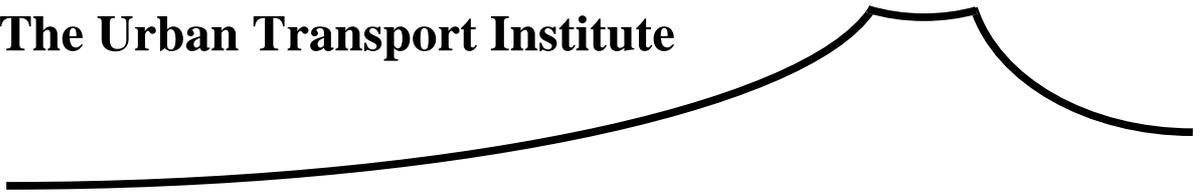


**The Urban Transport Institute**



**TUTI Report 6-2000**

**Little Things Mean a Lot**

**– a Controlled Test of Incentives in On-board Travel Surveys**

**A.J. Richardson**

**July 2000**

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**Abstract:** In an era of declining response rates for all types of survey, many people talk about offering various types of incentive to participants in an attempt to increase the response rate. Relatively little, however, is known about the effects of incentives, either in terms of their effect on response rates or on the potentially biasing effect on the types of respondents that are attracted to complete the survey. The reasons for this lack of knowledge are that incentives are usually not tested in controlled experiments, and the impacts of incentives are often not considered important enough to warrant full documentation of the effect. This paper documents the results of controlled experiments undertaken as part of a large-scale on-board public transport travel survey, in which the effect of providing survey participants with pencils was tested. These small incentives were shown to increase response rate significantly, without introducing any uncorrectable bias. The use of the pencils was also shown to be highly cost effective, delivering a benefit-cost ratio of over ten to one.

**Keywords:** travel survey, on-board, incentive, response rate, bias, pencils

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## **BACKGROUND**

Over the period 1997-1999, the State Government of Victoria, Australia was in the process of privatising Victoria's public transport system as an integral stage in the reform of the transport system. As part of this process, Melbourne's train system is now run by two operating companies (Hillside Trains and Bayside Trains), the tram system is run by two operating companies (Swanston Trams and Yarra Trams), the bus system is run by a large number of private companies (as happened for the past 30 years or so), while V/Line Passenger (the rural passenger service) is also now run by a private company. During and after this privatisation process, it was the intention of the Government to retain the existing multimodal MET ticketing system as the primary means of ticketing (although individual operators would also have the opportunity to introduce single-operator tickets for those trips which do not need to take advantage of the multimodal benefits of the MET ticketing system). In such an arrangement, all revenue from the sale of MET tickets goes to a Revenue Clearing House, which then distributes it to the operating companies according to a revenue allocation process which recognises the passenger loads carried by each of the operators.

In 1997, the Transport Research Centre was commissioned by the Transport Reform Unit within the State Treasury to undertake the design and conduct of Customer Surveys on the Victorian public transport system to support the revenue allocation process. The Public Transport Revenue Allocation Survey (PUTRAS) is used to support the calculation of fare-box revenue allocations to each of the companies operating public transport services under the privatised system arrangements (1, 2). The revenue allocation process uses a procedure whereby passenger loadings (trips and distance covered) on each property are estimated by first calculating usage factors for each of the major ticket types sold in Melbourne (i.e. by ticket type and by ticket zone) for each property. These usage factors are then applied to the sales of the various types of tickets in each time period to estimate passenger loadings. These loadings are then used in a Revenue Allocation Formula to calculate the distribution of the fare-box revenue to each of the operators.

## **INCENTIVE SYSTEMS**

The initial phase of the PUTRAS survey was conducted (during the first quarter of 1998) by teams of two people riding the public transport vehicles. The main survey was conducted using a mail-back questionnaire which was handed to randomly selected passengers soon after they boarded the vehicle and which they were asked to send back to the survey office at the end of the day. In addition, all passengers boarding the vehicle were counted, and the characteristics of passengers randomly selected for receiving a questionnaire were recorded.

One of the main problems with surveys involving the on-board distribution of questionnaires is the relatively low response rates obtained. This is compounded by the fact that the questionnaires are distributed anonymously, in that no contact details of the sample are usually available, thereby preventing any follow-up of respondents to improve the

response rate. In the PUTRAS survey, some characteristics of the non-respondents were obtained by the undertaking of the parallel observation surveys of the total patronage and the selected sample of passengers, but clearly it was also desirable to increase the response rate as much as possible.

In an era of declining response rates for all types of survey, many people talk about offering various types of incentive to participants in an attempt to increase the response rate. Relatively little, however, is known about the effects of incentives, either in terms of their effect on response rates or on the potentially biasing effect on the types of respondents that are attracted to complete the survey. The reasons for this lack of knowledge are that incentives are usually not tested in controlled experiments, and the impacts of incentives are often not considered important enough to warrant full documentation of the effect. The information that is available about the effect of incentives in mail surveys is usually limited to conventional mailout-mailback surveys (3, 4, 5). In this context, it has often been found that small, unconditional gifts are the most effective in increasing response rates. However, very little has been reported on the effectiveness of incentives in the context of intercept surveys, with distribution of mailback surveys, on board public transport vehicles.

