other cycling barriers each accounted for slightly over 10 percent of the responses: not confident about cycling skills in traffic, weather, and the need to carry materials/books. The issue of cycling skills development can obviously be addressed through training courses such as the Cycle In course funded by the University’s Alternative Transport Fund. The issues of weather and carrying materials can be addressed with appropriate clothing and/or equipment and perhaps there is potential to provide information about the availability of those items or some form of subsidy scheme to assist with their purchase. Interestingly, weather featured less as a barrier to cycling than it did for walking, even for nearby respondents. Similarly, commitments before and after university were only half as important as a barrier for cycling compared to walking.

There is little difference in the perceived public transport barriers between ALL respondents and those who live NEAR campus (Figure 8). Frequently cited barriers such as “takes too long,” “limited service availability,” “lack of direct services,” and “expense” (particularly for students located near to campus) are not easy to address and relate to the extent of public transport services offered and subsidies provided. Expansion of public transport services is unlikely to be a low-cost option although opportunities to draw on spatial analysis of student travel patterns to better tailor existing services to their needs may exist.

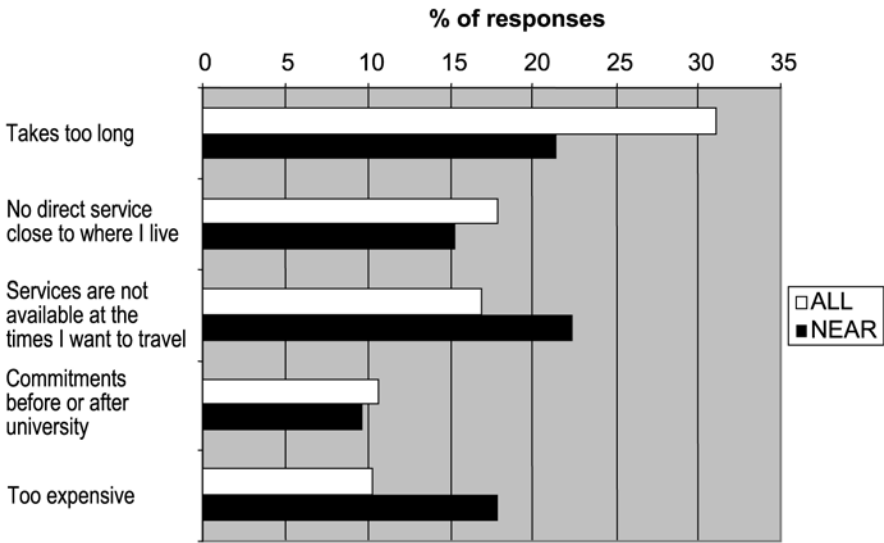


Figure 8. Public Transport Barriers

The lowest perceived public transport barrier (about 4% of responses) was lack of information or knowledge on how to get to the university by public transport. Provision of information about existing public transport services, a key feature of the TravelSmart initiative, therefore appears to be effectively disseminated through the combination of printed timetables and route maps along with the personalized advice provided at the time of presenting the TravelSmart program. The latter component may be important in assisting students to interpret the route and timetable information. It is also possible that the existing information may not be adequately framed to influence perceptions of different modes. Research undertaken in Western Australia indicated that Perth residents overestimated the time by public transport by 45 percent while underestimating the journey time by car by 16 percent (Socialdata Australia, 2000).

In addition to provision of information on public transport services, travelers should be made aware of the true car journey times to improve public transport's attractiveness as a modal alternative. In relation to the issue of expense, particularly for students living near campus, the subsidized public transport pass schemes (known as UPASS in the United States) should be explored as they have proven successful in boosting public transport ridership (Toor and Havlick 2004). While

schemes of this type could overcome the financial barrier, it is also possible that they will stimulate the use of public transport by nearby residents at the expense of walk and bike modes.

Little difference exists in the perceived barriers to carpooling between all respondents and those who live near campus (Figure 9). Three barriers stand out: not having anyone to carpool with, not wanting to be tied to a schedule, and lack of flexibility. The first of those can be addressed by greater promotion of the carpool matching service. It is possible that respondents perceive the carpool option to be less flexible than it really is. A topic for future study is the promotion of positive experiences of existing carpoolers as role models. It is worth noting that the issue of “commitments before/after university” was consistently nominated as a barrier in about 10 percent of responses in relation to public transport and carpooling while only half that proportion of the responses indicated that it was a barrier for cycling.

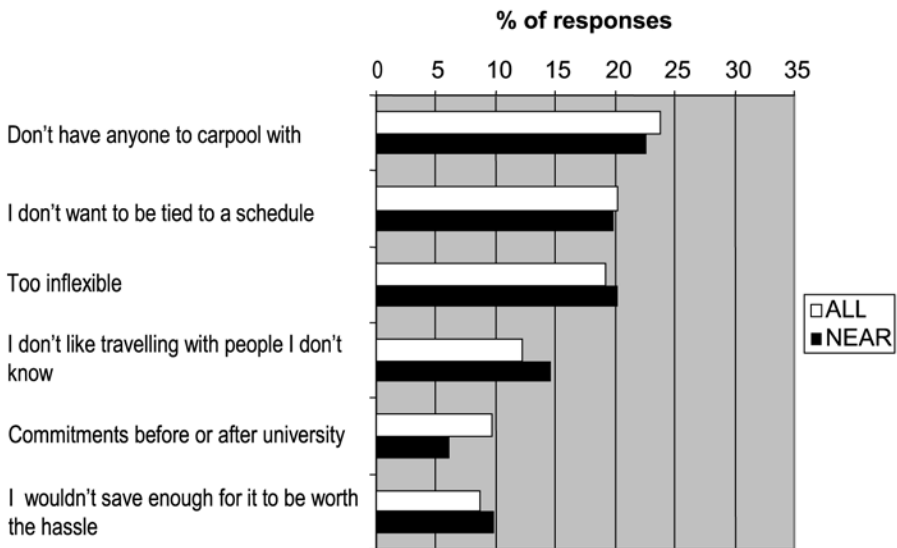


Figure 9. Carpool Barriers

Conclusions and Recommendations

Travel survey results suggest statistically significant changes in mode choice between 2003 and 2004 with a reduction in car driver trips of about 9 percent and

