

# Australasian Journal of Market & Social Research

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# AUSTRALASIAN JOURNAL OF MARKET & SOCIAL RESEARCH

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AMSRS recognises the contribution of Professor Lester Johnson and the Melbourne Business School and would like to thank him for all his years of service as Editor of the Journal.

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## AJMSR – Editorial

This current issue (volume 17, number 2) marks the last issue I will be editing. After 17 years it is time for me to step down and hand over the responsibility for editing the Society's journal to someone else. It has been an honour and a privilege to be able to serve the Society in this way over so many years. Thank you all for your support over the years.

I am very pleased to announce that Associate Professor David Bednall of Deakin University, and also an AMSRS Fellow, has agreed to edit AJMSR from 2010. Please support David in this endeavour by submitting papers to him at [dbednall@deakin.edu.au](mailto:dbednall@deakin.edu.au).

The current issue contains four papers, all of which have something to do with collection of survey data. Vicente and Reis examine telephone surveys using mobile phones, and compare this with using fixed lines. This issue will become more important in the future since we are seeing a switch to households that only have mobile phones and no fixed lines.

Both Glover et al and Brennan examine the impact of colour on response rates. In the Glover et al paper, they examine Maori and Pacific Islander response to colour versus black and white questionnaires. Brennan focuses on the general public and examines the impact of five different colours on survey response rates.

Finally, Healey, Gendall and Haslett examine the vexing issue of postal noncontact, and find that such noncontact is a nontrivial contributor to postal survey nonresponse. They provide a method for estimating the total noncontact rate to assist in understanding the various components of postal survey nonresponse.

Lester W Johnson

Editor and AMSRS Fellow

*Australasian Journal of Market and Social Research*

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# The Effect of Questionnaire Colour on Mail Survey Response Rates: New Data

**Mike Brennan**  
**Massey University**

## **ABSTRACT**

This study compared the response rates associated with five different coloured questionnaires (red, blue, green, purple and white), in a mail survey of the general public. Overall, none of the colours produced a significantly different response rate in any of the three mail-outs (initial plus two follow-ups), or cumulatively, with one exception; red did produce a significantly higher affect response rate to a reminder letter sent without a replacement questionnaire. However, this result may well be due to random error, given conflicting results for these colours in a previous study. Colour did not significantly affect response rates for males, but for females both white and purple produced higher response rates than red. The differences in response rates were not statistically significant for any of five age-groups, and colour did not affect respondents' willingness to be re-interviewed, or the composition of respondent groups. Overall, these results suggest that there is no significant advantage in using coloured questionnaires over white. However, there would also appear to be no compelling reason not to do so, at least in surveys where there is unlikely to be an association between colour and survey topic.

## **INTRODUCTION**

A major challenge facing any survey researcher is to generate satisfactory response rates, given the general trend of falling response rates in survey research (de Leeuw & de Heer 2002; CMOR 2003; Bednall & Shaw 2003) and the need to minimise non-response bias. Whilst numerous procedures have been employed in an attempt to lift response rates in mail surveys (see Kanuk & Berenson 1975; Linsky 1975; Dillman 1978, 2000; Heberlein & Baumgartner 1978; Yu & Cooper 1983; Harvey 1987; Fox, Crask & Kim 1988; Brennan 1992; Edwards et al. 2002) it has been clearly established that the most effective procedure is to send follow-up mail-outs (Dillman 2000). What is less clear is whether it sufficient to simply send a reminder letter or postcard, thereby reducing costs, or whether it is better to send a replacement questionnaire.

The reasoning behind sending a replacement questionnaire is that the longer a respondent delays in responding, the more likely it is that they will mislay or throw out the questionnaire, and so will

be unable to respond, even if sent a reminder letter. Thus it would seem sensible to make the questionnaire as conspicuous as possible, so it can be easily recognised and retrieved by a respondent who has put it aside (Pressley & Tullar 1977; Fullerton & Dodge 1988; Greer & Lohtia 1994; Hartley 2000). A simple and cost-effective way of making a questionnaire more conspicuous would be to print the questionnaire on coloured paper. The question is, does questionnaire colour improve response rates?

Of the 17 published studies that have compared white with coloured questionnaires, only two report a statistically significant difference: Matteson (1974) found a significantly higher response from pink than white for one of two conditions (form letter but not semi-personal letter), and Blythe and Essex (1981) reportedly found yellow to be more effective in one of two conditions, but they did not report response rates (see Etter, Cucherat & Perneger 2002 p.192). In meta-analyses of the available data at the time, Buttle and Thomas (1997), Etter et al. (2002),

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and Hartley and Rutherford (2003), each concluded that there was no statistically significant effect for pooled colours versus white, while for the individual colours examined (green, blue, yellow and pink), only pink showed a significant effect. Note, however, that most of the studies in these meta-analyses were common to all three analyses (see Appendix A for a bibliography).

Since the most recent of these reviews, three further studies have been published. The most notable results are those of Brennan and Charbonneau (2005), who obtained significantly different response rates for four colours (red, blue, green and purple), with purple being the most effective. Unfortunately, they did not include a white questionnaire for comparison, so they could not say whether any of these colours is superior to white. In a subsequent study, Brennan and Xu (2009) found no statistically significant difference in response rate between purple and white questionnaires, but since this study employed only two mail-outs and had a very low response rate, the results need to be treated with caution.

In the third study, de Rada (2005) reported a significantly higher response from white than green questionnaires, but a non-significant difference in response for green or white follow-up postcards. Finally, two studies not included in previous meta-analyses also failed to find a difference between coloured and white questionnaires (Crittenden, Crittenden & Hawes 1985; Newby, Watson & Woodcliff, 2003).

While it would appear that the colour of a questionnaire generally has little if any effect on mail survey response rates, relatively little research has examined this issue, and most that was conducted more than 10 years ago, so might not be relevant today. Furthermore, only three studies have examined questionnaire colour in a survey of the general public

(Brennan & Charbonneau 2005; de Rada 2005; Brennan & Xu 2009), and each of these studies has limitations; one of the studies did not use white as a control (Brennan & Charbonneau 2005), one study was limited in scope (Brennan & Xu 2009), and the third was conducted in Spain where mail surveys are uncommon (de Rada 2005). In this context, Brennan & Charbonneau's (2005) finding of significant differences between colours, and strong colour effects across gender and age groups, suggest that these colours should be investigated further. Thus the purpose of the present study is to compare the effect on survey response rates of using white versus coloured questionnaires, employing the same colours (purple, blue, red and green) as Brennan and Charbonneau (2005).

## **METHOD**

A mail survey of 1800 members of the general public was conducted between June 25 and August 31, 2007. The sample was randomly selected from the 2006 Electoral Roll of a major South Island city in New Zealand, with equal numbers and males and females in each of five age categories. Two reminder mail-outs were sent: the first, 10 days after the initial mail-out, and the second, 14 days after the first reminder. Responses to the first, second and third mail-out are subsequently referred to as "wave 1", "wave 2" and "wave 3" respectively. The final sample size after removing undeliverable mail and ineligible participants (e.g. deceased) was 1646.

Respondents were randomly allocated to the mail survey treatments (5 colours of questionnaire balanced across 6 incentive conditions), with the treatments balanced across gender, age groups and questionnaire version. The incentive was a chocolate sent with either the first or second mail-out. Post-tests determined that there was no interaction between colour and incentive or questionnaire version, and so the effects of the incentive and questionnaire version are not



examined further here. The paper used for the questionnaires was Popset, and the colours were Poppy (red), Pistachio (green), Maritime blue (blue), Purple (purple), and White.

The topic of the survey was “New Zealanders attitudes towards new products”, and required respondents to complete 50 questions, including two choice tasks and 11 rating tasks with respect to five new or innovative products. The questionnaire was 12 A4 pages long. While this questionnaire is quite long and somewhat tedious, a review of mail survey methods in New Zealand suggests that a respectable response rate should still be possible (Brennan 1992). This questionnaire should also provide a good test of the effectiveness of survey procedures designed to improve response rates when used with surveys that are more demanding and for which non-response is therefore likely to be higher and non-response bias of more concern.

## RESULTS

Table 1 reports the response rates for each colour, broken down by wave. Overall, there are no significant differences between the five colours for wave 1, wave 2, wave 1+2, wave 3 or overall (wave 1+2+3). Pairwise comparisons of white with the lowest and highest performing colours in each wave revealed no significant differences at the .05 level. Furthermore, pairwise comparisons of purple with the other colours revealed no significant differences at the .05 level for waves 1, 2, 3 or overall, with one exception: purple was associated with a significantly higher response than red in wave 3 (13.0% c.f. 6.0%;  $z = 2.294$   $p = .022$ ). However, given the absence of any other statistically significant differences between colours, and the balanced design, it is likely this difference between red and purple in wave 3 is due to random error.

**Table 1 : Response rates by wave for each colour**

	Wave 1		Wave 2		Wave 1+2		Wave 3		Wave 1+2+3	
	N	%	N	%	N	%	N	%	N	%
<b>White</b>	329	27.4	239	11.3	329	35.6	212	11.3	329	42.9
<b>Purple</b>	325	27.4	236	11.9	325	36.0	208	13.0	325	44.3
<b>Green</b>	340	26.8	249	14.1	340	37.1	214	9.8	340	43.2
<b>Red</b>	321	23.7	245	15.9	321	35.8	206	6.3	321	39.9
<b>Blue</b>	331	26.0	245	11.8	331	34.7	216	7.4	331	39.6
<b>Overall</b>	1646	26.2	1214	13.0	1646	35.5	1056	9.6	1646	42.0

Note. W1  $\chi^2 = 1.581$ , d.f. = 4,  $p = .812$       W2  $\chi^2 = 3.262$ , d.f. = 4,  $p = .515$   
W1+W2  $\chi^2 = 0.407$ , d.f. = 4,  $p = .982$       W3  $\chi^2 = 7.261$ , d.f. = 4,  $p = .123$   
W1+2+3  $\chi^2 = 2.415$ , d.f. = 4,  $p = .660$

**Table 2 : Response rates by wave and colour for "letter only" treatment in wave 2**

	Wave 1		Wave 2		Wave 2: colour vs. white
	N	%	N	%	
<b>White</b>	166	25.3	124	8.1	
<b>Purple</b>	160	27.5	116	10.3	z = 0.611, p = .542
<b>Green</b>	171	26.3	126	11.9	z = 1.010, p = .313
<b>Red</b>	160	26.9	117	16.2	z = 1.945, p = .051
<b>Blue</b>	167	24.6	126	11.1	z = 0.816, p = .415
<b>Overall</b>	824	26.1	609	11.5	

Note. Each colour group received a reminder letter only as the first reminder, and a replacement questionnaire with the second. The colour treatments are balanced with respect to mail treatments received in each mail-out.  
 Wave 1:  $\chi^2 = 0.479$ , d.f. = 4, p = .975    Wave 2:  $\chi^2 = 4.213$ , d.f. = 4, p = .378

**Table 3 : Response rates by gender and colour**

	Male		Female	
	N	%	N	%
<b>White</b>	158	33.5	171	<b>51.5</b>
<b>Purple</b>	159	37.7	166	50.6
<b>Green</b>	167	<b>43.1</b>	173	43.4
<b>Red</b>	157	40.1	164	39.6
<b>Blue</b>	167	37.7	164	41.5
<b>Overall</b>	808	38.5	838	45.3

Note. Male:  $\chi^2 = 3.398$ , d.f. = 4, p = .494  
 Female:  $\chi^2 = 7.865$ , d.f. = 4, p = .097  
 The highest response rate for each gender is in bold

**Effect of colour on response to first reminder**

Of particular interest is whether or not using a coloured questionnaire improves response rates to a reminder when only a letter is sent, given the supposition that a coloured questionnaire will be easier to find than a white one because it will stand out more. The results for treatments that received a letter but not a replacement questionnaire with the first reminder, are reported in Table 2.

All colours achieved similar response rates in wave 1 so, given that each colour

sample was initially balanced with respect to respondent age and gender, and with respect to mail treatments in waves 1 and 2, any effect in wave 2 can be attributed to either colour or random error. Although all four colours did achieve a higher response rate than white in Wave 2, only the result for red was statistically significant. Thus the results, for purple, green and blue, at least, are likely due to random error.

Curiously, the finding that red produced the best response rate in wave 2 while purple performed no better than the other

colours are quite different to those reported by Brennan and Charbonneau (2005). Together, these findings support a conclusion that the effects of colour are most likely due to random error rather than a respondent's behavioural response to the colour itself. That said, none of the colours performed worse than white, so there seems to be no reason not to use coloured paper for questionnaires.

### Colour and gender

Previous research suggests that male and female respondents may respond differently to different colours (Brennan and Charbonneau, 2005), the implication being that researchers should use different colours for male and female respondents.

While an analysis revealed that, for males, all colours generated higher responses than white, we cannot discount the possibility that this was a random outcome since the differences across colours were non-significant at the .05 level ( $\chi^2 = 3.398$ , d.f. = 4,  $p = .494$ ), as were those between white and the individual colours. Notably, purple did not perform better than the other colours (red, green and blue) for the males. This is in contrast to the findings of Brennan and Charbonneau (2005), who report that purple generated significantly higher responses than red, green and blue for males.