Several incentive schemes were considered during the survey design process for PUTRAS. A range of give-aways, charity donations and lottery schemes were suggested as means of increasing response rate. They were all rejected, however, because of their cost, their unknown efficiency and their potential biasing effect on responses (6). While small cash incentives have been found to work best in many mail surveys, it was unclear whether they would work in the PUTRAS survey. Firstly, since the respondents were recruited on-board the vehicle, and since our surveyors would be conducting surveys on a continuous basis on board public transport vehicles, it was unclear whether the visible act of offering a cash incentive would create an expectation with other passengers which may have affected the conduct of future surveys on board vehicles on that route (as discussed in general by Singer et al., 7). Secondly, because the survey was being conducted on behalf of the State Treasury, there was some concern that giving away cash incentives may have created an unfavourable public relations situation for the Treasury.

However, during one of the steering committee meetings, one of the specialist survey advisors (Ms. Liz Ampt from Steer Davies Gleave, London) suggested that pencils should be provided to respondents, primarily to help them with completion of the questionnaire but also as a small incentive for participation. Since it was not desired that respondents should fully complete the questionnaire on-board the vehicle, it was not considered absolutely necessary for them to have a pencil at that time. However, it was considered that if they started completing the questionnaire on-board using the pencil provided, then maybe they would be more willing to finish the completion of the questionnaire at the end of the day. It was also considered that the provision of the pencil may have a positive, perhaps small, incentive effect.

Because the incentive effect of the pencils was unknown at the time, it was decided to conduct a controlled experiment during the PUTRAS survey. Half the sample would be provided with no pencil, while the other half would be given a free pencil. As a further small test, two different types of pencil were used. About 40% received a plain pencil, which was a 10-centimetre plain hexagonal pencil, while about 13% received the same pencil but with "Transport Research Centre" embossed in gold print on the side. We were curious to see whether the "sponsoring" of the pencil had a positive effect on response rates.

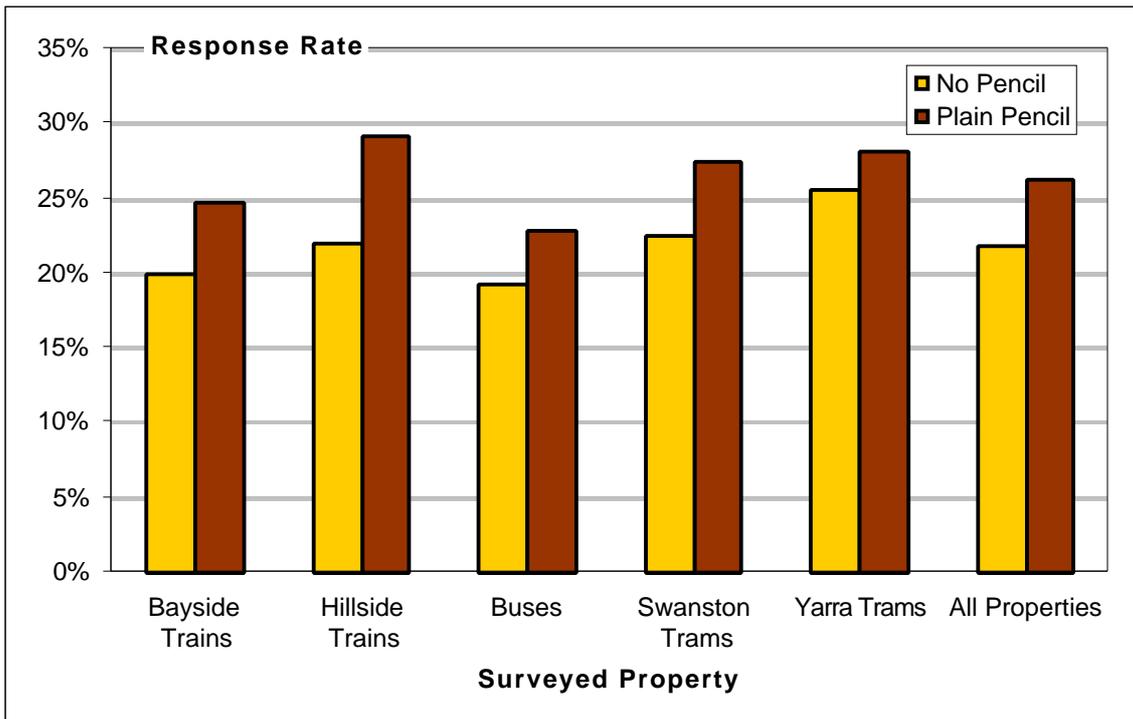
To minimise the confounding effects of other variables, the distribution of the pencils was rotated across the different modes and routes in a systematic fashion. Because of a delay in delivery of the "TRC pencils", the first several weeks of the survey involved only the use of the "plain pencils". Thus there was a "one-pencil" experimental period and a "two-pencil" experimental period. In addition to noting whether the provision of the pencil had an effect, we were also curious to see whether respondents actually used the pencil to complete the questionnaire (thus confirming its utilitarian effect) or whether they just accepted the pencil but did not use it to fill in the questionnaire. Therefore, in the data entry phase, data enterers were instructed to record which type of writing instrument was used to complete the questionnaire.

The following analysis seeks to answer a number of questions related to the provision of the pencils:

1. Did the provision of the pencils have any significant effect on response rates?
2. Did the different types of pencil have different effects?
3. Did respondents use the pencils to complete the questionnaire/
4. Did the provision of pencils affect the speed with which questionnaires were returned?
5. Did specific demographic groups respond differently to the provision of pencils?
6. Were the pencils more or less effective with different types of ticket?
7. Did the provision of pencils affect the number of trips recorded on the questionnaire?
8. Was the provision of pencils a cost-effective means of obtaining responses?

