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Non-response bias in a lifestyle survey

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Summary

Background Monitoring health targets is often undertaken using questionnaire surveys of lifestyle risk factors. Non-response bias is recognized but rarely quantified.

Methods Following a questionnaire survey on a random sample of 6009 residents of Somerset with a response rate of 57.6 per cent, a telephone survey was undertaken on a random sample of 400 non-responders. A small number of the more important questions from the questionnaire were put to the non-responders over the phone.

Results Fifty-nine per cent of the sample were contacted and agreed to participate. Statistically significant differences between responders and non-responders to the original questionnaire were detected for current smoking, hazardous alcohol consumption and lack of moderate or vigorous activity.

Conclusions Lifestyle questionnaire surveys need to include an assessment of the non-response bias.

Keywords: non-response, bias, questionnaire, lifestyle

Introduction

Non-response to questionnaire surveys may potentially bias results, as those who respond to such questionnaires may differ in some systematic way from non-respondents.[1–3] Lifestyle surveys have been used for a decade in the United Kingdom with a variety of objectives. Some have been undertaken with the objective of setting baselines and monitoring trends. More recently, this has been done in the context of setting and monitoring targets as part of the *Health of the nation* initiative. Some surveys have set out to provoke health-promoting interventions either by making issues explicit or by motivating decision-makers. Finally, some lifestyle surveys have attempted to evaluate health promotion interventions although confounding variables usually make this difficult to achieve.

Lifestyle surveys also vary in scale and approach. The two main techniques are postal questionnaires and interviews. On a large scale, the Health Survey for England[4] used interviews, and many regional surveys such as those in Yorkshire and South East Thames[5] have used postal questionnaires. Many district based surveys, such as the one reported here, have been carried out, and in some areas more localized work has been undertaken, often as part of a community development approach.

Somerset Public Health Department carried out postal questionnaire lifestyle surveys of its residents in 1987 and 1992 as part of a process of setting and monitoring health targets. In 1992, non-response to the initial postal questionnaire was assessed.

Method

In 1992 a systematic random sample of 6009 16–64-year-old residents of Somerset health district was taken from the computerized Family Health Services Authority register. The survey was conducted using a postal questionnaire, and two written reminders were sent to non-respondents. The questionnaire consisted of 43 questions covering smoking habits, eating patterns, alcohol use, physical activity, previous medical history and demographic and socio-economic details.

Two methods were used to determine differences between responders and non-responders. First, routinely available data on age and gender were compared for responders, non-responders and the original sample. Second, an attempt was made to contact by telephone a random sample of 437 out of 2185 (20 per cent) non-responders to the postal questionnaire. Telephone numbers were obtained from the telephone directory, hospital records or general practitioner records. The enquiry sought basic details concerning whether a questionnaire was originally received; the smoking habits of the non-respondent; whether a diagnosis of hypertension has been made in the past; and a small number of questions on eating habits, alcohol use and physical activity. The telephone interview took less than five minutes.

Results

A total of 236 (54 per cent) of those in the sample of 437 were contacted and agreed to participate. For 79 (18 per cent) we were unable to find a telephone number and 122 (28 per cent)

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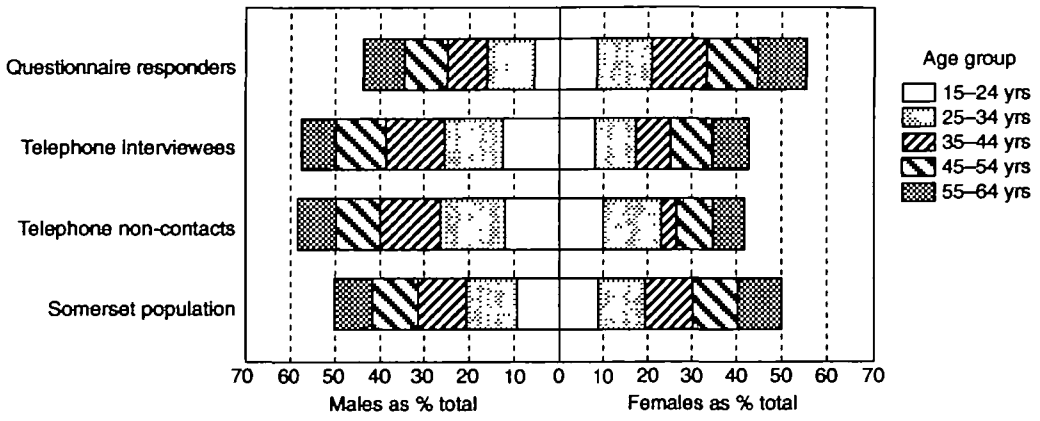


Figure 1 Gender–age groups of responders and non-responders; questionnaire responders, telephone interviewees and non-contacts compared with population of Somerset.

were unavailable or refused to take part. Figure 1 and Table 3 (below) show a comparison of the Somerset population, postal questionnaire responders, telephone interview responders and non-contacts (i.e. those non-responders we were not able to contact by telephone). As expected, the Somerset population, and hence the original sample, falls between the responders and non-responders.

