

# Walcyng in New Zealand: an analysis of readiness to change

Charles Sullivan<sup>1</sup>, Carolyn O'Fallon<sup>2</sup>

<sup>1</sup> ACNielsen, Wellington, NZ

<sup>2</sup> Pinnacle Research, Wellington, NZ

## 1 Introduction

In 2003, Sport and Recreation New Zealand (SPARC) and the Cancer Society of New Zealand commissioned a major nationwide survey to segment adult New Zealanders in terms of physical activity and healthy eating habits. The questionnaire, based on previous work by the American Cancer Society, included several questions about current usage of, and attitudes toward, active transport (particularly cycling, and to a lesser extent walking). The resulting "Obstacles to Action" database (with responses from over 8000 people aged 16 or over) thus provides opportunities to analyse transport responses with a larger sample size than is usual with New Zealand surveys.

Our full report (Sullivan and O'Fallon, forthcoming) analyses the Obstacles to Action database with respect to cycling and walking, including:

- providing baseline data for monitoring the progress of transport strategies and other initiatives in New Zealand
- describing and quantifying the "target" population segments for walking and cycling development programmes
- examining the readiness of respondents to replace at least two car trips per week with trips by active modes
- exploring respondents' likelihood of use and perceived availability of walking and cycling facilities in their neighbourhood
- analyzing neighbourhood barriers to physical activity
- examining characteristics of those who never learned to cycle.

The focus of this paper is on one aspect of that report, namely the **stage of change** questions that build on the detailed development work done in the UK by the Transport Research Laboratory (TRL). The transtheoretical model of change, or stages of change model, is widely used in New Zealand and overseas to promote major changes in behaviour (e.g. quitting smoking, increasing intake of fruit and vegetables, alcohol abuse, cocaine abuse, safer sex). There is also evidence that approaches based on this model are effective for promoting physical activity in general.

Stage of change questions can be useful for *developing* active transport promotional strategies because they highlight the extent to which different initiatives may be required for people at different stages of readiness to walk or cycle. *Monitoring* movement through the stages of change or improvements in readiness to change, not just current behaviour, can be useful given that behaviour change may often involve a number of process steps being undertaken in order for individuals to be ready to change behaviour.

## 2 Method

This project analyses a large existing dataset collected in mid-2003 for SPARC and the Cancer Society. Thus, there was no possibility of either changing or adding to the existing questions.

A key strength of the Obstacles to Action dataset is the unusually large sample size (over 8000 people aged 16+ years). This allows reliable analysis of sub-groups (e.g. regions,

ethnic groups, age groups) to a greater degree than the much smaller sample sizes of most surveys in New Zealand.

A key weakness of the dataset is that most of the survey questions are not directly relevant to transport. This is because the survey was designed with other objectives in mind (promoting physical activity and healthy eating).

A second weakness of the SPARC dataset for this analysis relates to self-reporting. A recent validation study completed by SPARC showed that self-reports of physical activity substantially overstate actual physical activity as measured objectively by heart rate monitoring (SPARC, 2004)

The final response rate of completed, usable questionnaires was 61%, distinctly higher than most survey research in New Zealand.

The results are weighted by age, gender, and ethnicity to the New Zealand population. Details about weighting are contained in a separate Technical Report available (Sullivan et al., 2003a).

## **2.1 Stages of Change model**

The stages of change model specifies an ordered set of stages of readiness to change into which people can be classified and identifies the factors that can facilitate movement from one stage to the next. Five stages of change are commonly emphasised:

- Pre-contemplation (e.g. not even considering the desired activity or behaviour, such as walking or cycling),
- Contemplation (e.g. aware of walking or cycling, but will not do it),
- Ready for action/ Preparation
- Action (e.g. cycle/walk sometimes),
- Maintenance (e.g. cycle/walk quite often or almost always).