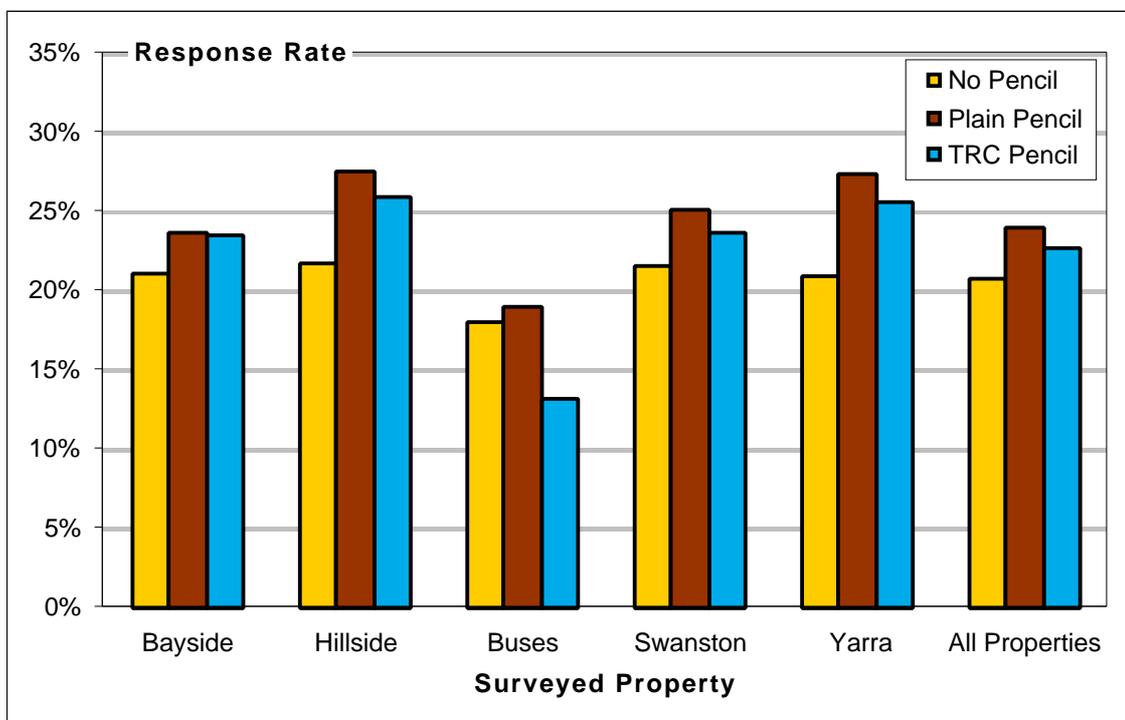
## **THE EFFECT ON RESPONSE RATES**

The provision of a pencil to respondents in the "one-pencil" experiment was surprisingly effective, resulting in a five percentage point increase in response rate (from 22% to 27%) as shown in Figure 1. This effect appeared to be consistent across all the public transport properties, with increases between three and seven percentage points, although the effect seemed to be smallest on the buses.



**Figure 1 The Effect of the Incentive in the "One-Pencil" Experiment**

In the "two-pencil" experiment, the effect of the plain pencil was similar to, although somewhat smaller than, the effect in the "one-pencil" experiment, with a three percentage point increase in response rate as shown in Figure 2.



**Figure 2 The Effect of the Incentive in the "Two-Pencil" Experiment**

Interestingly, the "TRC pencil" was not as effective as the plain pencil. Although the TRC pencil gave an overall increase in response, compared to no pencil at all, the increase was not as great as that obtained for the plain pencil. Indeed, for the buses, the TRC pencil gave a decrease in response rate, while the plain pencil effect was again the smallest for the buses.

Three points are worth noting in these results. Firstly, the plain pencils were very effective in increasing response rate with overall increases of between three and five percentage points. While this may not seem very large in absolute terms, it should be remembered that it is working from a base response rate of only about 20%. Therefore, the relative increase is between 15 and 25% of the base response rate. As Dillman (8) notes, in his explanation of the "total design method" wherein attention is paid to the numerous aspects of survey design, each design attribute only accounts for a very small individual effect on response rates. In this context, a 3-5% increase in response rate by giving away a small pencil as an incentive is an impressive result.

Secondly, it is unclear why the TRC pencil is not as successful as the plain pencil. In hindsight, it would have been useful to have done some "cognitive laboratory" follow-up with respondents to better understand their reactions to the pencils. It could have been that respondents saw the plain pencils as just a thoughtful gesture on the part of the surveyors, whereas they saw the TRC pencils as "advertising" which had an ulterior motive. However, such explanations are somewhat speculative, unsupported by in-depth research.

Thirdly, it is unclear why the pencils had the smallest effect on the buses (including a negative effect for the TRC pencils). Buses are different from trains and trams in that they carry far more passengers on concession tickets (school children and older persons). However, it is unclear whether this is the reason for the different reactions to the pencils. Again, "cognitive laboratory" follow-ups would have been most useful in understanding this effect.

## **THE USAGE OF PENCILS IN COMPLETING THE SURVEY**

One of the reasons suggested for distribution of the pencils was to enable respondents to start filling in the form while on board the vehicle, in the hope that this would encourage them to complete the survey at the end of the day after they had finished all trips on the ticket they held when intercepted. Note that surveyors were instructed not to accept surveys back on the vehicles, since we wanted respondents to fill in all the trips they made on that multi-modal ticket across the entire day. Therefore, there was no absolute necessity for respondents to fill out the surveys on board and so, theoretically, there was no absolute need for them to use the pencil provided. The improvements in response rate noted above could have been entirely an "incentive" effect based on the respondents' positive reaction to our give-away.