For the females, none of the colours performed as well as white, with both white and purple generating higher response rates than the other colours, although the differences across the five colours are not statistically significant ( $\chi^2 = 7.865$ , d.f. = 4,  $p = .097$ ). However, the difference between white and red is statistically significant at the .05 level (white > red:  $z = 2.169$ ,  $p = .030$ ), as is the difference between purple and red (purple > red:  $z = 1.999$ ,  $p = .045$ ). These results are somewhat consistent with those of Brennan and Charbonneau (2005), who found that with females, purple performed better than the other colours.

### Colour and age

There were no significant differences in mean age of respondents responding to the different colours for either males ( $F = 1.333$ , d.f. = 4, 296,  $p = .258$ ) or females ( $F = .398$ , d.f. = 4, 360,  $p = .810$ ), or across the total sample ( $F = .667$ , d.f. = 4, 661  $p = .608$ ).

While at least one colour performed better than white for each age group except in the 56-65 group, the best performing colour varies across age groups and none of the differences between the best colour and white are statistically significant. One must therefore conclude that in general, no particular colour produces a higher response rate for any particular age group.

**Table 4 : Response rates by age group and colour**

Age	16-25		26-35		36-45		46-55		56-65	
	N	%	N	%	N	%	N	%	N	%
<b>White</b>	64	20.3	64	32.8	65	44.6	68	50.0	68	<b>64.7</b>
<b>Purple</b>	60	21.7	61	<b>45.9</b>	68	39.7	69	<b>53.6</b>	67	58.2
<b>Green</b>	67	26.9	64	34.4	70	<b>55.7</b>	68	38.2	71	59.2
<b>Red</b>	57	<b>31.6</b>	59	37.3	65	32.3	69	49.3	71	46.5
<b>Blue</b>	62	22.6	67	32.8	64	37.5	69	50.7	69	52.2
<b>Overall</b>	310	24.5	315	36.5	332	42.2	343	48.4	346	64.7

Note. 16-25  $\chi^2 = 2.736$ , d.f. = 4,  $p = .603$     46-55  $\chi^2 = 3.807$ , d.f. = 4,  $p = .433$   
 26-35  $\chi^2 = 3.230$ , d.f. = 4,  $p = .520$     56-65  $\chi^2 = 5.534$ , d.f. = 4,  $p = .237$   
 36-45  $\chi^2 = 8.759$ , d.f. = 4,  $p = .067$   
 The highest response rate for each age group is in bold

**Effect of colour on sample composition**

While it is important to obtain respectable response rates, it is also important to ensure that procedures used to achieve these do not bias the sample. The characteristics of the subsamples of respondents to each colour are dis-

played in Table 5. It is clear that the respondent colour groups are biased with respect to the characteristics of the original sample, at least in terms of age (originally 20% in each category), and to a lesser extent for most colours, of gender (originally 50%:50%). While the proportion of male respondents is noticeably smaller

**Table 5 : Effect of colour on respondent characteristics: demographic variables**

	Red %	Green %	Blue %	Purple %	White %	X <sup>2</sup>	d.f.	p
<b>Gender:</b>								
Male	49.2	47.9	44.2	42.9	36.0	5.837	4	.212
Female	50.8	52.1	55.8	57.1	64.0			
<b>Age:</b>						11.816	16	.757
16-25	14.1	12.2	10.7	9.0	9.2			
26-35	17.2	15.0	16.8	19.4	14.9			
36-45	16.4	26.5	18.3	18.8	20.6			
46-55	26.2	17.7	26.7	25.7	24.1			
56+	25.8	28.6	27.5	27.1	31.2			
<b>Ethnicity:</b>						5.7	8	.681
European	85.9	80.3	82.4	79.2	76.6			
Maori	3.9	6.8	6.9	5.6	6.4			
Other	10.2	12.9	10.7	15.3	17.0			
<b>Employment:</b>						13.833	12	.312
Fulltime	60.2	61.2	58.8	68.8	55.3			
Part-time	23.4	19.7	27.5	13.2	27.0			
Homemaker	5.5	8.	5.3	6.2	6.4			
Other*	10.9	10.2	8.4	11.8	11.3			
<b>Formal Education:</b>						6.785	12	.872
<4yr 2 <sup>o</sup> school	26.0	30.1	26.6	23.0	27.6			
>3yr 2 <sup>o</sup> school	35.0	26.6	29.7	30.9	26.1			
<4yr tertiary	18.7	18.9	18.8	23.7	24.6			
>3 yr tertiary	20.3	24.5	25.0	22.3	21.6			
<b>Formal qualification:</b>						8.324	20	.989
None	14.6	17.6	14.0	13.2	15.6			
School only	26.0	23.2	27.9	23.5	27.4			
Trade/Professional	26.0	24.6	23.3	26.5	24.4			
Diploma	8.9	13.4	10.1	14.7	7.4			
Bachelor's Degree	13.8	12.0	14.7	11.0	14.1			
Postgraduate	10.6	9.2	10.1	11.0	11.1			
<b>Personal Income:</b>						23.195	24	.508
\$15,000 or less	17.2	19.9	14.6	11.1	16.2			
\$15,001-\$30,000	23.8	16.9	17.9	18.5	26.2			
\$30,001-\$45,000	22.1	26.5	22.8	20.7	27.7			
\$45,001-\$60,000	17.2	20.6	17.1	22.2	11.5			
\$60,001-\$75,000	9.8	7.4	9.8	11.1	7.7			
\$75,001-\$90,000	4.1	4.4	8.1	8.1	5.4			
\$90,001+	5.4	4.4	9.8	8.1	5.4			
<b>Household Income:</b>						24.267	28	.667
\$15,000 or less	4.9	3.8	3.3	5.9	6.1			
\$15,001-\$30,000	8.2	13.6	10.6	6.7	9.9			
\$30,001-\$45,000	13.9	14.4	10.6	10.4	13.7			
\$45,001-\$60,000	18.0	12.1	14.6	15.6	11.5			
\$60,001-\$75,000	16.4	12.9	17.1	11.9	15.3			
\$75,001-\$90,000	11.5	11.4	16.3	8.9	12.2			
\$90,001-\$105,000	9.8	15.2	6.5	14.8	13.7			
\$105,001+	17.2	16.7	21.1	25.9	17.6			

\* Unemployed/beneficiary/ student

for groups who received a white questionnaire than the groups who received other colours, this is likely a random effect as the differences in response rate across colours was not statistically significant for either males or females (see Table 3); it could be due to chance that white produced the lowest response rate for males and the highest response rate for females. The absence of any statistically significant differences across colour groups for any of the demographic variables, including gender, indicates that the sample bias present should not be attributed to the colour of the questionnaire.

#### Effect of colour on respondent willingness to be re-surveyed

It is also important to ensure that procedures used to minimise nonresponse do not bias responses. In this survey, respondents were asked at the end of the questionnaire for permission to re-contact them in the future, and to provide a first name and telephone number if they agreed. Given the demanding nature of the survey, one would expect this question to be particularly susceptible to any effects on respondent cooperation, if present. The results shown in Table 6 indicate that the colour of the questionnaire had no significant effect on respondents' willingness to be re-contacted.

## DISCUSSION

The present study found no significant differences between the overall response rates generated by white and the other four colours (purple, red, blue and green), and failed to replicate the finding of Brennan and Charbonneau (2005) that purple produced a significantly higher response than red, green and red. While purple performed better than red for females, the results generally fail to support the suggestion that males and females, and respondents in different age groups, respond differently to different colours, and respond better to purple than the other three colours (blue, red and green). The main finding was the white generally performs as well as, if not better, than the other colours, and that the differences between colours are likely due to chance. There was also no evidence that any of the colours significantly affected sample composition or respondents' willingness to participate in a follow-up survey. This finding is consistent with the conclusion of Fullerton and Dodge (1988).

An important question is why the present results differ from those of Brennan and Charbonneau (2005). The disparity is unlikely to be due to differences in the two samples, as these were drawn from the same database (New Zealand Electoral

**Table 6 : Willingness to be re-interviewed**

	Ok to Re-interview		Colour vs. white
	N	%	
<b>White</b>	134	52.2	
<b>Purple</b>	137	58.4	$z = 1.017, p = .309$
<b>Green</b>	142	57.7	$z = 0.981, p = .359$
<b>Red</b>	122	56.6	$z = 0.691, p = .489$
<b>Blue</b>	130	50.0	$z = 0.363, p = .717$
<b>Overall</b>	665	55.0	$\chi^2 = 2.916, d.f. = 4, p = .572$

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Roll). However, there are two major differences between the studies: the topic, and the nature of the questions that are likely to have had an influence on response rates.

The topic in the Brennan and Charbonneau (2005) study was reality TV, and the questionnaire was short (8 pages), with questions and scales that were relatively easy to understand and answer. In contrast, the topic of the present study was new technology products, and probably not intrinsically interesting to many respondents. Furthermore, the questionnaire was longer (12 A4 pages), and the tasks quite laborious and repetitive (a point made by a number of respondents).

These conflicting findings suggest that colour may have a positive effect where respondent cooperation is likely to be high anyway, that is, when the topic is interesting and the tasks undemanding (as per Brennan & Charbonneau 2005), but is likely to have little or no effect when respondent cooperation is likely to be low, such as when the topic is of more limited interest to respondents and/or the survey requires respondents to complete onerous tasks (present study). In other words, colour appears to have a weak effect at best.

While using a coloured questionnaire in the first mail-out slightly improved responses to a reminder letter, the differences between the five colours was not statistically significant, and only red generated a significantly higher response than white. Thus it would appear that either a coloured questionnaire is no easier to find than a white one, or the task of locating a questionnaire that has been put aside is not a major contributor to non-response. Overall, questionnaire colour appears to be of little consequence with respect to mail survey response rates, at least with regard to questionnaires printed on monotone coloured paper.

In summary, none of the colours made a statistically significant difference to the overall response rates in the present study for either males or females, different age groups, or in aggregate. In a simple survey with an interesting topic the colour of the questionnaire might help boost response rates, but in a demanding survey colour is unlikely to make any difference. That said, using a coloured questionnaire does not appear to do any harm, and may possibly help a respondent find a questionnaire that has been set aside. Provided that there is no reason to suspect an interaction between questionnaire colour and survey topic, a researcher can feel free to use any of these five colours for their questionnaire.

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# Does Colour Make A Difference? Māori And Pacific Island Parental Response To And Completion Of Colour Vs. Black And White Questionnaires.

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## **SUMMARY**

Low participation rates are a common problem in community intervention studies. Under-representation is particularly likely in minority population groups due to concerns such as time involved in and being a research subject. Those with lower levels of education are more likely to express concerns about their privacy. Low literacy may pose another barrier to participation, especially among immigrant communities.

Creativity and innovation can minimise barriers to participation in postal surveys. People prefer materials that are simple, time-efficient, easy to use, fun, colourful and interactive. Researchers have tried to improve response rates using plain black text questionnaires printed on colour paper, changing questionnaire appearance and varying questionnaire cover design. Other techniques include offering participation incentives.

This study tested if a full colour questionnaire using script font, pictures, symbols and arrows to indicate flow would improve response rates and be easier to complete than a black text on white paper version. The questionnaire was designed for a smoking initiation intervention study aimed at Māori (indigenous New Zealanders) and Pacific Island parents resident in South Auckland. Five hundred (250 of each colour and black on white) questionnaires were sent out to parents of a school in a different area of Auckland with a similar ethnic composition. Sixty one percent of questionnaires were returned. Almost equal numbers of black and white (150) and colour (152) questionnaires were returned, and the proportions were similar for the different ethnic groups. Response to the questionnaire overall varied by ethnicity. There was no difference between the two questionnaire types in the proportion of all errors, although there were between different questions.

Although the statistical analyses failed to provide support for using the more attractive colour questionnaire, other reasons for continuing with this approach may be worth taking into account. These include 'branding' to facilitate participation in follow-up surveys. Also eliciting rapport with the participants through creative techniques should increase the uptake of intervention resources and activities.

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## INTRODUCTION

Low participation rates are a common feature in community intervention studies (Spoth & Redmond 1994) and in postal surveys (Finn, Gendall & Hoek 2004). Under-representation is particularly likely in minority population groups due to concerns such as the amount of time likely to be involved and being a research subject (Spoth & Redmond, 2000). For instance, Spoth et al (1996) found that parents with lower levels of education were more likely to express concerns about their privacy. Low literacy may pose another barrier to participation, especially, but not exclusively among immigrant communities (Coatsworth et al 2006) where lower rates of participation in community intervention studies could also reflect a warranted cultural mistrust of researchers (Coatsworth, Duncan, Pantin & Szapocznik 2006). Despite these challenges to participation, Spoth and colleagues found that research involving family issues and interventions may be viewed more favourably by parents than other types of research (Spoth & Redmond 2000).

We report on an evaluation of a novel approach to gain high completion levels of a survey that is part of a community intervention study, Keeping Kids Smokefree (KKS). This study is a quasi-experimental community trial of smoking initiation prevention among children aged 11-13 years involving a range of strategies, with a particular emphasis on changing the smoking behaviour and attitudes of their parents. The study is set in two suburbs in South Auckland, New Zealand, where large numbers of Māori (indigenous New Zealanders) and Pacific Islands peoples (such as Samoans, Tongans, Niueans and Cook Islanders) reside.