The Maintenance stage is sometimes divided into two categories: Maintenance1 (cycle/walk quite often) and Maintenance2 (cycle/walk almost always)

It is recognised that movement through the stages is often not in an orderly linear progression. For example, people may advance to trying a target behaviour (the Action stage) and then relapse to merely hoping to improve (Contemplation). Relapse is particularly common the first time individuals try to change, but this is not a reason for despair. Rather, the first attempt is a valuable source of lessons for future attempts to change (hence Prochaska et al, 1994 prefer “recycling” to “relapse”).

In addition, some individuals may remain in the Contemplation stage for many years (self-changing smokers typically spent two years in contemplation before taking action; Prochaska et al, 1994).

To the extent that behaviour change follows a stage process, we can identify the predominant stage or stages in a population and focus resources on those issues most likely to move people to the next stage (e.g. from no intention of changing, to contemplating change). That is, interventions or “treatments” can be matched to individuals because people in different stages have different needs (Horwath, 1999). In addition, stage models lead us to prepare properly for common “problems” such as relapse rather than focusing single-mindedly on achieving shorter-term action/behavioural change.

Although the relevance of the stages of change model to achieving transport behaviour change has been increasingly apparent to transport researchers and decision-makers, there are some concerns about how the approach is applied. In particular, Fergusson et al (1999), among others, observed that many transport behaviour change interventions are designed for individuals who are “ready for action”; missing out what may be the majority of the population who are in an earlier stage of change and thus require greater information, motivation or incentives to modify their behaviour. A related concern is that promotional initiatives concentrating on removing “barriers”, such as safety risk, may be presupposing a suppressed demand (particularly for cycling) and failing to address the socio-psychological process of behaviour change (Davies et al, 1997). Both of these issues are recognised in the New Zealand walking and cycling strategy, *Getting there – on foot, by cycle* (Ministry of Transport, 2005):

Supportive transport systems — plus improved perceptions of walking and cycling — will increase the likelihood of individuals *considering* the use of these modes for transport. But for many of us, our ability to turn *contemplation* into *action* can also benefit from active encouragement and support. (p.39)

### 3 Cycling: Stages of Change

#### 3.1 Stage of change measurement

In the questionnaire, the cycling stage of change question immediately followed simpler questions about cycle availability and recent use. We used the exact wording reported for UK research by TRL (Davies et al, 2001) for cycling. As shown in Table 1, the wording was:

**Table 1 Stage of change—cycling.** [D12]

<b>For a short journey when the weather was fine and you have nothing to carry, would you ...</b>		<i>Unweighted count</i>
Not even consider using a bicycle [ <b>Precontemplation</b> ]	41.1%	3430
Realise that you could use a bicycle but wouldn't actually do it [ <b>Contemplation</b> ]	13.6%	1111
Think seriously about the pros and cons of cycling but rarely do it [ <b>Ready for action</b> ]	8.0%	695
Try cycling on some occasions [ <b>Action</b> ]	17.6%	1438
Cycle quite often [ <b>Maintenance1</b> ]	9.8%	733
Almost always cycle [ <b>Maintenance2</b> ]	4.7%	314
Not answered	5.2%	442
<b>Total</b>	<b>100.0%</b>	<b>8163</b>

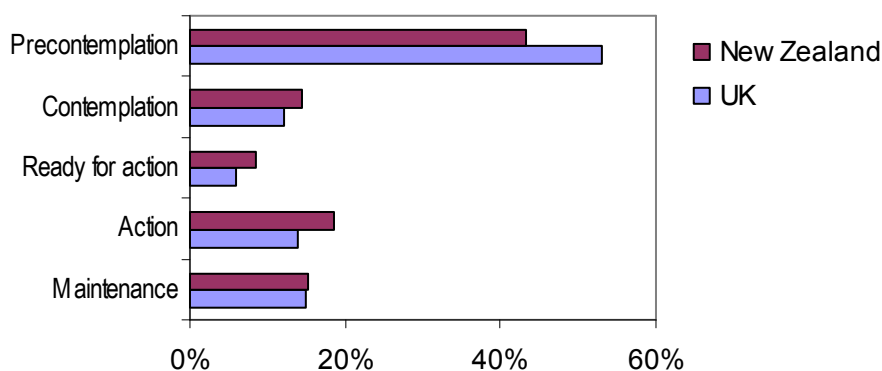
Given the relatively small numbers cycling “quite often” or “almost always”, we often combine them into a single “Maintenance” stage.