To test whether the pencils were used to fill in the surveys, data enterers were instructed to record what type of writing implement was used to fill in various parts of the form. There were three parts to the survey. The first two parts about the ticket and the traveller could

easily have been filled out on board. The third part, about all trips made on the ticket, could not be fully completed for those travellers who made more trips on the ticket later in the day.

In fact, it appears that the pencils did have a "utilitarian" effect in helping respondents to fill out the questionnaire surveys, as shown in Table 1. For those respondents who were not given any type of pencil, only 3% used a pencil to fill out any part of the form. On the other hand, those who were handed a plain or TRC pencil were much more likely to use a pencil to fill in the form, with over 50% using a pencil to fill in some or all of the survey form. Most of those who used the pencil used it to fill in all the survey, with only 3-4% using it to fill in only the first parts of the form.

**Table 1 The Usage of the Incentive Pencils in Completing the Surveys**

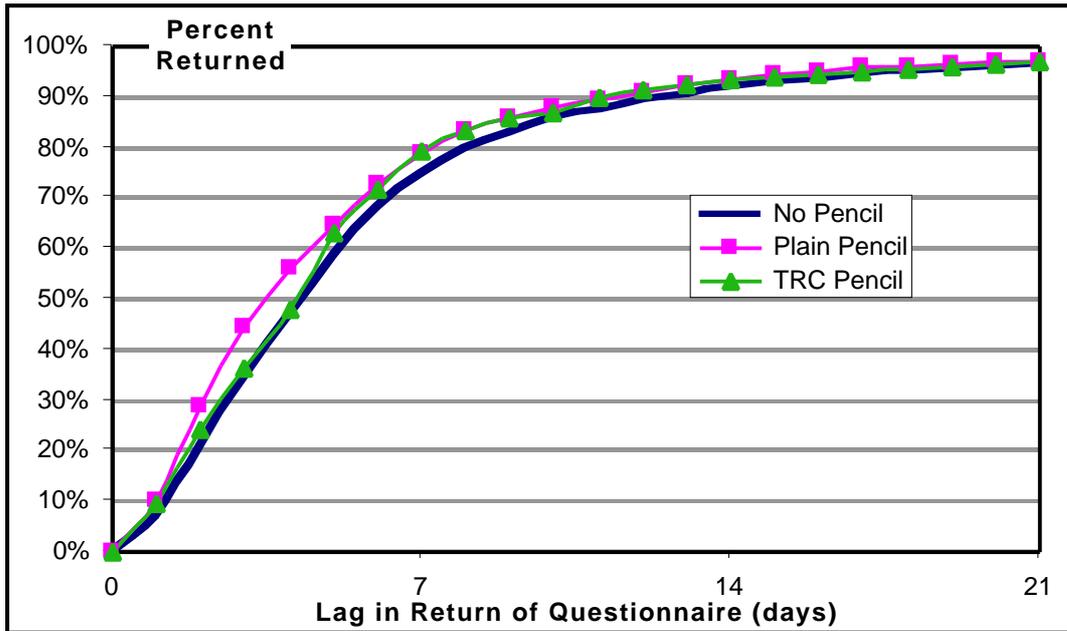
<b>Usage of Pencil</b>	<b>Incentive</b>			<b>TOTAL</b>
	<b>No Pencil</b>	<b>Plain Pencil</b>	<b>TRC Pencil</b>	
Pencil used for allparts	3%	51%	55%	29%
Pencil used for some parts	0%	3%	4%	2%
Pencil not used for any parts	97%	46%	41%	69%
<b>TOTAL</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

While the pencil was not absolutely necessary for respondents to fill in the survey, they did in fact use it more frequently than they used another writing implement. It therefore appears that the "utilitarian" function of the pencil was equally as important as the pure "incentive" function in raising the response rate.

### **THE EFFECT OF PENCILS ON TIME LAGS IN RESPONSE**

Given that the pencils were useful in encouraging the sampled travellers to respond, a related question is whether it also encouraged them to respond more quickly. This was tested by recording the time between distribution of the questionnaire and its return to the survey office in the mail (the "lag" in return). The distribution of the lags for the three incentive groups are shown in Figure 3.

It can be seen that those who received the plain pencil returned their surveys slightly earlier, but there was no major difference between the TRC pencil group and those who received no pencil, especially in the first few days after the survey. Statistically, however, there was no significant difference between any of the three groups.



**Figure 3 Return Lags for the three Incentive Groups**

### DEMOGRAPHIC VARIATIONS IN RESPONSE

One of the perplexing issues with respect to incentives is that while they often increase response rates, there remains the question of whether they increased response only from certain groups, thereby introducing a possible response bias. This question could be addressed in the current study because some information was known about all travellers to whom a questionnaire was given. Therefore these characteristics could be compared for the various groups of respondents and non-respondents.

#### *Gender*

The gender of all sampled passengers was recorded by the field observers on board the vehicle when they selected passengers to receive the questionnaire. Those passengers who completed and returned the questionnaire also recorded their gender on the questionnaire. It was therefore possible to compare the gender distribution of responding passengers with those of all selected passengers, and hence calculate response rates by gender. This was done for passengers who received no pencil incentive, and for those who received the various types of pencil incentive. From these response rates, the "response gain" for each incentive was calculated as the percentage point increase in response rate for those passengers receiving the incentive compared to those who received no incentive. The response gains by gender for each type of incentive are shown in Table 2.