The mean age for males who responded to the postal questionnaire was 40.4 years and for the telephone responders was 37.8 years [difference 2.5 years, 95 per cent confidence interval (CI) 0.1–5.0]. For females the mean ages were 40.1 and 39.0 years (difference 1.1 year, 95 per cent CI 1.6–3.9). Only two age–sex groups showed a significant difference between postal questionnaire responders and telephone interview responders. These were males aged 15–24 years, who were over-represented in the telephone responders, and females aged 35–44 years, who were under-represented.

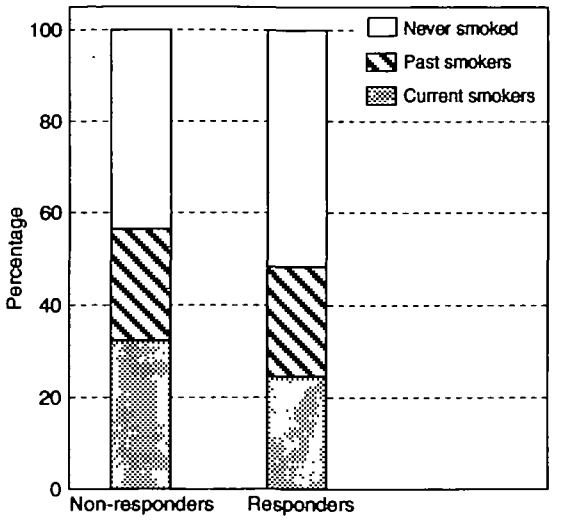
The survey identified statistically significant differences (Table 1) between responders and non-responders for current smoking (Fig. 2), hazardous alcohol consumption (Fig. 3; defined as over 21 units per week for men and over 14 for women) and lack of moderate or vigorous exercise. A greater proportion of non-responders had been told by their doctor that they had high blood pressure but this did not reach conventional levels of statistical significance. The differences for type of milk used and main type of bread used were not statistically significant.

Discussion

Non-response has long been an acknowledged problem for those who undertake population-based lifestyle surveys, particularly as many use postal questionnaires and achieve a response rate of between 50 and 70 per cent. For that reason, in

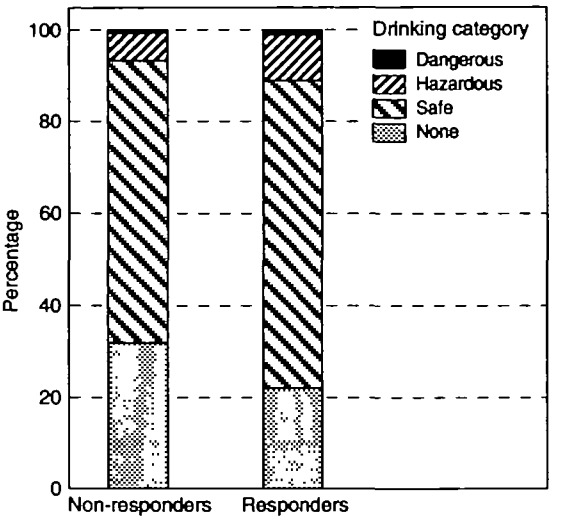
Table 1 Comparison of prevalence amongst questionnaire and telephone survey responders

	Prevalence (%) among questionnaire responders	Prevalence (%) among telephone interviewees	Difference	95% CI
Males				
Current smokers	24.4	34.1	9.7	1 4–18 0
Unsafe alcohol consumption	17.7	8.2	−9 4	−14.5 to −4.4
No moderate or vigorous activity	35.9	69.6	33.7	25.6–41.8
Told by doctor of high BP	14.6	16.3	1.7	−4.7 to 8.2
Females				
Current smokers	24.0	30.0	6.0	−3.2 to 15.2
Unsafe alcohol consumption	6.0	4.0	−1.9	−5.9 to −2.1
No moderate or vigorous activity	51 0	65.3	14.3	4.8–23.9
Told by doctor of high BP	16.7	25.7	9.0	0.3–17 1
Males and females				
Current smokers	24.2	32.3	8.1	2.0–14.3
Unsafe alcohol consumption	11.3	6.4	−4.9	−1.6 to −8.2
No moderate or vigorous activity	44.3	67 8	23.5	17.3–29.7
Told by doctor of high BP	15.8	20.3	4.6	−0.7 to 9.9



43.8	51.5	Never smoked
23.8	24.3	Past smokers
32.3	24.2	Current smokers

Figure 2 The 1992 lifestyle survey – cigarette smoking. Comparison between responders and non-responders.