Around half the responses indicate little interest at all in cycling (55% in Precontemplation and Contemplation). This is to be expected given that fully 69% of respondents were classified as non-cyclists in our other analysis. Indeed, although relatively few placed themselves in the Maintenance stages (14-15%), it seems fair to suspect some wishful thinking, given that only 7% of respondents reported cycling two or more days a week.

Note, however, that the Action stage quite closely mirrors the number of respondent stating that they “occasionally” cycle (17.6% compared with 16%).

Figure 1 shows that our cycling stage of change results are broadly similar to those from the UK nationwide survey (Davies et al, 2001). This is despite levels of cycling in the UK survey being slightly higher (16% cycled about once a week or more compared with 11% in New Zealand), perhaps because the UK survey concerned summer whereas our survey was in autumn. The UK results are also based on a large sample size (3118) of those aged 16 or over, but they used a different interview mode. Rather than a self-completion questionnaire, the UK questions were presented face-to-face as part of an omnibus questionnaire.

Figure 1 Cycling stage of change: New Zealand and UK results.



Note: New Zealand results are adjusted upwards slightly (from those in Table 1, which includes *Not answered*) to improve comparability with the UK results (which did not report any *Not answered* category).

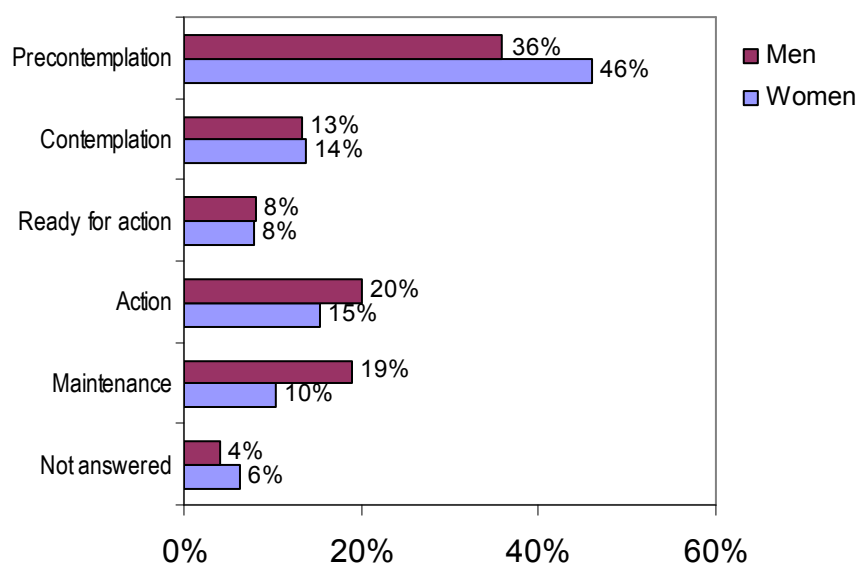
### 3.2 Demographics

With respect to demographics, we were able to consider the effects of age, gender, employment status, the presence of children, personal and household income, ethnicity, and educational attainment on both cycling and walking stages of change.

Respondents were asked how many times they had ridden a bicycle in the last three months. Sixty-nine per cent said they had done no cycling at all, while 11% reported they were “regular” cyclists (cycling about once a week or more often. Cycling is strongly related to both age and gender:

- about twice as many men are regular cyclists (16% overall, compared with 7% of women),
- regular cycling decreases steadily with age, particularly among men.

Consistent with these baseline results, men are clearly more common in the Action and Maintenance stages of change (Figure 2). Given this, it also seemed possible that men might dominate all stages of change above Precontemplation. However, the Ready for action and Contemplation stages did not show a clear gender bias. Thus, a cycling promotion initiative targeting people in these stages should not necessarily be focused on men.