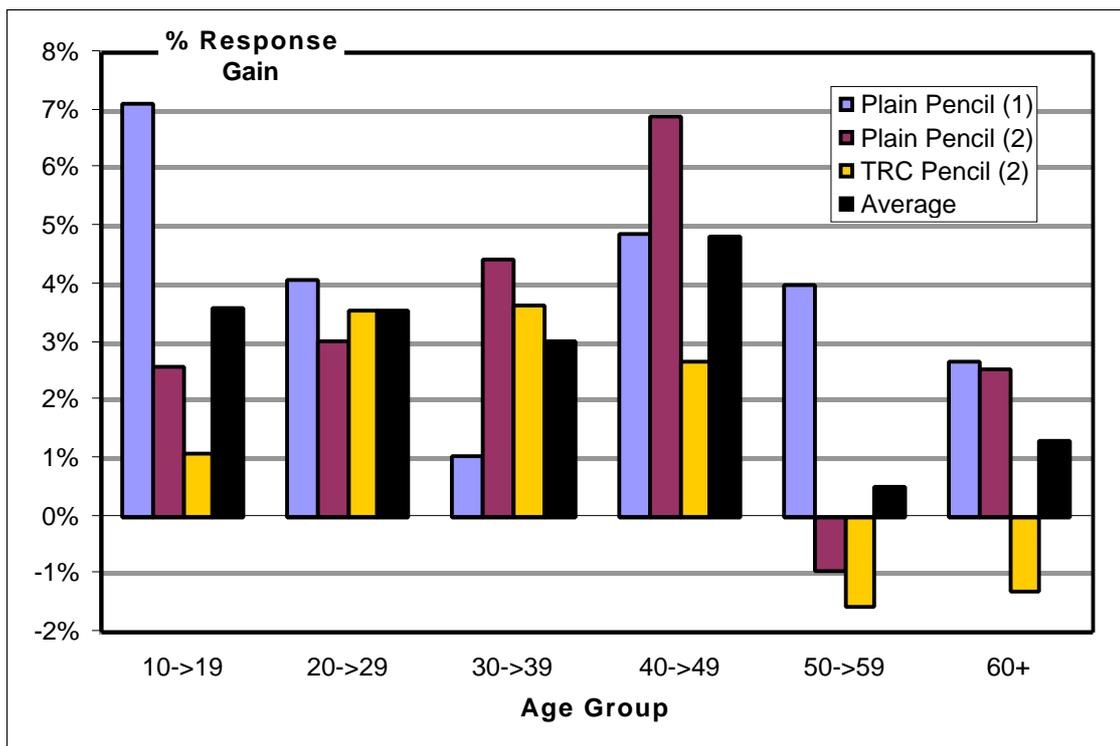
**Table 2 Response Gains by Gender**

Incentive	% Response Gain	
	Male	Female
Plain Pencil (1)	4.8%	3.9%
Plain Pencil (2)	2.4%	4.1%
TRC Pencil (2)	2.3%	1.7%

It can be seen that there is no clear difference between the genders. In the "one-pencil" experiment, the plain pencil produced an increase in response rate of 4.8% for males and 3.9% for females. On the other hand, in the "two-pencil" experiment, the plain pencil produced an increase in response rate of 2.4% for males and 4.1% for females (the opposite trend to that observed in the "one-pencil" experiment). Finally, the TRC pencil also gave a higher response gain for males. These mixed results indicate that there is no clear case for the pencils to be more favourably received by either males or females.

### Age

Because age of the passenger was also recorded in the field and on the questionnaire, a similar analysis could be conducted to detect any differential effect of the incentive by age of the respondent. The results are shown in Figure 4 for each of the incentives, and for an average value across all incentives.

**Figure 4 Response Gains by Age of Respondent**

Across all of the incentives, it can be seen that the effect is reasonably constant for all passengers between the ages of 10 and 50. However, the pencils have much less effect for passengers over 50. This could be seen as introducing a bias into the results by encouraging