an increase in public transport trips of about 6 percent. Nearly one third of all students who registered for the TravelSmart program indicated that it had influenced them to the extent of thinking about using, trying, or regularly using environmentally friendly modes (carpool, public transport, walk, or cycle). A statistically higher proportion of students who participated in the program in 2005 reported either regularly or always using environmentally friendly modes compared to those students who were not exposed to the program. The provision of information about public transport was particularly effective since only a very small percentage of respondents indicated that they lacked adequate information about public transport options for commuting to campus.

Barriers remain that are an impediment to further behavior change. Some of those (e.g., aspects of public transport service provision) will require substantial investment or service redesign to address. Others (e.g., availability of low-cost bicycles, education/training on riding in traffic, and equipment for carrying items on a bike and clothing for dealing with variations in weather) can be addressed much more cost effectively. The carpool matching service could be better promoted and greater use could be made of carpooling “role models” to highlight the relative advantages, and address perceived disadvantages with that mode.

Overall, these results suggest that the Monash TravelSmart initiative was effective in encouraging behavior change even though the reduction in the student concession card fee and improvements in the intercampus shuttle bus were confounding effects. Future development of the TravelSmart initiative could focus on the provision of services or information to address the remaining perceived barriers to behavior change. In addition, a follow-up with the students over time to examine the longer terms impacts of the TravelSmart initiative is encouraged. Future projects could also aim to lift the response rates to the travel questionnaires by varying the methods of recruitment.

Endnote

¹ The academic year in Australia runs from late February to mid-October.

References

Book, S. A., and M. J. Epstein. 1982. *Statistical analysis: Resolving decision problems in business and management*. Glenview, IL: Scottt, Foresman and Company.

- Brög, W., and M. Schadler. 1998. Marketing in public transport is an investment, not a cost. Proceedings of the 22nd Australian Transport Research Forum, Sydney.
- Cooper, B., and D. Meiklejohn, D. 2003. A new approach for travel behaviour change in universities. Proceedings of the 26th Australasian Transport Research Forum.
- Davidson, G. 2004. *Car wars: How the car won our hearts and conquered our cities*. Crows Nest, NSW: Allen and Unwin.
- Department of Infrastructure. 2004. Victorian TravelSmart web site, www.travel-smart.vic.gov.au. Accessed 12/8/04.
- Montgomery, D.C., G. C. Runger, and N. F. Hubele. 1998. *Engineering statistics*. New York: John Wiley.
- Nakayama, S., and J. Takayama. 2005. Ecotravel coordinator program: Effects on travel behaviour and environmental attitude. *Transportation Research Record* 1924, 224–230.
- Richardson, A. J., E. S. Ampt, and A. H. Meyburg. 1995. *Survey methods in transport planning*. Melbourne: Eucalyptus Press.
- Rose, G. 2005. Evaluation of the 2004 Monash University campus TravelSmart initiative. Report prepared for the Victorian Department of Infrastructure.
- Rose, G., and E. Ampt. 2001. Travel blending: an Australian travel awareness initiative. *Transportation Research*, Part D 6, 95–110.
- Rose, G., and E. Ampt. 2003. Travel behaviour change through individual engagement. In D. Hensher and K. Button, eds., *Handbooks in Transport, Volume 4: Transport and the Environment*. Elsevier, UK: 739–755.
- Rose, G., and H. Marfurt. 2007. Travel behaviour change impacts of a major ride to work day event. *Transportation Research Part A* 41, 351–364.
- Seethaler, R., and G. Rose. 2006. Using the six principles of persuasion to promote community-based travel behavior change. CD-ROM proceedings of the U.S. Transportation Research Board Annual Conference.
- Shannon, T., B. Giles-Corti, T. Pikora, M. Bulsara, T. Shilton, and F. Bull. 2006. Active commuting in a university setting: Assessing commuting habits and potential for modal change. *Transport Policy* 13, 240–253.

- Socialdata Australia. 2000. Potential analysis for Perth. Department of Transport, Western Australia. Cited in Shannon et al. 2006.
- Taniguchi, A., and S. Fujii. 2007. The effects of workplace mobility management targeting commuter transport. CD-ROM proceedings of the U.S. Transportation Research Board Annual Meeting, Washington DC.
- Tapestry: Campaign solutions for transport. 2003. [Online] Available at <http://www.eu-tapestry.org/>. Accessed: July 19, 2004.
- Tolley, R. 1996. Green campuses: cutting the environmental costs of commuting. *Journal of Transport Geography* 4(3), 213–217.
- TNK Consultants. 2004. Monash University intercampus bus service review. Report submitted to Monash University.
- Toor, W., and S. W. Havlick. 2004. *Transportation and sustainable campus communities: Issues, examples, solutions*. Washington, DC: Island Press.

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