**Figure 2 Gender and cycling stage of change.** [G1, D12]

Seniors (aged 65+) are much more likely to be in Precontemplation. Interestingly, potential for change, as indicated by the Action and Ready for action stages, is about as common among those aged 35-64 as among younger age groups. This suggests that these age groups may be open to increasing cycling for reasons similar to those found in the UK (Davies et al, 1997): cycling being more practical with older children than young ones, the departure of children from home providing more leisure time, and increased concerns about personal health/fitness with age.

Previous cycling surveys in New Zealand have also shown that more men than women cycle and that cycling decreases with age. But the large sample size here also enabled us to show that cycling is significantly less common among those with Pacific or Asian ethnicity. Specifically, the proportion of regular cyclists in these groups is roughly half that of Māori and NZ European respondents. (These ethnic differences remained statistically significant after adjusting for age and gender using logistic regression.) This same tendency was reflected in the stages of change where Pacific and Asian peoples were more likely to be in the Precontemplation and Contemplation stages compared with New Zealand European and Māori.

Analysis of work status provides information useful for workplace initiatives promoting cycling. It was possible that readiness to cycle among those working might have been distinctly low because of greater constraints on their time or because they commonly travel when roads are particularly busy. However, both full-time and part-time workers included substantial numbers (29% in both cases) in the Action and Ready for action stages.

We did not find any notable relationship between personal or household income; or educational attainment and cycling stages of change.

While having young children (under 5 years old) significantly reduced cycling among women (but not among men), there was not a parallel significant difference when the stages of change were analysed. Women with children under 5 (and no children between 5 and 17) were also more likely to be noncyclists than were women with children aged between 5 and 17.

### 3.3 Motivation, perceived benefits and barriers

The questionnaire had 114 statements providing non-demographic ratings about motivations, perceived benefits, and perceived barriers for physical activity in general. At first sight, these may seem very promising as a way of describing differences between people in different stages of change that can be used to help change their behaviour. However, because these psychological measures were worded with respect to physical activity in general rather than cycling specifically (since cycling is only one of a range of physical activities available to people), differences between stages of change with respect to them are of less interest in general than the demographics and so on already profiled.

Other types of psychological measurements might be more useful to characterize cycling stage of change segments. For example, it would be possible to develop question items directly about cycling that fit with the broader theoretical framework commonly used in conjunction with stages of change (e.g. decisional balance scales, processes of change scales). Alternatively, question items from other social marketing frameworks could be used, such as those reported in Davies et al (2001). In particular, they found substantial differences in agreement with "I hate to stand out from the crowd" (cyclists 24% versus noncyclists 45%) and "my friends would laugh at me if I were to cycle" (cyclists 6% versus noncyclists 26%).

### 3.4 Other baseline characteristics

In addition to more traditional "demographic" characteristics, such as age, gender, and income, we were able to analyse the factors of obesity and never learning to ride properly on cycling.

The effect of obesity on cycling was most apparent among the severely obese, rather than simply considering all those above a conventional definition of obesity (Body Mass Index of 30 or more). The proportion of noncyclists rises from 66% (normal weight) to 78% (severely obese<sup>1</sup>) and 82% (morbidly obese<sup>2</sup>).

Overall, 5.8% of respondents reported that they had *Never learned to ride properly*. This distinction is important because such adults are not likely to respond to promotional initiatives related to cycling. Those who had never learned were particularly:

- women (8% of women compared with only 3% of men),
- Pacific peoples (17%) and Asians (21%) rather than NZ Europeans (4%) or Māori (6%),
- morbidly obese<sup>2</sup> (24%, compared with 6% for both the severely obese and the obese).

## 4 Walking: Stages of Change

### 4.1 Stage of change measurement

The stage of change question concerning walking is simply an adaptation of the wording of the cycling stage of change question from TRL (Davies et al, 2001). Given that the SPARC/Cancer Society project was not focused on transport, there was neither time nor funding for more extensive development of this walking question.