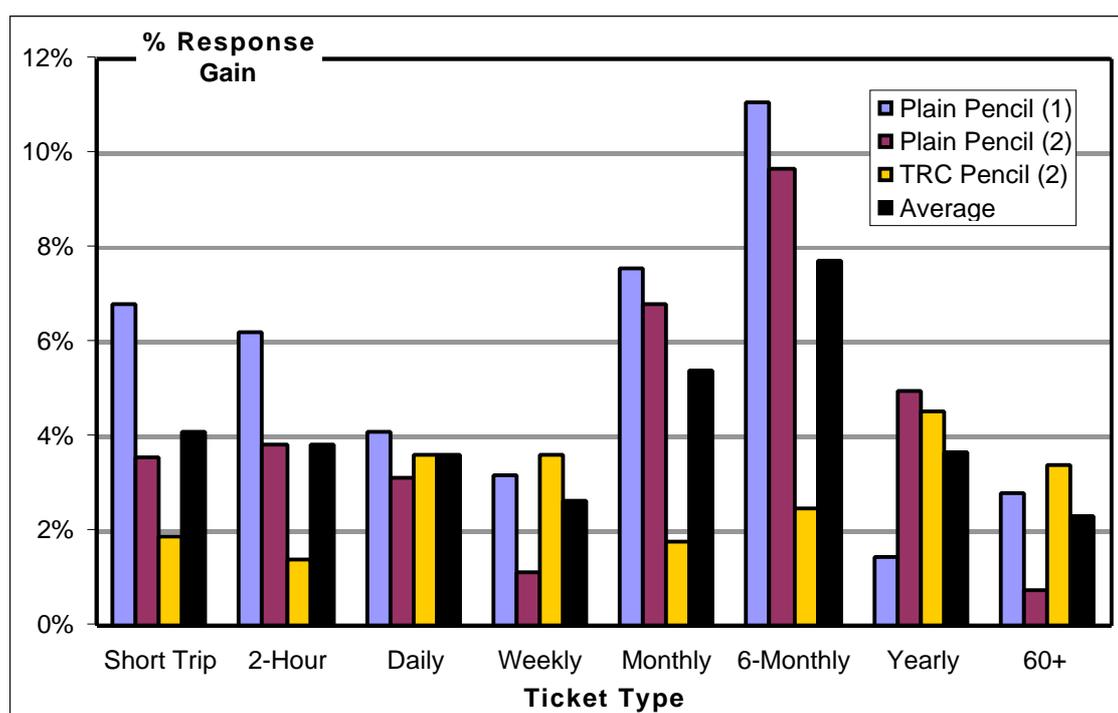
young and middle-age passengers to respond more than older passengers. However, from other analyses, it is known that older passengers are generally more willing to respond, and hence the use of the pencil incentives could actually be seen as a way of correcting for an existing response bias.

### TICKET TYPE VARIATIONS IN RESPONSE

In addition to recording age and gender of potential respondents, the field observers also recorded the type of ticket held by passengers selected for the survey. This same information was also recorded on the questionnaire, and hence similar analyses as described above could be conducted for ticket type and ticket zone.

#### *Ticket Type*

The response gains for different types of ticket are shown in Figure 5. Overall, it can be seen that the response gain for most ticket types is about 4%, with two notable exceptions. The response gain for 6-monthly tickets is significantly higher at 7.7% while the response gain for 60+ tickets is significantly lower at 2.3%.

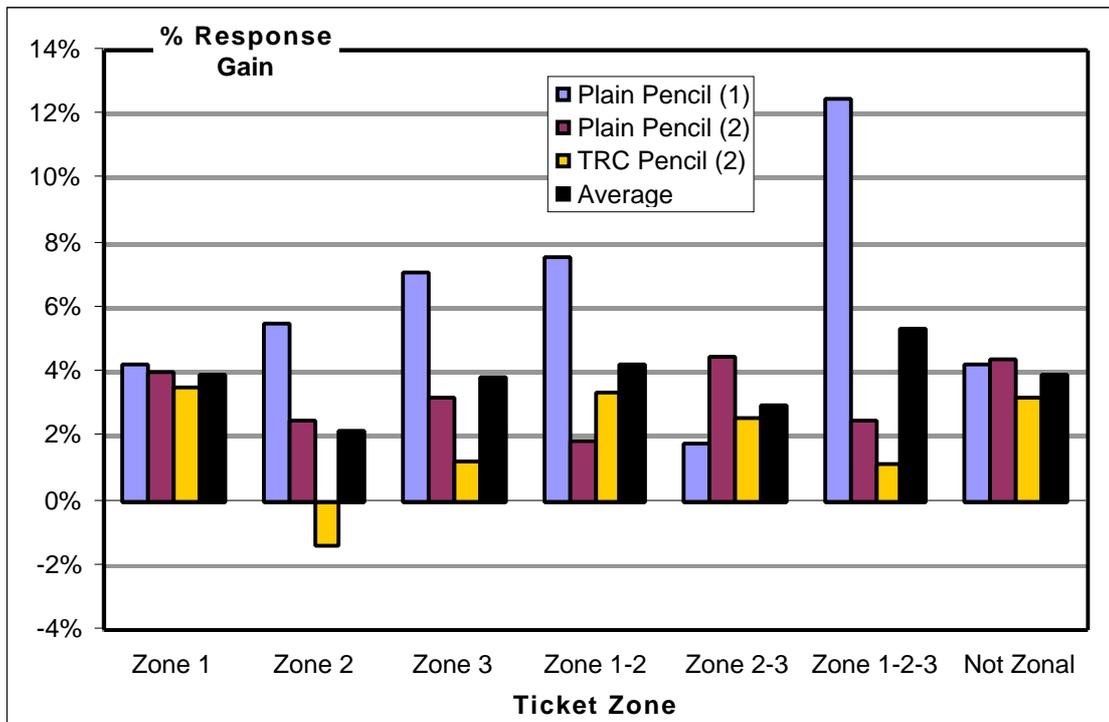


**Figure 5** Response Gains by Type of Ticket

These findings are consistent with previous results which showed that older people (the users of 60+ tickets) are less affected by the pencil incentives. On the other hand, the 6-monthly tickets are exclusively for the use of school children and it appears that this group is very favourably disposed to the pencil incentives.

### *Ticket Zone*

Melbourne's public transport ticket system is based on travel within and between three concentric zones (Zone 1 being the Inner Zone and Zone 3 being the Outer Zone). The response gains for different ticket zones are shown in Figure 6. Overall, it can be seen that the response gain for most ticket zones is about 4%, with no major exceptions. It therefore appears that the response gain is not significantly different for different ticket zones.