Māori and Pacific peoples are over-represented among lower socioeconomic groups in New Zealand (Ministry of Health 2006). More than two-thirds of Māori (71%) and three-quarters of Pacific peoples (76%) have a literacy level of 1

or 2 on the International Adult Literacy Survey (Culligan, Arnold, Sligo & Noble 2005). People with literacy level 1 would have difficulty determining the correct amount of medicine to take from information printed on a package. People assessed at level 2 would be able to deal only with material that is simple, clearly laid out and in which the tasks involved were not complex. The low level of literacy among Pacific peoples reflects lower proficiency with written English, referred to as language and perceptual proficiency. (Culligan et al, 2005)

Smoking has been estimated to account for up to 10% of the ten year gap in life expectancy between Maori and non-Maori New Zealanders. It is a key target to reduce health inequalities in New Zealand (Blakely et al 2006). Smoking is more prevalent among Māori (42.2%) and Pacific Island people (26.9%) compared to Pākehā (New Zealand Europeans) aged 15 years and over, of whom only 18.6% smoke at least monthly (Ministry of Health, 2008). There are substantial differences by gender and between different Pacific ethnic groups. For example more Maori than Pacific Island women smoke (40.1% vs 34.8%) (Ministry of Health, 2008). In 2006 47% of Cook Islands people aged between 25-29 years smoked, whilst only 37% of Samoans in the same age group smoked (New Zealand Statistics Census 2006).

### Improving Response Rates to Postal Surveys

Creativity and innovation appear to be important to minimise barriers to participation in postal surveys (Spoth & Molgaard 1993). Beatty and Cross (2006) suggest that parents prefer materials that are simple, time-efficient, easy to use, fun, colourful and interactive. Other researchers have tried to improve response rates using plain black text questionnaires printed on colour paper (Phipps, Robertson & Keel 1991; Paynter, 1995), changing questionnaire appearance and varying questionnaire

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cover design (Finn, Gendall & Hoek 2004; Gendall, 2005), but to no avail (LaGarce & Kuhn 1995; Edwards et al, 2002). La Garce and Kuhn did find that postal survey responses improved using a user-friendly format and two-colour printing. They defined user-friendliness as: a non-technical appearance, with no pre-coding, boxes, lines or numbered questions; easy to read, with more white space, larger and bolder fonts; and, pre-testing showing the questionnaire to be visually appealing.

### **Māori and Pacific Response Rates to Postal Surveys**

Māori and Pacific Island peoples were historically oral cultures, with no written language prior to colonisation by Europeans. Both Māori and Pacific Islands' cultures prefer "kanohi ki te kanohi" (face to face) communication processes (Ministry of Health 1996). Administering the questionnaire using face-to-face interviews was infeasible in this study. In the absence of any literature on how to maximise Māori and Pacific Island response rates to postal surveys, we hypothesised that Māori and Pacific parents would be more likely to respond to a colourful questionnaire that used illustrative pictures, based on the common assertion, unsupported by evidence, that Māori and Pacific Island peoples are a sensory visual people (Fleming, 1995; Cormack in Ritchie, 2003; Pacific Health Research Centre, 2003; Ogden, Cooper & Dudley, 2003). We further hypothesised that, given the likely low levels of adult literacy among parents, a questionnaire using script font, pictures, symbols and arrows to indicate flow would be more likely to catch parents' attention, appear easier to complete and assist in compliance with the questionnaire instructions. Finally, we drew on evidence showing that financial incentives improve participation rates (Edwards et al, 2002, Guyll et al, 2003).

Accordingly, we abbreviated the questionnaire to fit on the equivalent of four

A4 size pages, printed on both sides of an A3 sheet and folded in booklet form. We developed the questionnaire with bold colours, script font, and arrows as detailed in Figure 1. We used incentives in the following ways: families, completing questionnaires with a consent form returned to the school study centres, were entered in a draw for one of three prizes. The research and prizes were promoted to students during school assembly. A further set of rewards (a current popular movie on DVD to watch; smokefree pens, lip balm or smokefree visor for students) was offered to the three classes with the fastest and highest response rate.

Spoth and Redmond (1994; 2000) have argued that recruitment and retention strategies should first be tested prior to embarking on the full study, given the crucial role of adequate recruitment and retention to ensure study validity. This applies especially among different populations and in different types of settings. Another reason for testing such forms is that the cost of designing and printing full colour questionnaires is significantly higher (82NZc per colour questionnaire) than the standard format. With these in mind, we undertook a small study with two objectives. The first, to assess parental response rates to two questionnaires: a full colour user-friendly questionnaire that used graphics, and a black text on white paper version; and second, to see if the user-friendly version was easier to complete (and therefore likely to result in less incomplete or missing data).

### **METHOD**

We used qualitative and quantitative methods to assess the effectiveness of the questionnaire. One focus group of 15 (1 Māori and 14 Pacific Island parents and one child who came to translate and write for her Tongan mother) took part. This was facilitated by the Maori (MG, AP) and Pacific Island (SEP) researchers. The colour version of the questionnaire (Figure 1) used bright, highly saturated colours

that stand out on the muted background. Each question is themed and separated, making the format more visually attractive. Basic signs and symbols have been used, as well as simple vector graphics to guide the reader through the questionnaire and act as visual cues. The font used is a script font that associates the questionnaire with fun and makes it seem less formal. The font resembles a child's writing, reinforcing the subject of the questionnaire. The plain black and white version of the KKS parents' questionnaire had identical text, but no added features. The questionnaire asks parents about the smoking behaviour of all people in the household, smoking in the house and car, their own smoking and quitting behaviour, and their attitudes towards children's access to tobacco and uptake of smoking. The respondents selected their ethnic group from a choice of Māori, Pākehā/European, Pacific Island or Other. Where 'Other' was chosen, participants are asked to write their ethnicity. Both versions of the questionnaire ask for contact details.

Participants completed the coloured version followed by the black and white version and then commented on both versions. The discussion was tape recorded and transcribed for thematic analysis, using the general inductive method (Thomas 2006).

We empirically tested potential respondents' ideas about what motivates them to complete the questions, as suggested by Finn, Gendall and Hoek (2004). An Auckland intermediate school with similarly high proportions of Māori (18%) and Pacific Island (39%) (Education Review Office, 2008a) students as those schools in the KKS study (Māori 33% Pacific 39.5% based on latest Education Review Office reports, 2005, 2007, 2008b, 2008c) agreed to take part in this study. The questionnaire developed for KKS was trialled with parents of all the children attending this school. We packed 250 colour and 250 black and white versions of the ques-

tionnaire, together with information sheets and consent forms in unmarked envelopes sorted sequentially. This was known to the researchers, but not to the school. The sample size was estimated based on the assumption that a difference of >13% would be detected with 80% power. The packs were given to the school for distribution to parents via their children, ensuring a blinded process. The information sheet indicated that those completing and returning the questionnaire would be entered in a draw to win a family prize (2 adults and 4 children) for a pass to a local theme park, movie theatre or family restaurant. All returned questionnaires were collated and the relative numbers of the two questionnaires assessed, overall and according to the ethnic group indicated on the completed questionnaire. We then examined the questionnaires for errors of completion and missing responses and made comparisons. We performed chi square tests with a P-value of 5% for assessing statistical significance, using Epi Info (version 6.04c, CDC, Atlanta, 1997). Ethics approval for this study was obtained from the University of Auckland Human Participants Ethics Committee.

## RESULTS

### Focus group

Prior to the focus group participants being shown the plain black text on white questionnaire, they commented favourably on the colour questionnaire saying "it was good" and "easy to fill in." Compared to the black and white version, the colour version was said to be "exciting" and it looked more appealing. One participant said the colour version "looks more fun." The black and white version was seen as being more 'official':

*"I'd sign this because it looks formal – because, you know, it's all black and white."*

Whereas the colour version was "funny" the black and white version was "straight-forward". It had no pictures to distract

the interviewee and therefore the writing stood out. However, others thought the black and white version would get lost in people's homes because "it's paperwork" and it would be easier to throw it away.

In contrast, some felt that the colour version "would stand out," was "eye catching" and would be easier to find if it had been set aside.

Some participants stated that the colour questionnaire could be confused with junk mail, but this would be less likely to occur if the questionnaire was sent home to the parents via the children.

Some, particularly older women, preferred the black and white version, since they perceived it as more appropriate to send to parents, whereas the colour version was appropriate for children. Others argued that the colour version was most appropriate because it would be a "draw card" to the child, would pique their interest, and would make it more likely that they would want to pass it to their parents for completion.

### Response rate

Of 500 (250 each of the colour and black and white) questionnaires provided to the school 498 (the total roll number at the time) were sent home with children. Three

hundred and four were returned over the subsequent 2 weeks, a response rate of 61%. Two colour questionnaires were subsequently excluded as they were completed by teachers. The response to the black and white (150) and colour (152) questionnaires was similar (Chi square .087,  $P=0.77$ ), and the proportions were similar for the different ethnic groups (Table 1). There were no statistically significant differences by ethnicity between the types of questionnaire returned overall (Chi square 6.96,  $P = 0.14$ ) or for the different groups. There were significant differences in response of any questionnaire for the different groups (Chi square (3 df) = 77.91,  $P<0.0001$ ) when response by ethnicity was compared against the proportions of students by ethnicity at the school taken from the 2007 Education Review Office (ERO) Avondale Intermediate School Report. Pacific Island and Asian parents appear to be over-represented among respondents, Maori were slightly under-represented and Pākehā/European and Other parents were under-represented.

There was no difference between the two questionnaire types in the proportion of all errors (62.7% for black and white v. 63.6% for colour,  $p=0.96$ ). There were significant differences in the number of errors for particular questions and the questionnaire format. Question 4 (see Figure 1) was more likely to be missed in the colour version ( $p=0.001$ ).

**Table 1. Number and proportion of questionnaires returned, by ethnic group**

Ethnic group	B and W	Colour	Total	%	ERO*% (School roll=498)
Māori	27	22	49	15.5	18
Pacific Island	67	73	140	46	39
Pākehā/European & Other	14	14	28	9	23
Asian	32	40	72	24	20
Missing	10	3	13	4	
<b>Total</b>	<b>150</b>	<b>152</b>	<b>302</b>	<b>100</b>	<b>100</b>

\* ERO = Education Review Office

## Completeness of questionnaire completion

Table 2 shows the frequency of incorrectly completed or missing responses across selected questions.

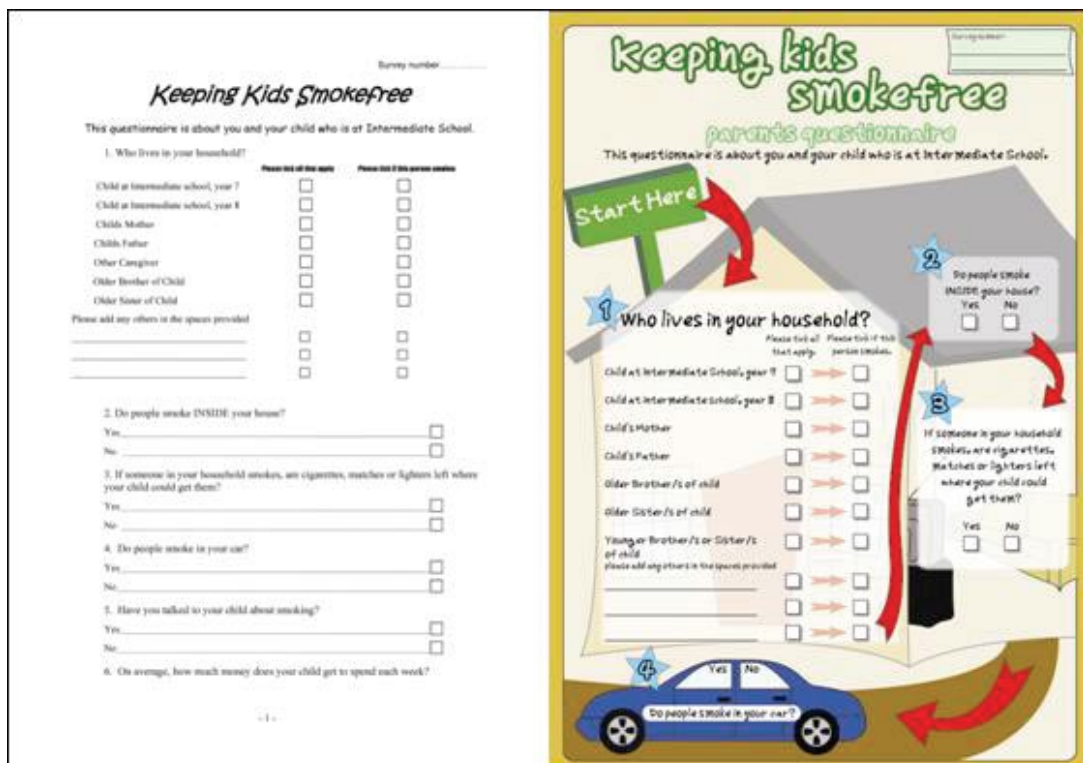
**Table 2. Missing and error rate by questionnaire format**

	Questionnaire type		P-value (from Yates corrected Chi-square value)
	Black and White (N out of 150)	Colour (N out of 154)	
Q2	2	1	0.98
Q4	2	17	0.0011
Q9 incorrect	44	15	<0.0001
Q9 missing	13	16	0.75
Q11-19	33	49	0.072
<b>Total</b>	<b>94</b>	<b>98</b>	<b>0.96</b>

Question 9 in the black and white version (see Figure 2) appears to have been particularly difficult to complete as instructed, compared with the colour version ( $p < 0.0001$ ); although the proportion missing for this question was similar for the two types of questionnaires ( $p = 0.75$ ) Questions 11-19 (see Figure 3) may have been harder to fol-

low in the colour version, although the differences in error between the two types of questionnaires just failed to reach statistical significance ( $p = 0.07$ ). The cognitive processes involved cannot be ascertained without watching the participants complete the forms and having an account of their decision-making processes.