---

<sup>1</sup> Body Mass Index (BMI) 35-39.9

<sup>2</sup> BMI 40+

In the absence of international precedent, the choice of length of journey was difficult. The length of 1.5 km was chosen after consideration of the length of walking trips in the New Zealand Travel Survey database (LTSA, 2000) and international research on walking (e.g. Forward, 1998). Note that 74% of walking “trip chains” were less than 2 km (O’Fallon and Sullivan, 2005).

The walking stage of change question immediately followed the similar (but simpler) cycling stage of change question. This position required an awkward lead-in to exclude cycling. As shown in Table 2, the full text is:

**Table 2 Stage of change—walking.** [D13]

**For this question only: if you have a bicycle, please assume that it is temporarily unavailable. For a journey of 1.5 km (about 15 minutes walk at normal walking speed), when the weather was fine and you have nothing heavy to carry, would you...**

		<i>Unweighted count</i>
Not even consider walking [ <b>Precontemplation</b> ]	5.8%	412
Realise that you could walk but wouldn't actually do it [ <b>Contemplation</b> ]	6.0%	426
Think seriously about the pros and cons of walking but rarely do it [ <b>Ready for action</b> ]	4.2%	341
Walk on some occasions [ <b>Action</b> ]	26.8%	2161
Walk quite often [ <b>Maintenance1</b> ]	21.6%	1859
Almost always walk [ <b>Maintenance2</b> ]	25.0%	2090
Not answered	10.5%	874
<b>Total</b>	<b>100%</b>	<b>8163</b>

Consistent with walking being much more widely used as a transport mode and for recreation / fitness purposes than cycling, responses in the Action and Maintenance stages of change are much more common for walking. Only 6% said that they would not even consider walking (compared with 41% for the comparable cycling answer). Because the high stages of readiness are much more common for walking than for cycling, in analysing walking we present the Maintenance1 and Maintenance2 responses separately (rather than combining them as done for cycling<sup>3</sup>). Not least this is because the Maintenance1 stage here can well be seen as indicating an important target group to encourage walking even more often.

The walking stage of change question was often not answered (10.5%). This problem may be related to the awkward lead-in relating to cycling, or possibly the wording does not work as well for walking as for cycling.

The question works well enough to be usable for the current analyses. However, we suggest that any wishing to collect such data in future surveys should first make improvements to this question.

We checked whether physical disability or illness had particularly strong effects on this question. There were clear effects, but these were not so strong as to require that such respondents should be removed from the subsequent analysis.

<sup>3</sup> It is perhaps arguable whether or not *Walk quite often* should be labelled as Maintenance, but we do so here for consistency with the cycling results (although with the walking results, we ensure that *Walk quite often* responses can be seen separately from *Almost always walk*).

## 4.2 Demographics

In sharp contrast to the cycling results, walking stage of change showed no marked gender differences.

Readiness to walk does not simply decrease with age. Our results showed an increase among the number of men aged 50-64 (50% compared with 42% of those aged 35-49) in Maintenance1 and Maintenance2 stages. This increase is plausible given the slightly higher numbers also reporting more actual walking in this survey. In addition, a separate survey involving 12,500 adults aged 18 and over showed increases in physical activity levels for those aged 50-64 (SPARC, 2003). In terms of targets for increasing walking, the 35-49 age group had the largest proportion in the Action and Maintenance1 stages.

Unlike the cycling analysis, no particularly marked differences between ethnic groups with respect to walking stage of change were apparent.

We did not find any notable relationship between personal or household income; or educational attainment and walking stages of change, apart from more individuals (aged 25-54) in the Action and Maintenance stages than in Precontemplation and Contemplation stages had university degrees.

Both full-time and part-time workers were comparable to the general population in terms of readiness to walk.

Children were expected to be more of a barrier for readiness to cycle than for readiness to walk. Our analysis confirmed that there were few marked differences between walking stages of change comparing those with and without children.

## 4.3 Motivation, perceived benefits and barriers

As with the cycling analysis, because the psychological measures in the survey were worded with respect to physical activity in general rather than walking or cycling specifically, differences between stages of change with respect to them are of less interest in general than the demographics and so on already profiled. Detailed analysis of motivations and benefits with respect to physical activity in general (which should remain substantially relevant for walking, given the high levels of walking undertaken as physical activity) is already readily available in existing SPARC analysis of the Obstacles to Action dataset (e.g. the segments and path analysis in Sullivan et al, 2003b).