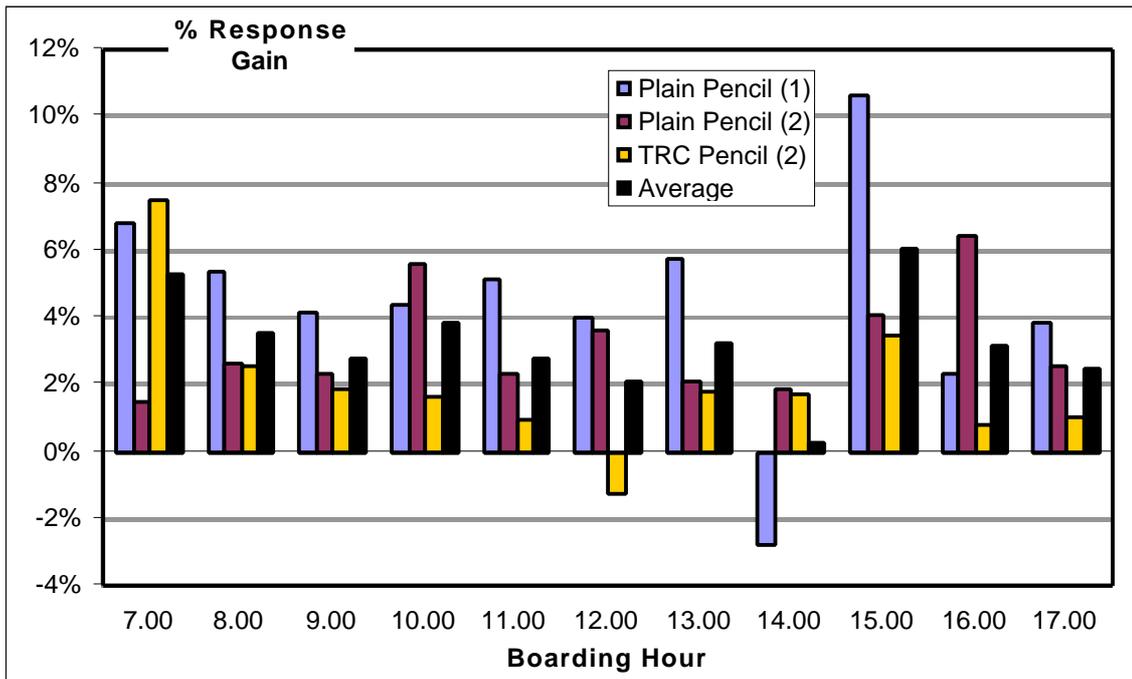
**Figure 6 Response Gains by Ticket Zone**

### **TRIP-MAKING VARIATIONS IN RESPONSE**

This section examines the response gain as a function of trip characteristics and examines whether the use of the incentives results in the reporting of more trips on tickets.

#### *Time of Making Trip*

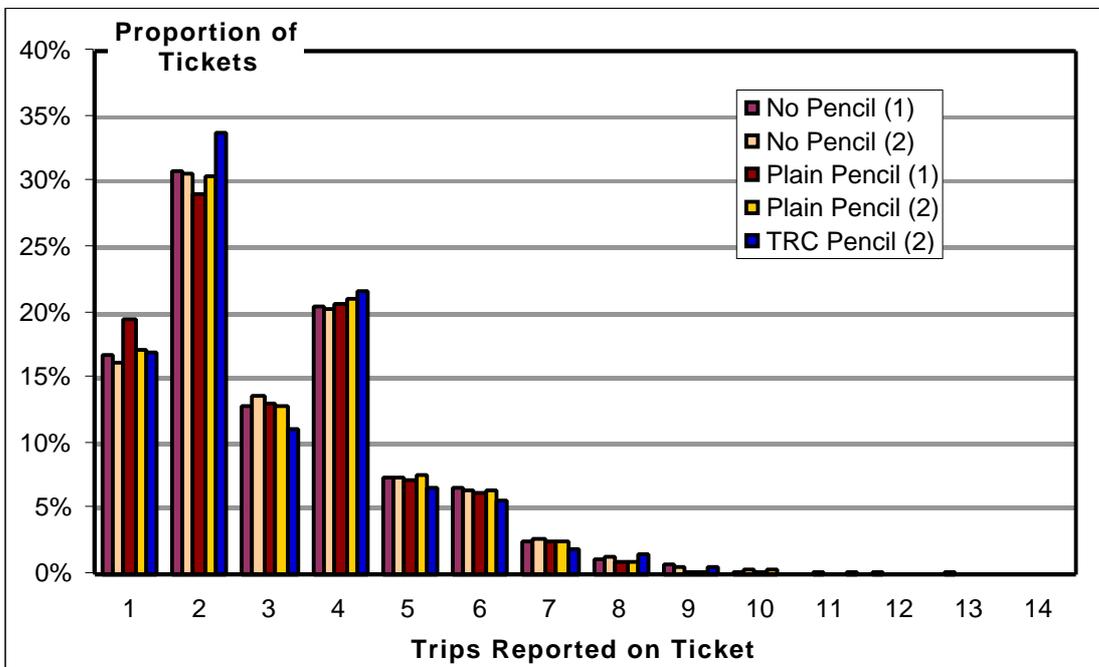
The response gain by different time of boarding the vehicle is shown in Figure 7. It can be seen that during the off-peak hours during the day (when older people are more likely to use public transport), the response gain is around 3%. However, during the morning peak and in the mid-afternoon school peak (at 1500 hours), when school children are more likely to be using the services, the response gain is around 5-6%