0.9	1.3	Dangerous
5.6	10.0	Hazardous
62.0	67.0	Safe
31.6	21.7	None

Figure 3 The 1992 lifestyle survey – alcohol consumption. Comparison between responders and non-responders.

our 1992 survey, we attempted to assess the impact of non-response on the results of the postal questionnaire. Only 54 per cent of the follow-up sample of questionnaire non-responders were able to be contacted and agreed to answer a limited number of sentinel questions by telephone. These answers indicate significant differences between responders and non-responders for some of the key lifestyle risk factors.

The differences lead us to revise our population prevalence of the risk factors, and the changes are shown in Table 2. The revised figures are simply calculated by applying the proportion of sampled non-responders with a particular attribute to the whole population of non-responders, and then adding this (estimated) number to that found in the responders. In effect, this is a method of weighting where original respondents are given a weight of one and interviewed non-responders are given

Table 2 Population prevalence adjusted for non-response

	Prevalence (%) among questionnaire responders	Prevalence (%) among telephone interviewees	Population prevalence adjusted for non-response
Males			
Current smokers	24 4	34.1	29.0
Unsafe alcohol consumption	17.7	8.2	12.7
No moderate or vigorous activity	35.9	69 6	51.9
Told by doctor of high BP	14.6	16.3	15.0
Females			
Current smokers	24.0	30.0	26.2
Unsafe alcohol consumption	6.0	4.0	4.9
No moderate or vigorous activity	51.0	65.3	56.1
Told by doctor of high BP	16.7	25.7	19.5
Males and females			
Current smokers	24.2	32.3	27.6
Unsafe alcohol consumption	11.3	6.4	8 8
No moderate or vigorous activity	44.3	67.8	54.0
Told by doctor of high BP	15.8	20.3	17.2

Table 3 Percentage in each ten-year age group by three survey groups and Somerset population 1992

	Questionnaire responders	Telephone interviewees	Telephone non-contacts	Somerset population
Males 15–24	7.0	13.1	12.5	9.5
Males 25–34	9.1	12.7	14.0	11.0
Males 35–44	10.2	13.1	13.5	10.8
Males 45–54	9.7	11.8	10.0	10.5
Males 55–64	8.9	6.8	8.5	8.5
All males	44.9	57.5	58.5	50.3
Females 15–24	8.3	8.4	10.0	8.7
Females 25–34	12.4	9.3	13.0	10.6
Females 35–44	12.3	7.6	3 5	10.8
Females 45–54	11.7	9 7	8.5	10.6
Females 55–64	10.4	7 6	6.5	9.0
All females	55.1	42.6	41.5	49.7
Total	100.0	100.0	100.0	100.0

a weighting of 9.25. This also results in increased confidence intervals.

Although these changes are marked, they may be an overestimate or an underestimate of the true population values. It is possible that those not contacted in the telephone survey have a prevalence of lifestyle risk factors greater than those who respond to the telephone questionnaire.

The differences between responders and non-responders for current smoking are as expected and in line with those reported by Bostram *et al.*[1] and Smith and Nutbeam[3] as a result of a similar studies. Although Smith and Nutbeam[3] found no significant difference in activity, in our study the difference for physical activity is much more marked, particularly in males. Perhaps it makes less difference as far as public health action is concerned – even a 44.3 per cent level of lack of moderate or vigorous activity demands extensive action from the health authority and its partners. More surprising is the statistically significant lower level of hazardous drinking amongst male non-responders. This may be a chance finding but cautions us against believing that non-responders always have a less healthy lifestyle than responders.

An alternative possibility is that all or some of the differences may result from the instrument by which the questions were delivered. There could be more or less dishonesty on the telephone compared with a questionnaire. The only study we could find reported 'no conclusive evidence that response differences resulted'.[6]

A final possibility is that the result is due to differences in the age–sex structure of the questionnaire responders group and the telephone interview group. The telephone sample is too small to deal with separate age–sex groups adequately but it seems an unlikely explanation, as the group with the highest percentage of drinkers over recommended limits was males aged 15–24 years, who were over-represented in the telephone survey.

The aim with any postal questionnaire survey is to achieve the highest response rate possible. Lifestyle surveys seem to present particular difficulties in this regard. Potential sampling frames are scarce. As a working tool, they tend not to be particularly accurate and the researcher has little opportunity to refine it. Also, lifestyle questionnaires tend to be lengthy and therefore uninviting, and as more questionnaire surveys about health are used 'survey fatigue' may be developing. A response rate of less than 60 per cent is therefore disappointing but not surprising.

A low response rate obliges those undertaking the postal survey to make some assessment of non-response. Often this is not undertaken, perhaps because the additional accuracy offered is not considered to be worth the additional cost, which can be considerable.

General practice recording is often cited as an alternative to lifestyle questionnaires, but does not include either the whole population or a suitably random sample from it. It offers an alternative for some health needs assessment but not for lifestyle or population risk factors.

These findings suggest that lifestyle questionnaire findings which do not take into account non-response should be treated with caution, and an assessment of the characteristics of non-responders should be made. This will allow the survey results to be used with more confidence – an important concern when attempting to persuade decision-makers of the need for action.

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