Specifically, Sullivan et al (2003b) found that self-efficacy (confidence about being able to do specified levels of physical activity) has a strong relationship with levels of physical activity as does intrinsic motivation (e.g. enjoying physical activity). In contrast, extrinsic motivations (e.g. doing physical activity to get approval from others) lack such a strong relationship. These results suggest that increasing self-efficacy and intrinsic motivation are likely to be useful campaign approaches.

Furthermore, segmentation of the target group not already active (45% of the adult population) identified six segments labelled as follows:

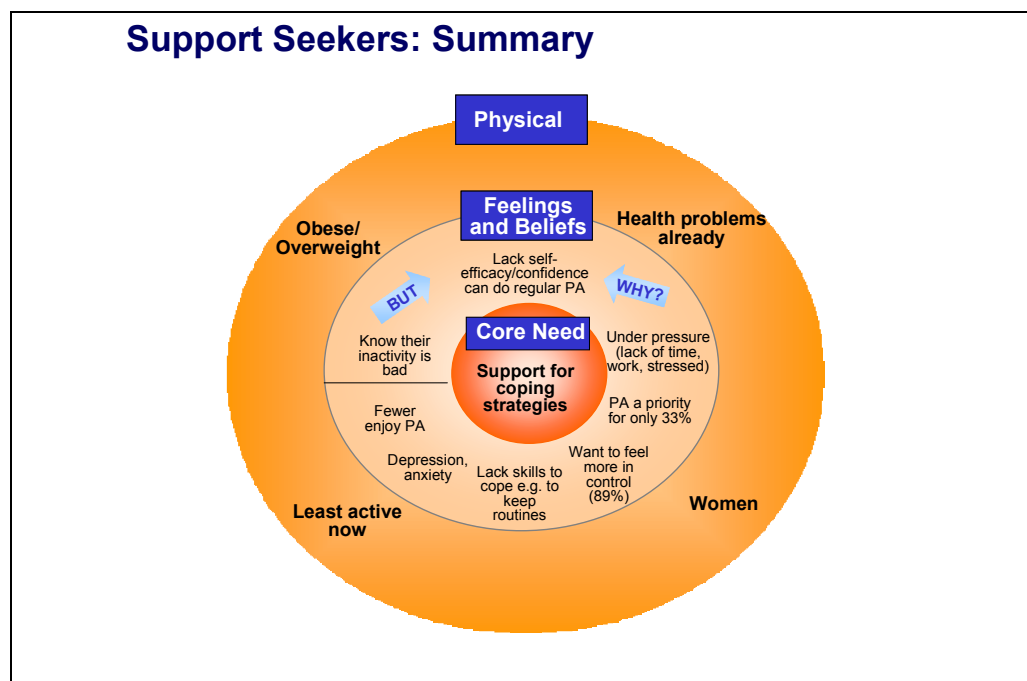
- Others Oriented,
- I'm OK Thanks,
- Go Away—It's Not For Me,
- Busy & Stressed,
- Support Seekers,



- Why Not Then?

For example, Figure 4 (from Sullivan et al, 2003b) summarises the Support Seekers segment.

Figure 4 Example of psycho-behavioural segment for promoting physical activity.



## 5 Conclusions

### 5.1 Cycling

Clearly, not all those who report some readiness to cycle will actually start cycling in response to relevant initiatives (e.g. construction of cycle paths). But the first stage of change, Precontemplation, usefully quantifies those who report quite bluntly that they would "not even consider using a bicycle". Realistically, these are currently a large proportion of adults (41.1%).