**Figure 1. The colour and black and white questionnaires front page.**





**Figure 2. Question 9 in the colour and black and white questionnaires.**

9. Rank the following problems in order of seriousness with 'A' representing the most serious issue

Bullying/violence.....

Overweight/Obesity .....

Marijuana smoking.....

Cigarette smoking.....

P and other drugs.....

Alcohol drinking.....

Sex .....

**9** Rank the following problems in order of seriousness with "A" representing the most serious issue.

Bullying/Violence

Overweight/Obesity

Marijuana Smoking

Cigarette Smoking

P and other drugs

Alcohol Drinking

Sex

Use each letter once.

A  
B  
C  
D  
E  
F

**Figure 3. Questions 11-19 in the colour and black and white questionnaires.**

11. Have you ever smoked a cigarette?

Yes  No  *Go to Q.19!*

12. Were you smoking 12 months ago?

Yes  No

13. How much do you smoke now?

I don't smoke now.....  *Go to Q.15!*

1-10 cigarettes a day.....

11-20 cigarettes a day.....

More than 20 cigarettes a day.....

14. What brand of cigarettes or tobacco do you smoke most often?

Manufactured cigarettes.....

Loose Tobacco.....

15. During the past year (12 months), have you ever tried to quit smoking cigarettes?

I did not smoke during the past year.....  *Go to Q.19!*

Yes, I have tried to quit smoking.....

No, I have not tried to quit smoking.....

16. Please tick whether you have done any of the following in the past year (12 months)

Called the Quitline 0800 778 778.....

Attended a programme to quit smoking.....

Got help to quit smoking from the doctors.....

Used NRT (nicotine replacement therapy).....

Other.....

17. Please tick one of the following options.

I have already quit.....  *Go to Q.19!*

I plan to quit in the next 30 days.....

I plan to quit in the next 6 months.....

I do not plan to quit in the near future.....

18. Do you think you would be able to quit smoking if you tried to quit?

Yes, I think I would be able to quit smoking.....

No, I don't think I would be able to quit smoking.....

19. What could we do to help protect your children from smoke and taking up smoking?

.....

.....

.....

.....

**11** Have you EVER smoked a cigarette? Yes  No  *If you answered No, go to Q.19!*

**12** Were you smoking 12 months ago? Yes  No

**13** How much do you smoke now? *Go to Q.15!*

I don't smoke now

1-10 cigarettes a day

11-20 cigarettes a day

More than 20 cigarettes a day

**14** What brand of cigarettes do you smoke most often? *(Please write on the packets)*

Manufactured cigarettes

Loose Tobacco

**15** During the past 12 months have you ever tried to quit smoking cigarettes? *Please tick whether you have done any of the following in the past year! (Tick all that apply!)*

I did not smoke during the past year.....  *Go to Q.19!*

Yes, I have tried to quit smoking.....

No, I have not tried to quit smoking.....

**16** Please tick whether you have done any of the following in the past year: (Tick all that apply!)

Called the Quitline 0800 778 778.....

Attended a programme to quit smoking.....

Got help to quit smoking from the doctors.....

Used NRT (Nicotine Replacement Therapy).....

Other (please specify).....

**17** Please tick one of the following options:

I have already quit.....  *Go to Q.19!*

I plan to quit in the next 30 days.....

I plan to quit in the next 6 months.....

I do not plan to quit in the near future.....

**18** Do you think you would be able to quit smoking, if you tried to quit?

Yes, I think I would be able to quit smoking.....

No, I don't think I would be able to quit smoking.....

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## DISCUSSION

Parents responded similarly to the colour and black on white questionnaires regardless of ethnicity. This could have been due to some limitations of the study, one being that the positive effect of the incentives may have been large enough to override any small effect that questionnaire design might have had. There were several differences between the colour and black and white questionnaires; for example, the colour version also had different fonts, pictures and symbols. If a differential response rate had been found, it would have been difficult to assess the individual contribution of any single one of these features. A more complex experimental design would have been required to avoid confounding of several possible effects. The envelopes were not strictly-randomised although distribution of each was blind to teaching staff and the system used was the optimal one given the limitations of working in a school environment. This was, however, a whole-school study on a topic of importance to parents (Glover et al 2006) which may also have prompted response regardless of questionnaire format. Pacific Island and Asian parents appear to be over-represented among respondents. This could reflect cultural differences in attitudes to school requirements of parents or in parenting style. In Glover et al's (2006) previous research on parents' attitudes to their children taking up smoking, Asian parents recommended an authoritative parenting style, Māori parents emphasised the role of the extended family, Pacific Island parents expressed a sense of powerlessness over whether their children would take up smoking or not and thought it was the role of schools to educate their children about smoking and Pākehā/European parents were more likely to consider their children to be at low risk of taking up smoking. Analysis of response by ethnicity however compared parents self-reported ethnicity against ERO reported ethnic mix for the school which was based upon the parents' report of students' ethnicity, which is a limitation.

Ogden et al (2003) similarly based some of their research design on the assertion that visuospatial design is culturally important to Maori and found no difference in performance between Māori and Pākehā/Europeans on two neuropsychological tests of visuospatial abilities.

On this basis it would be reasonable to discontinue the coloured user-friendly styled questionnaire, especially given the added design and printing costs. There are, however, other reasons to retain the distinctive and visually more complex questionnaires. First, they are memorable (Nederhof 1988) and this may be important for participant retention in projects where later reminders will be sent, as in the KKS study that runs over three years and involves at least one follow-up questionnaire per student. The design and style help brand the project and assist parents' and teachers' recall of the project. Second, the perceptions of prospective participants in the project may influence their willingness to participate in the intervention components of the trial (Spoth and Redmond 1994). Parents and teachers of children attending the intervention schools continue to be sent newsletters and invitations to attend intervention activities. Third, it may assist developing rapport between respondents and research staff and thus in reducing participation barriers. In short, maintaining a consistent style may help with retention, increase uptake of intervention resources and participation in intervention activities and build rapport of school staff and respondents with the research staff. We agree with Finn, Gendall and Hoek (2004) who concluded that if a more 'likeable' design performs no worse than a less likeable one, then leaving cost aside, it makes sense to try and design attractive 'likeable' questionnaire covers.

Our study suggests that illustrative graphics could improve compliance with question instructions. In the colour version, provision of a graphic of 'Scrabble' pieces

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may have helped participants to comprehend the requirement for them to unscramble the letters and place them in the boxes provided. Questions should however, be placed on the page so that they flow logically, for example, from left to right and top to bottom for English-speakers. The question 'Do people smoke in your car?' in the colour version was placed under, and therefore after, the 'yes/no' tick boxes, possibly contributing to people missing the question. Arrows showing divergent direction, such as pointing up the page rather than across or down, should be avoided.

This paper adds to the body of literature showing that changes to questionnaire appearance and content are unlikely to affect differential response rates, even in minority ethnic and indigenous groups where literacy may be low.

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# The Nature and Extent of Postal Survey Noncontact: Implications for Survey Practice

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## **Abstract**

Noncontact, the failure of a survey sample member to receive a survey request, is a potential source of nonresponse bias that has largely been ignored by postal survey researchers. This is due to the difficulty of identifying the components of nonresponse when nothing is heard from potential respondents. Yet, the need to understand postal nonresponse is increasing as more studies move to mixed mode designs incorporating a postal element, and technological, resource and societal changes increase the attractiveness of self-administered surveys. This study examined noncontact in a general population postal survey by identifying addresses that were likely to be inaccurate at the time the survey was fielded and comparing these with 'gone, no address' (GNA) returns to the survey invitation. An exploratory analysis of the resulting data is presented.

Noncontact was found to relate to survey-independent demographic variables (e.g. age, household composition), meaning it has the potential to cause bias in postal survey results. Furthermore, its incidence was estimated to be as much as 400% higher than indicated by 'gone, no address' (GNA) returns, although an envelope message tested as part of the research was able to significantly increase levels of noncontact return. Thus, noncontact appears to be a nontrivial contributor to postal survey nonresponse; consequently, survey cooperation rates are likely to be routinely understated. A method for estimating total noncontact rates is offered to provide for response calculation adjustment and to assist researchers interested in decomposing the components of postal survey nonresponse.

## **Introduction**

Common postal survey frames inevitably contain various inaccuracies, but one kind in particular, out-of-date address information, causes recurring misaddressing issues for survey researchers. The noncontact nonresponse that results from such inaccuracies has the potential to generate more than just a financial cost; it may lead to incorrectly calculated cooperation rates and bias in survey estimates.

Cooperation rate inaccuracies may occur when only a portion of total noncontact due to misaddressing is reported to researchers in the form of 'gone, no address' (GNA) returns. This is because

the remainder, unreported noncontact, is typically combined with passive refusal into an 'inaction' category when reporting survey response, leading to underestimates of cooperation rates (Gendall, Hoek & Finn, 2005; Sosdian & Sharp, 1980).

This practice occurs because there is typically no mechanism for distinguishing between the two main components of inaction nonresponse. In an environment of increasing concern about declines in response across survey modes, this is of interest for two reasons. First, it masks the proportion of postal survey nonresponse attributable to noncontact rather than noncooperation, thereby confound-

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ing analyses of the causes of response rate declines and the efficacy of efforts to address them. Second, it hinders investigations into noncontact's contribution to any bias in survey estimates.

Conceptually, noncontact is likely to be linked to frame update processes along with individual and household movement. Furthermore, the return of any resulting noncontact is likely to depend on third party (household) and survey invitation characteristics such as the number of people in the household and whether or not the invitation prompts receivers to return any misaddressed letters. Together, these factors may lead to noncontact being both systematically underreported and unevenly distributed amongst the target population. To the extent that those more likely to be noncontactable differ from others in the population in their behaviour and attitudes, noncontact may be an important contributor to postal survey nonresponse error.

Indeed, there is good reason to suspect this is the case. For example, the March 2007 quarter Survey of Dynamics and Motivation for Migration in New Zealand (Statistics New Zealand, 2007) reports that movement is related to age, ethnicity, marital status, living arrangements, income, employment status, occupation, and current region of residence. These key demographic variables are likely to correlate with a range of behaviours and attitudes. Furthermore, studies examining the fate of misaddressed mail have established that a significant portion is not returned. For instance, Esslemont and Lambourne (1992) sent 200 misaddressed questionnaires within New Zealand of which 70% were returned. Similarly, Healey and Gendall (2005) sent 1,400 misaddressed envelopes in New Zealand and received only 53% back to their 'normal' treatment (the rate was 67% when a 'please return' message was included on the envelope). An American study also found that only 41% of the 1,000 deliberately misaddressed ques-

tionnaires sent were returned unopened (Braunsberger, Gates & Ortinau, 2005).

Two of these studies (Braunsberger et al., 2005; Healey & Gendall, 2005) examined household characteristics and their relationship to return of misaddressed mail. However, Braunsberger et. al. examined only gender, and did so by relying upon an assumption about the gender of the receiver that was likely to have been wrong in a number of cases (see Healey & Gendall, 2005). The Healey and Gendall (2005) study looked at a range of frame-based variables including address type, average age of electors in the household, number of elector surnames in the household, and geographic location. It found clear differences in noncontact return rates at different levels of those variables and tentatively concluded that "identified non-contacts (i.e. 'gone no address' returns) to a single-shot mailing without an envelope message should be doubled" to estimate total noncontact (p. 44).

Unfortunately, the population movement research from Statistics New Zealand does not indicate the degree to which movement translates into noncontact for a given frame. Furthermore, as Healey and Gendall (2005) noted, the misaddressing studies were limited because they involved a single mailing when, in practice, multiple follow-up mailings may be employed; a factor which may improve noncontact return rates. Moreover, because they sent deliberately misaddressed mail to random population samples, the studies failed to examine a realistic distribution of noncontact amongst households. For example, it is unlikely that misaddressing and its associated noncontact incidence occurs at random because some people (e.g. those more likely to move) may be more likely to have inaccurate address information against them in standard sampling frames. Indeed, it is also possible that a form of 'double jeopardy' exists with respect to noncontact; those more likely to be noncontactable in a sample may also be more likely to have lived in house-



holds that tend not to notify researchers about it. If this occurs, prior studies may have overestimated the return rates that can be expected in typical misaddressing situations.