**Figure 7** Response Gains by Time of Boarding the Vehicle

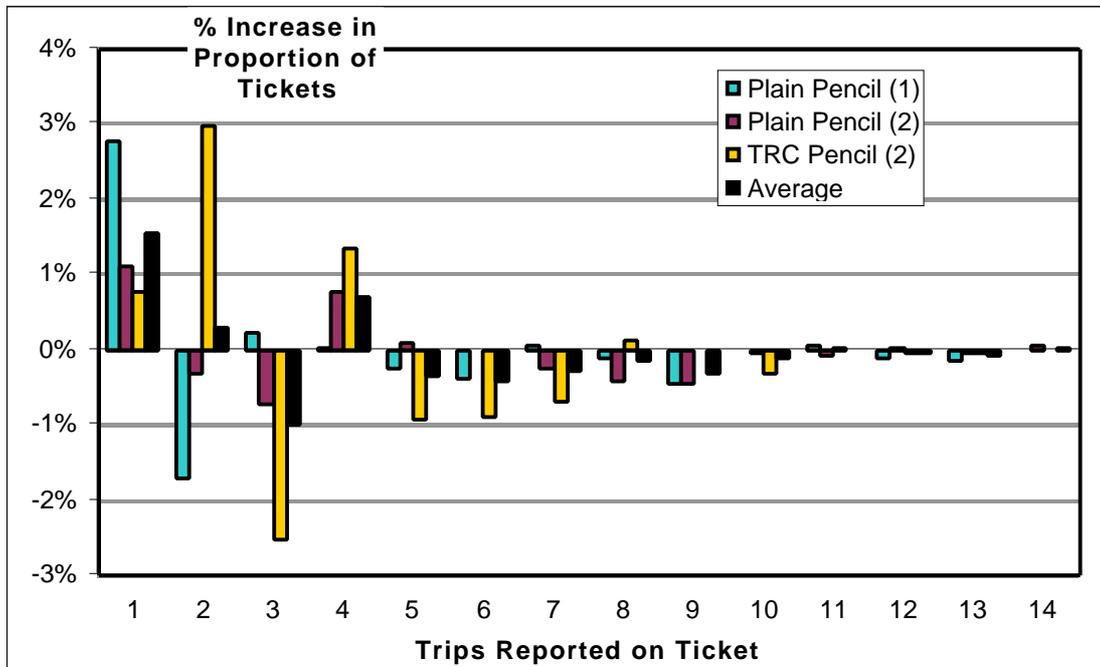
***Number of Trips Reported***

The number of trips reported as being made on each ticket, under a range of incentive and non-incentive conditions, is shown in Figure 8. It can be seen that the most likely number of trips per ticket is two, followed by four (because of the propensity of public transport users to make return trips on a single ticket).



**Figure 8** Trips Reported on Tickets under Various Incentive Conditions

From Figure 8, it appears that the trip rate distributions are similar for all incentive and non-incentive conditions. However, if the difference in proportions is graphed for the three incentive conditions, a somewhat different picture emerges, as shown in Figure 9. Here it can be seen that each of the three incentives is more likely to result in only one trip being reported, compared to the corresponding no-incentive condition. Conversely, the three incentives produce less cases of more than four trips being reported.



**Figure 9 Response Gains by Time of Boarding the Vehicle**

The overall result of the effects shown in Figure 9 is that the average trip rate on tickets surveyed under an incentive scheme is slightly lower than those surveyed under a non-incentive scheme. The differences, however, are not statistically significant.

### **COST-EFFECTIVENESS OF THE INCENTIVES**

The preceding sections have shown that the use of the pencil incentives has been successful in increasing response rates. At the same time, no major biases have been introduced which cannot be corrected by normal expansion weighting processes. However, since the pencils cost extra money, the question remains as to whether the use of the pencil incentives are economically justified.

A full analysis of the cost of the survey showed that the marginal cost of increasing response rates by 1% (i.e. one percentage point) by means of increasing the number of passengers surveyed was approximately \$13,200 (Australian dollars). Since the plain pencils increased the response rate by an average of 3.8% (across the one-pencil and two-pencil experiments), this means that the use of the plain pencils would have effectively saved about \$50,000.

On the other hand, the cost of the plain pencils was approximately 10¢ each. If one had been given to all passengers selected for the survey, a total of 46,000 pencils would have been required, at a total cost of \$4,600. Dividing the cost savings from use of the pencils by the cost of buying the pencils, one obtains a cost-benefit ratio for the plain pencils of over ten to one.

Although the TRC pencils were not as successful in increasing response rate (a response gain of only 2%) and they were more expensive (15¢ each), the TRC pencils still gave a benefit-cost ratio of nearly four to one.

## CONCLUSION

This paper has examined a relatively unexplored (or at least unreported) topic in on-board travel survey design - whether to give respondents a pencil to complete the survey. By means of two controlled experiments within the survey, it has been shown that the use of the pencils as incentives has been highly successful. Response rates have been increased by between 2% and 4%, depending on the type of pencil used. While the use of the pencil incentives has made some minor differences to the nature of the responses, these differences can be allowed for in normal expansion weighting processes.

In an era of declining response rates in all types of surveys, being able to increase the response rate by 4% in a traditionally difficult survey environment (i.e. on-board travel surveys) is not to be ignored, especially when the use of such incentives has a benefit-cost ratio of over ten to one.

Giving pencils to respondents may seem like a very minor issue in survey design. However, as Dillman (8) says, in his explanation of the "total design method", each design attribute only ever accounts for a very small individual effect on response rates. In this context, a 4% increase in response rate by giving away a small pencil as an incentive is an impressive result

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