Despite the relatively small number of regular cyclists, substantial numbers expressed some readiness to cycle and were classified into the following stages: Contemplation (13.6%), Ready for action/Preparation (8.0%), and Action (18%). It is common to focus on individual/psychological factors with stage of change results. But with cycling, it is important to note that environmental factors in their neighbourhood (e.g. lack of cycling infrastructure, heavy or fast moving traffic) may be major reasons many reported no contemplation of cycling. For example, the stage of change based "Walk in to Work Out" initiative in Glasgow successfully increased walking but not cycling (Mutrie et al, 2002). The authors concluded that the environment for cycling had to be improved before cycling would become a popular option. The same might well be true in many parts of New Zealand.

Age and gender differences in the cycling stages of change are broadly consistent with those in current cycling behaviour. Nevertheless, the composition of important stage of change segments in who might be targeted for promotional initiatives (Ready for action,

Action) is fairly evenly balanced between genders. These stages of change also have substantial numbers (around half) aged 35-64 rather than being dominated by the youngest age groups to the same extent that regular cycling behaviour is. Thus, the stage of change results suggest that current demographic groups showing relatively high cycling rates are not necessarily the best to target to achieve further change.

Somewhat surprisingly, we did not find marked differences by level of urbanisation, that is, comparing large cities (more than 100,000 people) with smaller cities, towns (1000-29,999) people, and small settlements. One reason is that substantial differences exist between cities within one level of urbanisation (e.g. over 100,000 people) in terms of cycling environment such as cycle-friendly infrastructure and hilliness. For example, as expected, Christchurch had fewer in Precontemplation (35%) than Auckland and Wellington (45% and 46% respectively).

## **5.2 Walking**

The Precontemplation group was only 5.8%, much smaller than for the cycling stage of change question (41.1%). Most of the responses were at the highest stages (Action, Maintenance). But even people at the Action and Maintenance<sup>1</sup> stage (reporting that they would Walk on some occasions, or Walk quite often) may still be valid targets for initiatives aimed at increasing walking.

We recommend improvements to this question before future use so as to reduce the high proportion who did not answer (10.5%). This was particularly a problem among seniors (e.g. 43% of those aged 80+ did not answer). For example, increasing the time specified to around 20 minutes (or allowing a range of times) for the distance of 1.5 km may be more realistic for many, particularly older, walkers. Placing the walking question before the cycling one would simplify its wording and presentation.

We considered but rejected the option of increasing the distance up to 2km. This option would help deliver a more even distribution of responses over stages of change (which would improve sensitivity of analysis, in particular analyses aimed at protecting increases in readiness to change over time). However, this distance would be even more unrealistic for older people and depart further from the kinds of distances commonly walked now.

For prioritising target audiences in terms of demographics, one pointer is that the 35-49 age group has the largest proportion (57%) in the Action and Maintenance<sup>1</sup> stages (among both men and women). This group already reports some walking and so might most easily be convinced to do more. But in general, the walking stage of change analysis did not show particularly marked differences in relation to demographic variables such as gender, ethnicity, work status, level of urbanisation, education, or household income. The near-universality of walking, combined with it not requiring substantial equipment (e.g. a bicycle), confirms the appropriateness of focusing on walking in active transport strategies. The stage of change concept could be used within such strategies:

- to help judge whether sets of proposed active transport initiatives have appropriate coverage of population segments (e.g. are they overly focused on achieving short-term action, without proper preparation for dealing with relapse/recycling?)
- to design content of active transport initiatives (e.g. to consider whether communications should be sharply focused on people in one particular stage, or broadened so that the benefits of a particular initiatives are seen as relevant by people in more than one stage)

- to exploit the greater readiness to change when people move home or change jobs (e.g. employee travel plans could well have a special focus on new staff).

The questionnaire had an unusually large number of non-demographic ratings about motivations, perceived benefits, and perceived barriers for physical activity in general. The great majority of these items either showed a minimal relationship or were not of practical interest. Detailed analysis of motivations and benefits with respect to physical activity in general (which should remain substantially relevant for walking) is already readily available in existing SPARC analysis of the Obstacles to Action dataset (e.g. the segments and path analysis in Sullivan et al, 2003b). In particular, increasing self-efficacy (confidence that they can regularly walk more) and intrinsic motivation (e.g. enjoyment of walking) are likely to be useful campaign approaches.