The present study attempted to address these limitations and develop a robust understanding of postal survey noncontact incidence and return. The study also sought to extend Healey and Gendall's (2005) work aimed at increasing the proportion of noncontacts returned, and to explore potential mechanisms for estimating underreporting via the decomposition of the inactive disposition category.

The vehicle for the study was a general population survey of 2,400 New Zealanders. Noncontact incidence was examined by exploiting a unique frame update situation to identify addresses that were likely to be inaccurate at the time the survey was fielded. These were compared with 'gone, no address' returns to the survey invitation. Independent frame information was also used to develop profiles of individuals more likely to change addresses and of third parties (e.g. households) more likely to return misaddressed mail. Finally, the study tested a 'please return' message on the invitation envelope aimed at increasing noncontact return rates.

## Exploring Noncontact Return using Frame Change Data

### Procedural Overview

In June 2005 an age-stratified random selection of 2,400 individuals was taken from the New Zealand electoral roll for an International Social Survey Programme (ISSP) survey on work orientation. Equal strata (of 800) were selected of those aged 18 to 34, 35 to 55, and 56 or over. The roll information was current on the 30th of April 2005.

The sample was sent a series of postal mail invitations to participate in the ISSP survey by completing and returning a

paper questionnaire. Three waves of mail were sent: an initial invitation and two reminders. Standard 'A4' envelopes were used for the initial contact and second reminder, which contained a replacement questionnaire. A standard 'Banker' envelope was used for the first reminder letter.

The survey invitations and reminders were sent between the 1st of August and the 8th of September 2005. Additionally, a split envelope message test was run. According to the procedure first tested by Healey and Gendall (2005), each sampled address was randomly allocated to one of two treatments, either an envelope with a 'please return to sender' message, or an envelope with no message. The message, presented below, was centred on the bottom front of the envelope.

*IMPORTANT: If this mail has not reached the intended person and cannot be forwarded, please mark the envelope "Return to Sender" and place it in a NZPost box.*

To enable analysis of response at the household level, a number of electoral roll variables relating to individuals registered at the same sampled households were retained, including age (within 5 year band), surname and title.

### A special frame update situation

The field period of the 2005 ISSP survey coincided with an enrolment update campaign undertaken in advance of the New Zealand general election to be held in mid September. As part of the data cleaning exercise, mail was sent to every eligible elector in New Zealand at their address on the roll by the Electoral Enrolment Centre (EEC). The mail contained a prominent "If this isn't for you, pass me on or post me back" message on its outer and an information update form inside. Electors who received the mail were asked to check their details. Where no changes were required, no response was to be made. Where

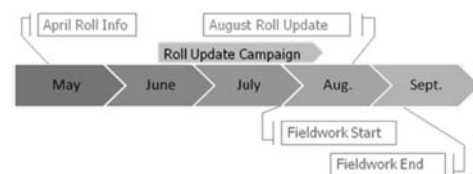
changes were necessary (e.g., to the address, surname, or occupation), the elector was asked to send the amended form back.

Extensive radio, television and print advertising also encouraged those no longer at their old address to contact the EEC via a freephone number or dedicated website. Where a 'gone no address' (GNA) response was received from the house to which the update form was sent, the elector's details were removed from the roll by the EEC.

On August 17th 2005, a fresh version of the electoral roll was published for use in the election, taking into account the changes, additions, and deletions uncovered in the enrolment update campaign. The enrolment update campaign is only undertaken prior to general and local-body elections, which occur once every three years, so the electoral roll is rarely as accurate as it was at that date.

Figure 1 illustrates the timing of roll updates and the survey field period.

**Figure 1: Snapshot and fieldwork timing**



**Frame detail comparison**

The enrolment update campaign provided a unique opportunity to compare changes in roll details for the 2,400 people selected in the sample and to undertake an analysis of the corresponding survey response profile of those individuals.

Specifically, the sample roll details obtained at the end of April 2005, and used to send the ISSP survey invitations, were compared with the details published in the pre-election roll of August

17th, around the time the ISSP survey was in the field. Comparisons were made at an electorate level (there are 69 electorates in New Zealand). For instance, details for a person sampled from the Palmerston North electorate were compared with the updated electorate details for Palmerston North.

Comparisons were limited to this level because it was not practical to look in all 69 electorate rolls for each of the 2,400 individuals originally sampled within a reasonable time period. The effect is that those who had moved from one electorate to another within New Zealand would be classified as 'Other' rather than 'Moved' under the scheme outlined directly below. From an analysis point of view, this is unlikely to be of consequence, since any source of address change presents an opportunity for noncontact to occur. Nevertheless, these two categories are analysed both separately and in combination in the analysis of results.

Roll entry differences were noted where they occurred and sampled units were allocated to one of three categories:

- **Same:** Sampled address and name information was the same in both the 30th April and 17th August rolls for the same electorate. This would apply to people who had not moved during the period, or who moved but the household failed to notify EEC that the person was no longer there.
- **Moved:** Sampled name information was the same, but address details differed between the 30th April and 17th August rolls for the same electorate. This would apply to people who moved within their electorate and notified EEC, either through a NZPost redirection or return of the roll update form.
- **Other:** The sampled name information could not be found in the 17th August rolls for the same electorate. This would apply to people who

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moved outside of their electorate during the period and notified the EEC of this, changed names due to marriage or deed poll, or were removed from the electoral roll due to death, incarceration, or lost contact.

## Hypotheses

Based on the findings of prior studies and given the conceptual determinants of noncontact incidence and return outlined earlier, the following effects were expected:

1. Address detail changes and, therefore, noncontact incidence, would be correlated with movement-related demographic variables such as age, household composition and address type.
2. Not all noncontacts would be returned and return rates would be lower from households more likely to contain individuals who had changed address.
3. An envelope message would improve return rates, as would follow-up contacts (i.e. reminders) to sampled individuals.
4. Despite the use of an envelope message and follow-up contacts, some unreturned noncontact would remain.

## Characteristics of Sample Units that Changed Details

Prior to examining the response profile of those with changed or unchanged addresses, it was important to determine whether there were clear between-group differences. To keep matters simple, Tables 1 through 6 present the results of an exploratory data analysis based on available frame variables one at a time (rather than using logistic regression for two roll change classifications or log-linear models for three). To facilitate comparisons, an 'Any Change' column, which combines the figures from the 'Moved' and 'Other' groups, is included in each table. Furthermore, to ascertain whether address type and location had

an influence on return rates, two variables were constructed from available frame data according to the methods used by Healey and Gendall (2005).

For address type, an address relating to a rest home, hall of residence, or other group accommodation was classed as a 'Multi Residence'. Addresses containing a Rural Delivery code or Post Office reference (e.g. PO Box), were classified as a 'Delivery Centre'. Simple residential addresses (e.g. 10 Smith Street) were classed as 'Residential – Whole' addresses, while more complex addresses (e.g. 10-A Jones Street) were classed as 'Residential – Split' addresses, to differentiate those more likely to be family homes from those more likely to be flats.

Conversely, the location variable classifications were based on the town or city of the address. Although imperfect, these classifications enabled a basic examination of differences in roll change patterns.

Readers should also note that two sets of age-related information are presented in the analysis for this section. Specifically, roll change classifications are compared both by age of individual sample units ('Individual Age') and the average age of electors at the address of each sampled unit ('Average Age of Electors in Household'). The first provides insight into links between an individual's age and their likelihood of changing address, while the second examines address change in relation to one aspect of household composition. Later sections analyse noncontact return rates by a number of household composition variables. Hence, the household-level address change data presented here provides a foundation for assessing the patterns identified in subsequent analyses.

**Table 1: Younger individuals were more likely to change details**

Individual Age	n	Roll Change Classification			Any Change (% row)
		Same (% row)	Moved (% row)	Other (% row)	
18-29	518	79	8	14	22
30-39	471	87	7	6	13
40-49	421	91	4	5	9
50-59	368	92	5	2	7
60-69	315	96	2	2	4
70+	307	94	2	5	7

Note:  $\chi^2(5, n=2,400)=82.3, p<0.01$ , for 'same' vs. 'any change' by age group

**Table 2: Some employment classes were more likely to change details**

Individual Employment Status	n	Roll Change Classification			Any Change (% row)
		Same (% row)	Moved (% row)	Other (% row)	
Student	251	80	6	14	20
Not Stated	118	85	9	6	15
On Benefit	50	86	8	6	14
Employed	1,384	89	5	6	11
Unemployed	56	89	2	9	11
Homemaker	280	92	4	4	8
Retired	261	95	2	3	5

Note:  $\chi^2(6, n=2,400)=34.7, p<0.01$ , for 'same' vs. 'any change' by employment status

**Table 3: People in younger households were more likely to change details**

Average Age of Electors in Household	n	Roll Change Classification			Any Change (% row)
		Same (% row)	Moved (% row)	Other (% row)	
18-29	224	74	13	13	26
30-39	705	87	5	8	13
40-49	629	88	5	7	12
50-59	348	94	3	3	6
60-69	240	95	3	2	5
70+	254	95	2	3	5

Note:  $\chi^2(5, n=2,400)=80.0, p<0.01$ , for 'same' vs. 'any change' by household age group

**Table 4: People in multi-surname households were more likely to change details**

Surnames in Household	Roll Change Classification				Any Change (% row)
	n	Same (% row)	Moved (% row)	Other (% row)	
One	1,498	92	4	4	8
Two	599	87	5	8	13
Three	183	75	8	17	25
Four	56	80	9	11	20
Five or more	64	73	9	17	26

Note:  $\chi^2(4, n=2,400)=72.0, p<0.01$ , for 'same' vs. 'any change' by household surname group

**Table 5: Address type did not have a significant effect on address change**

Household Address Type	Roll Change Classification				Any Change (% row)
	n	Same (% row)	Moved (% row)	Other (% row)	
Multi Residence	27	78	4	19	23
Delivery Centre	164	87	6	7	13
Resident. - Split	473	88	6	6	12
Resident. - Whole	1,492	89	4	6	10
Rural Delivery	244	90	5	5	10

Note:  $\chi^2(4, n=2,400)=4.3, p=0.36$ , for 'same' vs. 'any change' by address type

**Table 6: Location type did not have a significant effect on address change**

Household Location Type	Roll Change Classification				Any Change (% row)
	n	Same (% row)	Moved (% row)	Other (% row)	
Metropolitan	1,339	89	4	7	11
Provincial	569	87	8	5	13
Rural	492	91	4	5	9

Note:  $\chi^2(2, n=2,400)=4.3, p=0.37$ , for 'same' vs. 'any change' by location type

There is clear evidence in the above tables supporting the hypothesis that address changes are correlated with individual and household characteristics. For instance, there is a strong downward trend in the age group data (Table 1), with younger individuals much more likely to be associated with changed address details. There is also a small increase in 'other' changes for those over 70 years of age, which is likely to relate to removal from the electoral roll due to death.

Turning to employment status (Table 2), students are more likely than the employed to change address details and the employed are in turn more likely to change than retirees.

With respect to household characteristics, those who live in younger households or multiple-surname households were more likely to change address details (see Tables 3 and 4). This makes intuitive sense, as such households are more likely to contain people with a higher propensity to move (younger individuals and renters). However, substantial differences in address change rates were not found for address type or location type. There were indications that those in multi-residence households (e.g. rest homes or university dormitories) or provincial locations were more likely to change. However,

the number of multi-residence sample units and the difference between location address types were too small to draw any generalisable conclusions (see Tables 5 and 6). Similarly, no significant differences were found in the rates of address change by gender (10% for females, 12% for males,  $p > 0.10$ ) or Maori descent (14% for those indicating yes, 11% for those indicating no,  $p > 0.10$ ). Nevertheless, the direction of difference for these variables is consistent with independent research relating to population mobility in New Zealand (Statistics New Zealand, 2007).

To examine the relationship between address change and noncontact return, it is necessary to explore how the different groups responded to the survey request. Table 7 shows the correspondence between survey response and roll detail change. Looking first at the '% of Row' breakdowns, significantly fewer 'gone, no address' (GNA) returns came from the 'Same' category than was the case for the other response classes (55% vs. at least 86% for the others in that column). Furthermore, looking to the '% of Column' breakdowns, those identified as 'Moved' or 'Other', returned GNA responses in much greater proportions than the 'Same' group (25% and 35% vs. 5%). Thus, as expected, there is a link between address change and noncon-

**Table 7: Survey response by roll change classification**

Response	n	% of Row			% of Column		
		Same	Moved	Other	Same	Moved	Other
Valid	1,307	94	3	3	58	33	25
Inactive	751	86	6	7	30	39	37
GNA	182	55	16	29	5	25	35
Refused	117	98	2	0	5	2	0
Ineligible	43	86	5	9	2	2	3
<b>Total (n)</b>					<b>2,131</b>	<b>118</b>	<b>151</b>

Note:  $\chi^2(4, n=2,400)=256.5, p < 0.01$ , for 'same' vs. 'any change' (moved plus other) by response

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tact returns. There also appears to be a relationship between address change and inaction, with those in the 'Moved' and 'Other' categories neglecting to respond at higher rates compared to the 'Same' group (39% and 37% vs. 30%).