An example of a stage of change approach that could be used in New Zealand is “Walk in to Work Out”, an active commuting initiative trialled in Glasgow (reported by Mutrie et al, 2002). Such approaches involve more than simply using stages of change to identify people most likely to change their behaviour successfully. They can also make use of other elements of the transtheoretical model, such as the “processes of change” (strategies that people use to help themselves to make change). Various introductions to the transtheoretical model outline ten processes of change to consider making use of in initiatives<sup>4</sup>. These include both experiential processes (consciousness raising, dramatic relief, self re-evaluation, social liberation, environmental re-evaluation) and behavioural processes (self liberation, counterconditioning, stimulus control, reinforcement management, and helping relationships).

## 6 Acknowledgements

First of all, we would like to thank Land Transport New Zealand for the funding to carry out this research project.

Peer review and excellent pointers to relevant overseas research and thinking came from Adrian Davis and Stuart Reid of TRL Limited (UK).

We gratefully acknowledge useful comments from our steering group (Craig Gordon of the LTSA and subsequently the Ministry of Transport; Rae-Anne Kurucz and Tricia Allen of the Auckland Regional Transport Authority; Richard Lindsay of SPARC). SPARC are particularly thanked for their permission to use the Obstacles to Action database, and for additional guidance on measurement and analysis of physical activity from Grant McLean. Helpful additional comments came from Reena Kokotailo (Ministry of Transport) and Karen Boyes (Energy Efficiency Conservation Authority).

## 7 References

Forward, S. (1998) *Behavioural factors affecting modal choice*. Swedish National Road and Transport Institute. (Part of the ADONIS project -- Analysis and Development of New Insight into Substitution of short car trips by cycling and walking)

Horwath, C. (1999) Applying the transtheoretical model to eating behaviour change: challenges and opportunities. *Nutrition Research Reviews*, 12, 281–317.

Land Transport Safety Authority. (2000) *Travel survey report 1997/98: increasing our understanding of New Zealanders' travel behaviour*. Wellington, New Zealand.

---

<sup>4</sup> For example, a useful introduction is available at [www.uri.edu/research/cprc/transtheoretical.htm](http://www.uri.edu/research/cprc/transtheoretical.htm)

Mutrie, N; Carney, C; Blamey, A; Crawford, F; Aitchison, T; and Whitelaw, A. (2002) Walk in to Work Out: a randomised controlled trial of a self help intervention to promote active commuting. *Journal of Epidemiology and Community Health*, 56, 407-12.

O'Fallon, C; Sullivan, C. (2005) Trip chaining: understanding how New Zealanders link their travel. *Transfund New Zealand Research Report No. 268*. Land Transport New Zealand, Wellington. Available from [www.landtransport.govt.nz/research/reports/index.html](http://www.landtransport.govt.nz/research/reports/index.html)

Prochaska, J; Norcross, J; DiClemente, C. (1994) *Changing for good*. New York: Avon.

SPARC. (2003) *SPARC facts: Results of the New Zealand sport and physical activity surveys (1997-2001)*. Wellington.

Sullivan, C and O'Fallon, C. (forthcoming) *Increasing cycling and walking: an analysis of readiness to change*. Land Transport New Zealand Research Report. Land Transport New Zealand, Wellington, NZ.

Sullivan, C; Oakden, J; Young, J; Butcher, H; and Lawson, R. (2003a) *Technical report (Obstacles to Action: A Study of New Zealanders' Physical Activity and Nutrition)*. [www.sparc.org.nz/news/290104\\_obstacles\\_to\\_action.php](http://www.sparc.org.nz/news/290104_obstacles_to_action.php) (accessed 16 January 2004)

Sullivan, C; Oakden, J; Young, J; Butcher, H; and Lawson, R. (2003b) *Overview Report (Obstacles to Action: A Study of New Zealanders' Physical Activity and Nutrition)*. [www.sparc.org.nz/news/290104\\_obstacles\\_to\\_action.php](http://www.sparc.org.nz/news/290104_obstacles_to_action.php) (accessed 16 January 2004)