Although the relationship between address change and noncontact returns is clear, it is not perfect. Half (55%) of all GNA responses come from those who did not change address details. A likely explanation for this is that a number of movers fail to update their roll details themselves and the households that some of them lived in also failed to notify the EEC during the enrolment update campaign. Additionally, some people will have moved in the time between the completion of the update campaign and the publication of the updated roll. Thus, a small proportion of those who appear to have kept the same address on the roll may have actually moved.

The fact that a non-trivial portion of those whose roll details changed returned valid responses (33% of 'Movers' and 25% of 'Others' in Table 7) is also not surprising. First, some movers will have had their mail redirected to them by NZPost. Second, some will have had their mail redirected to them via alternative means, the most likely being forwarding by the current occupants of their old household. Finally, a very small proportion of people complete surveys not addressed to them (5.0% in Esslemont and Lambourne (1992) and 0.5% in Braunsberger et al.(2005)).

From a practical perspective these findings suggest that address change can be employed as a key indicator of noncontact incidence. Furthermore, it is apparent that a relationship exists between sample unit movement (as indicated by roll modification), noncontact and GNA returns. However, the higher inaction rates for the 'Moved' and 'Other' groups suggest that this relationship is moderated by the propensity of households receiving misaddressed mail to return it

to researchers. To examine the nature of this propensity, an investigation of survey response by address change and household characteristics was undertaken.

### **Characteristics of Third Parties Returning Noncontacts**

Before examining the results from the current study, it is worth revisiting the findings of prior research based on deliberate misaddressing undertaken in 2004 on the same general population. Healey and Gendall (2005) sent 1,400 misaddressed envelopes to a random sample of households from the New Zealand electoral roll. Using data available for all respondents from the roll they found that noncontact return rates were strongly related to household composition.

Specifically, households comprising younger people (e.g. where the average age of electors in the household was 18-29) were more than 2.5 times less likely to return than households of older people (e.g. where the average age of electors was 70+). Households in which the inhabitants shared the same surname were significantly more likely to return than mixed households (i.e. those with two, three, or four surnames) and Split Address and Metropolitan households were least likely to return the mail.

Healey and Gendall's (2005) results provide good support for the hypothesis that households more likely to contain movers are less likely to report noncontact. However, as noted earlier, this study involved only one wave of mailing and assumed a random incidence of noncontact across the population. These factors were likely to mean the level of overall noncontact reporting achieved was not the same as would occur in a typical survey.

### **Noncontact Return In The Current Study**

An assessment of the rate of return of noncontact mail in this study could not be undertaken in as clear-cut a fashion as that in Healey and Gendall (2005)

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because incidence of noncontact was not known with certainty. Nevertheless, given the results in the previous section, address change was employed as a proxy for misaddressing so that the tendency of households to return mail across change classification could be examined.

Given the various factors contributing to survey nonresponse (active refusal, passive refusal, noncontact, and ineligibility), the correlates of address detail change identified earlier, and the findings of noncontact return propensity from Healey and Gendall (2005), it is worth considering what patterns might be expected in a household level analysis of return rates in the present study. First, if roll detail change is a good proxy for misaddressing, the proportion of households returning GNAs for sample units with address detail changes should be much higher than for the unchanged group. Second, if the results from Healey and Gendall (2005) generalise, there should be evidence of the patterns they found in noncontact returns.

It is important to note, however, that patterns are likely to be confounded by factors not present in the Healey and Gendall (2005) study. For example, some of the households that receive misaddressed mail will be able to forward it on to the intended recipient, so it may be returned as a valid, refusal or ineligible response. Indeed, those households motivated enough to return GNAs may also be expected to forward mail if they can. Thus, rather than focusing solely on the patterns in GNA returns analysis should also examine patterns in non-return. Households associated with low rates of return in Healey and Gendall (2005) were expected to show relatively high rates of non-return (as signified by the inactive category) in this study.

Another pattern of interest that could not occur in Healey and Gendall's 2005 study relates to the profile of households from which no response is received when

address details did not change. Some of this nonresponse will undoubtedly relate to unreported noncontact. However, the vast majority should relate to passive refusal. To the extent that they share a similar cause (e.g. a lower propensity for altruistic behaviour), it is likely that passive refusal patterns will be similar to those for noncontact nonreturn. That is, households associated with movers may also be more likely to contain individuals who, even if they correctly receive a survey request addressed to them, are more likely to ignore it.

A more complex analysis using log-linear models and all variables simultaneously is possible. However, in line with the exploratory nature of this study and the need to reference comparative patterns found in earlier research, a collection of crosstabulations is employed here. Specifically, Tables 8 through 11 present a set of three-way tables, each analysed as a collection of two-way tables. For the sake of clarity, the 'Responded' category in these tables relates to a grouping of valid, refusal and ineligible responses. Given the similarity of the 'Mover' and 'Other' groups in prior analyses, these two categories have also been grouped.

The tables show the hypothesised patterns. Consistent with expectations, households comprising younger people in the 'Address Changed' group had the highest levels of inaction and lower levels of reported GNAs. Furthermore, although the base numbers are too small to determine clear trends, it appears that the households associated earlier with movers (two to four surnames) generate more inaction. Also, as found by Healey and Gendall (2005), the 'Five or more' group counters this trend by having the highest GNA return rates of all the groups. This is likely to be due to the fact that these are often rest homes or shared residences such as student hostels, which have different processes for dealing with mail to those used by typical households.



**Table 8: Response by household average age and roll detail status**

Average Age of Electors in Household	Address Changed				Address Unchanged			
	<i>n</i>	Responded (% row)	GNA (% row)	Inactive (% row)	<i>n</i>	Responded (% row)	GNA (% row)	Inactive (% row)
18-29	59	27	29	44	165	45	8	47
30-39	91	26	30	44	614	60	4	36
40-49	73	40	22	38	556	61	4	34
50-59	21	33	43	24	327	69	4	28
60-69	12	42	50	8	228	83	3	14
70+	13	31	54	15	241	77	7	16
<b>Overall</b>	<b>269</b>				<b>2,131</b>			

Note:  $\chi^2(10, n=269)=17.2, p=0.07$ , for the 'Address Changed' cells.

$\chi^2(10, n=2,131)=101.7, p<0.01$ , for the 'Address Unchanged' cells.

**Table 9: Response by household surnames and roll detail status**

Surnames	Address Changed				Address Unchanged			
	<i>n</i>	Responded (% row)	GNA (% row)	Inactive (% row)	<i>n</i>	Responded (% row)	GNA (% row)	Inactive (% row)
One	117	36	26	38	1,381	70	4	26
Two	79	28	35	37	520	58	5	36
Three	45	29	29	42	138	51	9	41
Four	11	27	9	64	45	38	9	53
Five or more	17	29	53	18	47	45	13	43
<b>Overall</b>	<b>269</b>				<b>2,131</b>			

Note:  $\chi^2(8, n=269)=11.1, p=0.20$ , for the 'Address Changed' cells.

$\chi^2(8, n=2,131)=65.3, p<0.01$ , for the 'Address Unchanged' cells.

Again, although the base numbers are small, the residential address groups (see Table 10) appear to have lower noncontact return rates than the other dwelling types, as evidenced by the proportion of inactive responses for

the 'Address Changed' group. This is consistent with the findings of Healey and Gendall (2005). Also of interest is that the Rural Delivery and Delivery Centre address types generated higher 'Responded' rates amongst the

'Address Changers' (though not significantly so), suggesting that surveys sent to such addresses are more likely to be forwarded if misaddressing occurs. Turning to location type, metropolitan households appeared to have lower

return rates for the 'Address Changed' group (i.e., they had the highest inaction rate), which is again consistent with the findings of Healey and Gendall (2005). However, the difference was not significant (see Table 11, below).

**Table 10: Response by address type and roll detail status**

Address Type	Address Changed				Address Unchanged			
	<i>n</i>	Responded (% row)	GNA (% row)	Inactive (% row)	<i>n</i>	Responded (% row)	GNA (% row)	Inactive (% row)
Multi Residence	6	33	67	0	21	48	19	33
Rural Delivery	25	48	24	28	219	73	2	25
Delivery Centre	22	45	23	32	142	66	4	30
Residential - Whole	158	30	29	41	1334	65	4	31
Residential - Split	58	22	36	41	415	62	6	32
<b>Overall</b>	<b>269</b>				<b>2,131</b>			

Note:  $\chi^2(8, n=269)=13.0, p=0.11$ , for the 'Address Changed' cells.

$\chi^2(8, n=2,131)=22.5, p<0.01$ , for the 'Address Unchanged' cells.

**Table 11: Response by location type and roll detail status**

Location Type	Address Changed				Address Unchanged			
	<i>n</i>	Responded (% row)	GNA (% row)	Inactive (% row)	<i>n</i>	Responded (% row)	GNA (% row)	Inactive (% row)
Metropolitan	150	27	32	41	1,189	62	5	33
Provincial	74	41	26	34	495	69	5	26
Rural	45	31	33	36	447	69	3	28
<b>Overall</b>	<b>269</b>				<b>2,131</b>			

Note:  $\chi^2(4, n=269)=4.5, p=0.35$ , for the 'Address Changed' cells.

$\chi^2(4, n=2,131)=13.7, p<0.01$ , for the 'Address Unchanged' cells.

Given the findings presented thus far, the overall conclusion is that there is a clear relationship between demographics and household characteristics, likelihood of address change, and noncontact. Furthermore, households containing people who are more likely to change address tend to return noncontacts at lower rates. This ‘double jeopardy’ effect means the overall noncontact return rates established in prior deliberate misaddressing studies probably underestimate the level of underreporting that would occur in a typical postal survey of the general population.

#### **Effect of Envelope Messages and Follow-Ups on Noncontact Return Rates**

Before attempting to estimate the total level of noncontact in this study, the effect

of multiple waves and envelope messages on returns was examined. Table 12 presents response to the survey by wave of contact. Additional waves substantially improved returns across all categories of response, including GNAs. Also, the incorporation of a ‘please return if mis-addressed’ message improved return of GNAs by over 70% (5.6% vs. 9.6%).

These results corroborate those from Healey and Gendall (2005), which found a significant improvement in GNA return rates when the envelope message was incorporated. Of note is that the message was able to elevate levels of GNA return beyond that achieved via the implementation of follow-up contacts. Thus, the two design elements can be deployed together to maximise noncontact return rates.

**Table 12: Multiple waves and an envelope message increased GNA returns**

<b>Response</b>	<b>Unmessedged</b>		<b>Messedged</b>		<b>Overall</b>	
	Wave 1 (% col.)	Final (% col.)	Wave 1 (% col.)	Final (% col.)	Wave 1 (% col.)	Final (% col.)
Valid	29.8	54.6	27.8	54.3	28.8	54.5
Inactive	63.8	32.7	64.0	29.9	63.9	31.3
GNA	2.8	5.6	5.2	*9.6	4.0	7.6
Refused	2.8	5.2	2.4	4.6	2.6	4.9
Ineligible	0.8	2.0	0.7	1.6	0.8	1.8
Total	100.0	100.0	100.0	100.0	100.0	100.0
<i>Group Size (N)</i>	<i>1,200</i>	<i>1,200</i>	<i>1,200</i>	<i>1,200</i>	<i>2,400</i>	<i>2,400</i>

\* The 4.0% difference between the unmessedged and messedged treatments in final GNA returns is significant at the 95% level. No other differences in final returns between the unmessedged and messedged treatments were significant.

**Table 13: The envelope message reduced the number of inactives**

Response	Unmessaged		Messaged		Difference
	<i>n</i>	% Column	<i>n</i>	% Column	<i>n</i>
Valid	655	54.6	652	54.3	-3
Inactive	392	32.7	359	29.9	-33
GNA	67	5.6	115	9.6	48
Refused	62	5.2	55	4.6	-7
Ineligible	24	2.0	19	1.6	-5
<i>Total</i>	<i>1,200</i>	<i>100.0</i>	<i>1,200</i>	<i>100.0</i>	

Indeed, the 70% improvement in GNA return rate suggests that the efficacy of the envelope message is much higher in typical postal surveys of the population than the 26% improvement found in the Healey and Gendall (2005) deliberate misaddressing study.

The difference in response make-up across the two envelope treatments also suggests that, as would be expected, the message draws most of the additional GNAs from the inactive category (see Table 13). Although it cannot be said that the message leads to significantly fewer inactive responses, since the only significant difference is in the number of GNAs reported, the pattern does at least suggest two things.

- Even after three waves of contact there are a number of households that do not notify the researcher of a GNA unless there is a message on the envelope prompting them to;
- If the message encourages anyone to return a GNA in place of a refusal or ineligible response, at most it has this effect on a handful of potential respondents.

A comparison of the proportion of valid returns across the treatments also suggests that the message does not stimulate additional forwarding of mail; the valid return figures are essentially the same.

Thus, it seems households who do forward mail take such action independently of a prompt.

#### **Estimating Unreturned Noncontacts**

One question left unanswered is how much noncontact remains unreturned despite the improvements from an envelope message and multiple waves of contact. To provide a basis for assessing this, Table 14 presents a breakdown of final response by treatment and contact detail classification. Again, some categories are aggregated for the sake of clarity. Specifically, valid, refusal and ineligible responses are grouped because they are all responses from individuals to whom the mailing was sent. Together, they reflect the proportion of people who received the stimulus and acted upon it. Similarly, the 'Moved' and 'Other' roll change groups described in the methodology section are collapsed here because they both represent cases with a high likelihood of misaddressing and, therefore, noncontact.

As expected, the response profile of those with changed details was dramatically different in all treatments, with much higher returned noncontact and fewer survey responses coming from them compared to the group that had not changed details. Furthermore, the envelope message generated significant increases in the proportion of cases returned as GNAs whether

**Table 14: Sample units with changed details responded in lower numbers**

Response	Unmessaged		Messaged		Overall	
	Same (% col.)	Changed (% col.)	Same (% col.)	Changed (% col.)	Same (% col.)	Changed (% col.)
Valid/Ref/Inel	65.5	35.8	64.2	26.3	64.9	31.6
Inactive	31.2	43.0	29.8	31.4	30.5	37.9
GNA	3.3	21.2	*6.0	*42.4	4.7	30.5
All	100.0	100.0	100.0	100.0	100.0	100.0
Group Size (N)	1,049	151	1,082	118	2,131	269

\* Messaged treatment value is significantly higher than the corresponding unmessaged value at the 95% level.

or not the roll details of sample units had changed. Significant differences between message treatments did not exist for any of the other response classifications at the 95% level.

These results enable decomposition of inaction into unreturned noncontact and passive refusal (i.e. those receiving the invitation who did not respond), thereby providing a means of estimating total noncontact rates. A cross-group comparison procedure is proposed to achieve this. It relies on two core assumptions:

1. That the total proportion of noncontact in the 'Same' group (those who have not changed address) is small enough to have minimal impact on the accuracy of the 'responded' rate calculated for that group, and
2. That response rates amongst those who receive a request, and noncontact notification rates for households receiving a misaddressed envelope, remain constant across the 'Same' and 'Changed' groups.

Given these assumptions, the response rate established in the 'Same' group can be used to estimate the total number of noncontacts in the 'Changed' group, along with an associated 'noncontact notification rate'. The 'noncontact notification rate' established in the 'Changed'

group can then be used to estimate the total number of noncontacts in the 'Same' group, with the resulting estimates for both groups yielding a total noncontact rate for the entire sample.

By way of example, total noncontact in the unmessaged treatment (i.e. the first two columns in Table 14) is predicted to be 12%, based on the following calculations:

First, the response rate of those who were likely to have received the invitation because their details did not change (65.5%) can be used to estimate the number of those with changed details who also received their invitation (e.g. via forwarding). Since 54 (35.8% of 151) people with changed addresses responded, and they are likely to represent approximately 65.5% of the people in that group who actually received the invitation, the total number of receivers in that group can be estimated at 82 (54 divided by 65.5%).

Using this to decompose the inactives for the address change group, we can estimate that 28 (82 minus 54) got the invitation and chose not to respond, while the remaining 37 (43% of 151, less 28) were noncontacts. Adding these 'inactive noncontacts' to the returned noncontacts (21.2% of 151 equals 32,

plus 37 gives 69) enables us to calculate a noncontact notification rate of 46% (32 returned noncontacts divided by 69 estimated total noncontacts) for the 'Changed' group.

Then, the noncontact notification rate established above can be applied to the group of people whose address details did not change in order to estimate total noncontact amongst them at 76 people (3.3% of 1,049, divided by 46%). Finally, the estimated total noncontacts from both groups can be added (69 plus 76 gives 145) and divided by the total sample size for the treatment to find a final estimated noncontact rate of 12% (145 divided by 1,200).

Algebraically, the method can be represented as follows:

**Equation 1: Estimated total noncontact for the 'Changed' group**

$$NC_C = G_C + \left( I_C \cdot V_C \left( \frac{n_S - V_S}{V_S} \right) \right)$$

**Equation 2: Estimated total noncontact rate for the entire sample**

$$R_{nc} = \left( \frac{G_S + 1}{G_C + 1} \right) \frac{NC_C}{n}$$

Where:

- NC<sub>C</sub> = The estimated total number of noncontacts in the 'Changed' group;
- G<sub>C</sub> = Number of GNAs in the 'Changed' group;
- G<sub>S</sub> = Number of GNAs in the 'Same' group;
- I<sub>C</sub> = Number of Inactives in the 'Changed' group;
- V<sub>C</sub> = Number of Valid, Refusals and Ineligibles for the 'Changed' group;
- V<sub>S</sub> = Number of Valid, Refusals and Ineligibles for the 'Same' group;
- n<sub>S</sub> = The sample size for the 'Same' group;
- n = The sample size across both groups;
- R<sub>nc</sub> = The estimated total noncontact rate (proportion) across both groups.

The method was used to estimate total noncontact in the messaged treatment (13%) and overall sample (13%). It was also used to generate estimates on cumulative data from only the first and then second waves of contact for the overall sample (12% in both).

That the procedure yields very similar estimates across these varied design scenarios suggests it holds promise as a decomposition mechanism. Furthermore, it can be applied in a range of circumstances, provided a sub-sample is sent survey invitations using old address data so that response comparisons can be made. Many organisations retain customer address change information that would enable this on a survey-by-survey basis. Alternatively, post-hoc analyses could be undertaken after a general frame update, as was done here, to establish a notification rate to be applied to future studies.

**Conclusions and Implications**

Although much has been done to better understand the causes and effects of nonresponse in telephone and face-to-face modes, relatively little is known about the components of postal survey nonresponse. In part, this is because it is difficult to separate out nonresponse components in that mode. Nevertheless, there is reason to expect that the components contribute differentially to bias, just as they do in other modes.

As a first critical step towards understanding postal survey nonresponse components, this research sought to examine the nature and extent of noncontact in the postal mode. It did so by exploiting a unique frame update situation to identify addresses that were likely to be inaccurate at the time a postal survey of the general public was fielded and comparing these with 'gone, no address' (GNA) returns to the survey invitation. Independent frame information was also used to develop profiles of sample units more likely to change addresses and of

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third parties more likely to return non-contacts. Finally, the study tested the efficacy of a 'please return' message on the survey invitation envelope, aimed at increasing noncontact return rates.

Frame address inaccuracies were found to correlate with age, employment status and household composition. For instance, those who were young, living in multi-surname households, or who were students or beneficiaries were more likely to have changed address details. Furthermore, noncontact return rates related to household characteristics, such that those households more likely to contain movers were also less likely to return noncontacts when they occurred.

Using a procedure developed to estimate levels of unidentified noncontact, it was found that follow-up mailings and envelope messages both significantly increased returns by third parties. Moreover, results suggest that total noncontact was as much as 400% higher than the returned level in a single-contact unmessaged study as (2.8% reported in Table 12 vs. the estimated 12% established in the last section). Indeed, even with three contacts and an envelope message, total noncontact was estimated to be 30% higher than GNA returns (9.6% vs. an estimated 13%).

These findings have significant implications for survey practice. Specifically, noncontact appears to be underestimated in standard postal surveys using frames such as an electoral roll. The cooperation rates reported for many postal studies are therefore likely to be understated. Moreover, our results suggest noncontact is a much larger component of total postal survey non-response than typically acknowledged. Given widespread concern about declining survey response, this is important to know. Efforts aimed at understanding the reasons for declining response, identifying any associated bias, or developing tools to combat the problem, all require

knowledge of the size and nature of non-response components. Both the envelope message technique and the total noncontact estimation procedure developed as part of this study contribute to the development of that knowledge.

Finally, the interrelationships identified between mobility and noncontact, and household characteristics and noncontact returns, present opportunities for targeted design interventions to be developed for this component of postal survey nonresponse. These might, for example, modify reporting propensities by the manipulation of survey features under the researcher's control (e.g. the survey invitation) or incorporate expected noncontact propensities into the survey design (e.g. at the sampling phase) to reduce the effect of this potential error source on estimates. Future research examining the efficacy of such approaches is necessary.

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# Telephone Surveys Using Mobile Phones: An Analysis of Response Rates, Survey Procedures and Respondents' Characteristics

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## **Abstract**

Telephone surveying has become the major mode of data collection in the sample survey field since the mid 1980s; presently other modes of advanced telecommunication such as mobile phones are fast becoming important supplements and even competitors to the fixed telephones. This paper uses a nationwide dual frame survey of fixed and mobile phone numbers to examine the potential of mobile phones for survey work, the methodological implications of their use and the differences to fixed phones surveys.

## **Introduction**

The penetration rate of mobile phones has increased to such an extent in recent years that it has already exceeded fixed phone penetration in some regions. In the European Union, 81% of households have at least one mobile phone compared with 71% with a fixed telephone; the percentage of mobile-only households is also becoming more marked, reaching 24% in 2007 (EC 2008). In the US, more than 50% of households possess a mobile phone while a fixed phone is found in over 89% of the households (Brick et al 2006); the percentage of mobile only households was 13% in 2006 (Keeter et al. 2007). With the decline in households and persons with a fixed phone, the coverage in traditional fixed telephone surveys also decreases which implies that estimates from these surveys have more potential coverage bias. Moreover, it may become more difficult to reach the households with a fixed phone as well as mobile phones and who rely on the latter for most of their calls. Thus, sampling mobile

phones may be necessary to gain access to the growing proportion of households that use mobile phones either exclusively or extensively.

A nationwide survey was designed to evaluate issues associated with conducting surveys on mobile phones. The study sampled telephone numbers from frames of both mobile phone numbers and fixed numbers. This article focuses on the operational feasibility of surveying mobile phone numbers. Specifically, the following issues are covered: (a) response rates from both samples – mobile and fixed, (b) survey procedures – time of contacts, level of effort, completion time of interviews - from both samples, and (c) mobile and fixed phone penetration within specific sub-groups of respondents. The next section gives an overview of the design of the study. The outcomes of the mobile phone sample are then presented and compared with those on the fixed phone sample. The last section summarizes the key findings.

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## Survey design

The study included two samples: the mobile phone sample and the fixed phone sample. The population of interest was the Portuguese adult population (age > 15 years).

The same survey company was hired to select and interview both samples. The Mobile Sample was comprised of randomly generated phone numbers. Mobile phone numbers are nine-digit and the first two digits identify the operator. The Portuguese Telecommunications Regulation Authority provides information about the market share of each of the three operators providing mobile phone service in Portugal which was used to divide the mobile sample into three subsamples. Within each two-digit prefix, mobile phone numbers were created by a generator of 7-digit random numbers. The selection method was ultimately very similar to a simple random sample from a set of numbers, not all of which have necessarily been attributed. In the mobile sample, interviews were conducted with the person who answered the phone. Interviewers confirmed that the person was aged 15 or older and in a safe place to talk before administering the questionnaire. Where this was not the case, an appointment was made with the respondent at a more convenient time.

The Fixed Sample was selected from Portugal Telecom Directory (the so called White Pages) which contains attributed residential numbers. An interval,  $K$ , was formed by dividing the population count of telephone numbers in the frame,  $N$ , by the desired sample size,  $n$ . The frame of telephone numbers was divided into  $n$  intervals of size  $K$  telephone numbers. One telephone number was drawn at random from each interval. Interviews were conducted with the last birthday adult at home at the time of the call, or in the absence of this adult, with any other adult available at the time of contact.

The interviews of both samples were administered using the company's CATI system. Data were collected over the same time period and using the same team of interviewers for both samples.

A total of 2000 interviews were obtained, 1000 using mobile phones and 1000 using fixed phones. The same questionnaire was used for the mobile and fixed phone sample and included questions about Internet usage, attitudes towards the Internet and demographics.

The same general scheduling protocols were used for both the mobile and the fixed phone sample. Up to 7 call attempts were made to each number to establish contact, except when the number was immediately identified as non-attributed or non-working (a message from the phone service operator provides this information). For the initial contact, the scheduling algorithm scheduled calls over different times of the day during weekdays.

## Response rates

In this section we present the outcomes of contact results by sample type (Table 1). In order to conduct 2000 interviews of individuals aged 15 and older, 11617 numbers were required in the mobile phone sample and 4144 in the fixed phone sample. Nearly 60% of the mobile numbers dialed were non-attributed. In the fixed sample 26.3% of the numbers were found to be not-working or disconnected. In the mobile sample 61 contacts were rejected and coded as out-of-the-scope because the person answering the phone was under 15 years old.

The completion rate was 8.6% for the mobile phone sample and 24.1% for the fixed phone sample. Based on useful numbers, i.e. by excluding the non-attributed, non-connected and out-of-the-scope numbers, the completion rate was 21.1% for the mobile phone sample as opposed to 32.7% for the fixed phone sample.

**Table 1. Detailed results of the calls by sample type**

Results of calls	Total		Mobile		Fixed	
	n	%	n	%	n	%
Interviews conducted	2000	12.7	1000	8.6	1000	24.1
Refusals	840	5.3	496	4.2	344	8.3
Non-contact <sup>(a)</sup>	4899	31.1	3188	27.4	1711	41.3
Out-of-the-scope (age < 15 years)	61	0.4	61	0.5	0	0.0
Non-attributed/non-working number	7961	50.5	6872	59.1	1089	26.3
Total numbers dialed	15761	100.0	11617	100.0	4144	100.0

<sup>(a)</sup> Includes voicemail, busy, ring with no answer, hang up without answering the call.

**Table 2. Interview rate, by sample type and time period**

Time period	Mobile	Fixed
10 a.m. – 3 p.m.	19.8% (465)	– (0)
3 p.m. – 6 p.m.	11.9% (1386)	12.6% (484)
6 p.m. – 8 p.m.	27.6% (1547)	40.7% (995)
8 p.m. – 10.30 p.m.	23.4% (1331)	33.9% (1576)

Note: Numbers in ( ) are the number of cases in the time period. Only numbers identified as attributed and working are included. No fixed phone call attempts were made during the earlier period.

There were 496 refusals in the mobile phone sample, corresponding to 4.2% of the cases; the percentage for the fixed phone sample was 8.3%. On the basis of useful numbers, the refusal rate was 10.5% for the mobile phone sample and 11.3% for the fixed phone sample thus indicating that there is a similar tendency for refusal in the mobile and the fixed phone sample. The fact that the interviewers began the mobile phone interviews by asking respondents if it was a convenient time and place for the interview and only proceeded if this was confirmed by the respondent might have contributed to a reduction in refusals and thus to bringing mobile phone results closer to fixed phone results.

Regarding non-contacts the rate was 27.4% in the mobile sample whereas in the fixed sample was 47%. However, when restricting the analysis to useful numbers the scenario changes: the non-contact rate in the mobile sample is higher (68.1% against 56%).

## Results of survey procedures

This section examines the efficiency of contacting and getting people's cooperation by time period, level of effort, in terms of number of call attempts and number of calls necessary per complete interview, and completion time of interviews, by sample type.

### Interview rate by time period

The outcomes of the time periods of the interviews are good indicators of when people answer their phones and are available to cooperate with surveys. To make the analysis pertinent to this goal, phone numbers found to be non-attributed, non-working, or out of the scope are excluded. Using this definition, 4729 mobile numbers and 3055 fixed phone numbers were used

As interviewing was not conducted on weekends, the outcomes only concern weekdays. All last call attempts were classified in four time periods. Table 2 presents the interview rate by the four grouped time periods for the fixed phone and the mobile phone samples.

**Table 3. Percentage of interviews by number of call attempt and sample type**

Number of calls	Mobile	Fixed
1 call	63.0%	66.4%
2 calls	21.6%	18.6%
3 calls	9.0%	8.7%
4 calls	3.9%	2.4%
5 or more calls	2.5%	3.9%

A chi-square test shows that the interview rate across the four time periods for the mobile phone sample is statistically different ( $\chi^2=51.952$ ,  $df=3$ ,  $p<0.001$ ) (ranging from 11.9% to 27.6%) between time periods. The fixed phone sample exhibits the most typical pattern identified in previous telephone surveys, with lower interview rates during the earlier hours than in the evening periods; differences across time periods (ranging from 12.6% to 40.7%) were statistically significant  $\chi^2=115.800$ ,  $df=2$ ,  $p<0.001$ ).

Despite the significant differences found across time periods for the mobile sample the interview rate did not vary as much as in the fixed sample. A possible explanation is that the mobile phone is a personal device that is carried at all times and people can answer them anywhere and anytime thus increasing the likelihood of getting a successful contact; the fixed phone, on the other hand, can only be answered when someone is at home which is more likely later in the day.

#### **Level of effort**

This section examines the level of effort required to complete the interviews. Specifically, we look at the total number of call attempts and the number of calls necessary per complete interview.

In the mobile phone sample, a total of 20602 call attempts were made to obtain 1000 interviews as opposed to 8112 call attempts in the fixed phone sample. This means that while an average of 20.6 calls had to be made to obtain one complete interview in the mobile phone sample, only 8.1 calls

were required in the fixed phone sample. If we exclude the non-attributed/non-working and out-of-the-scope numbers in both samples the average number of calls per complete interview is 13.7 in the mobile sample and 7.0 in the fixed phone sample. In each case the mobile phone sample required a greater level of effort to obtain the same number of completed interviews.

Table 3 presents the percentage of interviews accomplished by number of call attempt. Between 1 and 7 calls were necessary to the telephone numbers that led to the successful completion of an interview. A chi-square test shows that the distribution of the percentage of interviews by number of call attempt was different across sample type  $\chi^2=13.743$ ,  $df=4$ ,  $p<0.008$ ). Although in both samples the interview became less likely as the number of call attempts increased, the percentage of interviews that could be completed with one single call attempt was higher in the fixed sample than in the mobile sample.

#### **Completion time of interviews**

Short questionnaires are typically recommended when the mode of data collection is the telephone as maintaining long conversations requires a mode in which the respondent cannot hang up so easily. The questionnaire of our study was intentionally designed to be short following advice from the researchers of the survey company cooperating in the project; more specifically they warned us of the risk of high dropout rates, especially for the mobile sample, if the questionnaire took much more than 15

**Table 4. Mean completion time (minutes) by time period and sample type**

Time period	Mobile	Fixed
10 a.m. – 3 p.m.	11.58	--
3 p.m. – 6 p.m.	12.31	11.08
6 p.m. – 8 p.m.	11.93	11.06
8 p.m. – 10.30 p.m.	11.56	10.61
Overall	11.99	10.91

minutes to be administered. In this section we present the outcomes for completion times in the overall samples and across the four grouped time periods in which the interviews were accomplished (Table 4).

Mobile phone respondents took on average 11.99 minutes to complete the interviews while the fixed phone respondents took 10.91 minutes, i.e. mobile phone interviews took about 1 minute longer on average to complete than fixed phone. The comparison of the overall mean completion times between samples was statistically different ( $t=-4.840$ ,  $df=1998$ ,  $p<0.001$ ). The mean completion time of the interviews was higher in the mobile sample for every time period and the major difference was found in the period 3 p.m. – 6 p.m.

On the whole, the lower mean times of completion were all obtained in the fixed phone sample namely in evening periods – 6 p.m.-8 p.m. and 8 p.m.-10.30 p.m. While these time periods favor finding people at home, they are also critical for household activities (e.g. cooking dinner, dining, putting children to bed). Calling respondents on the fixed phone in a time period when they are engaged in other tasks is likely to cause rushed responses which might have an impact in the overall mean completion time of fixed phone interviews.

### **Respondents' characteristics**

Despite the massive dissemination of mobile phones, it is not thought to be uniform, i.e., mobile phone ownership and usage varies considerably

between population groups. In this section we analyze the impact of using mobile phones on sample composition by looking at the proportion of interviews obtained via mobile phone and via fixed phone among specific sub-groups of the sample. Comparative profiles of sample type characteristics are shown within the sub-groups of gender, age, educational level, working status, household size and family life-cycle (Table 5).

Mobile and fixed samples were found to be statistically different at  $p<0.001$  in all demographic characteristics except for gender. Regarding age, it is noted that approximately 70% of the interviews of respondents aged between 25 and 34 years were conducted over the mobile phone while only 27% of the respondents older than 55 were interviewed over the mobile phone.

Working status also has a significant effect on sample type composition. Nearly 60% of either employed or unemployed people were interviewed by mobile phone but only 21% of the interviews with the retired segment were conducted by mobile phone.

Respondents' life cycle also has an influence on this. Among the respondents living alone, 66.3% were interviewed by mobile phone while the proportion of mobile phone interviews with married people without children did not reach 40%.

**Table 5 – Percentage of respondents in the fixed and the mobile sample by demographic characteristics**

Demographic Characteristics	Mobile	Fixed	Significance test
Gender			$\chi^2=3.700$ (df=1)
Male	52.2	47.8	
Female	47.9	52.1	
Age			$\chi^2=212.900^{***}$ (df=4)
15-24	58.1	41.9	
25-34	69.0	31.0	
35-44	60.2	39.8	
45-54	53.0	47.0	
55+	27.0	73.0	
Educational level			$\chi^2=17.362^{***}$ (df=2)
Basic level (9 years compulsory)	46.0	54.0	
Secondary/professional (3 years after compulsory)	53.9	46.1	
Superior/University	57.3	42.7	
Working status			$\chi^2=215.300^{***}$ (df=4)
Employed	60.9	39.1	
Unemployed	59.8	40.2	
Student	52.0	48.0	
Retired	21.0	79.0	
Other	43.6	56.4	
Household size			$\chi^2=35.909^{***}$ (df=3)
1 person	43.9	56.1	
2 persons	41.0	59.0	
3 persons	57.8	42.2	
4 or more persons	52.9	47.1	
Family life-cycle			$\chi^2=84.357^{***}$ (df=5)
Single living with the parents	51.1	48.9	
Single living alone	66.3	33.7	
Married having no children	39.6	60.4	
Married having children	62.7	37.3	
Single-parent family	63.3	36.7	
Other type of family	41.1	58.9	

\*\*\* Significant at p < 0.001

Regarding household size, mobile phone interviews are less likely in the case of smaller households – 1 or 2 persons – and more likely in bigger households.

As for educational level, 57.3% of the university respondents were interviewed on the mobile phone while among the basic level respondents mobile phone interviews were 46%.

In short, the outcomes illustrate that the proportion of completed interviews over the mobile phone varies according demographic characteristics, especially on age, working status and family life cycle of the respondent; gender does not differentiates mobile and fixed sample respondents.

While the average deviation between fixed and mobile sample (computed within all the sub-groups of each variable) is less than 5 percentage points for gender (4.3 percentage points) it goes to over 20 percentage points for age (25.3 percentage points), working status (23.2 percentage points) and family life-cycle (20.9 percentage points).

These results replicate to some extent the findings for mobile phone populations in other countries. In most European countries, mobile phone owners tend to be younger, are more often employed, single and are more likely to belong to households with three or more persons than those who do not have a mobile

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phone (EC 2007). In the United States, mobile phone owners are more likely to be employed persons and single or never married; they are also less likely to be aged 65 years or older and retired (Link et al 2007).

## Conclusion

Our findings support the idea that the use of mobile rather than fixed phones to collect data causes important differences to appear in response rates, survey procedures and sample composition.

Sample selection for mobile and fixed telephones was very different. In the mobile phone sample, 59.2% of the dialed numbers were of no use since they were non-attributed or out-of-the-scope numbers, while the figure for non-useful numbers for the fixed sample was only 26.3%. Although this is due to the non-existence of a sampling frame for mobile phone number selection, the time spent to screen those numbers and discover they were of no interest was in fact higher in the mobile sample than in the fixed sample. The refusal rate was around 10% in both samples but the completion rate was lower in the mobile than the fixed sample. The non-contact rate was higher in the mobile phone sample – 67.4%, after excluding non-useful numbers – against 56.0% in the fixed phone sample. Even though people always carry mobile phones everywhere, this does not mean the person can be more easily contacted than via the fixed phone. In fact, the largest proportion of the contacts coded as “non-contact” in the mobile sample – 55.9% – was coded as “voicemail”, which means that a considerable share of mobile phone owners do not always keep their mobile phones switched on.

The mobile sample contacts were more evenly distributed across the day; while more than half the contacts (51.6%) in the fixed phone sample were concentrated in one single period (8 p.m. till 10.30 p.m.) the largest share of contacts in the mobile phone sample did not exceed one third

of the overall number of contacts, ranging from 10% to 32% across the time periods. This outcome is likely to reflect the fact that the survey company knows people always carry their mobile phones everywhere which enables them to prolong the schedule for interviewing.

The biggest share of interviews was accomplished on the first contact attempt both in the mobile and in the fixed sample; however, overall the mobile sample required more contact attempts per completed interview than the fixed phone sample. Fixed phone contacts were therefore more efficient.

The samples were different in terms of interview length; interviews with the mobile phone respondents took almost 10% longer to complete; however, some caution is needed before concluding that mobile interviews systematically last longer than fixed phone interviews. The completion time issue must be linked with the pricing strategies in each country for mobile phone services. Whereas receiving a call on a mobile phone is free of charge in Portugal, as in most European countries as well as Australia and New Zealand, the subscriber of the mobile phone in countries such as US, Canada, Hong Kong, Singapore or China has to pay for received calls (OECD 2000); when the call originates an expense for the recipient, there is likely to be a tendency to rush responses and thus make mobile interviews shorter than those by fixed phone. As this question is closely linked to the specific conditions of mobile phone service in each country, it certainly warrants further investigation.

Significant differences were found in respondents' characteristics between the samples. Although the demographic differences between mobile and fixed phone respondents are expected to become less prevalent as mobile phones dissemination increases and extends to other specific subgroups, at present mobile phones ownership is more marked among young-

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er people, professionally active people and people either living alone or in families with children. This has a reflection on the composition of mobile phone samples.

Although there are some differences –some of them being disadvantages - to using mobile phones rather than fixed phones for collecting survey data, their use is likely to increase in the near future, both in the context of mixed-mode designs and in single mode designs. The coverage rate of fixed phone frames is likely to decrease even more as mobile phones continue to proliferate and this will surely be the main reason for bringing mobile phones to survey research. The challenge for survey methodologists will be to adapt old methods to this new survey mode, a domain that in the times ahead will be rich in investigation.

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