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ORIGINAL RESEARCH

Factors influencing the response to postal questionnaire surveys about respiratory symptoms

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Abstract

Background: Response rates to postal questionnaires have been falling in recent years.

Aim: To examine factors affecting the response to five postal respiratory questionnaire surveys.

Design: Cross sectional study.

Setting: General practice.

Method: Five surveys were conducted in all adults registered with two UK general practices using an ECRHQ-based questionnaire, with two reminders at 4-week intervals.

Results: Response rates declined over time (1993 - 71.2%; 1995 - 70.5%; 1999 - 65.5%; 2001 - 65.3%; 2004 - 46.9%). Age and gender of non-responders were available for 2001 and 2004: responders were older (mean 48.8 years vs 37.6, p<0.001; 50.5 vs 38.8, p<0.001) and more likely to be female (54.9% vs 44.9%, p<0.001; 55.3% vs 48.5%, p<0.001). The response rate was increased by 18% (2004) and 23% (2001) by the use of two reminders. Early responders were older and more likely to be females, but were less likely to smoke than late responders after reminders. There was no important association between respiratory symptoms and associated feature prevalence and stage of response.

Conclusion: Declining response rates may represent reduced motivation and reluctance to share personal information. Qualitative exploration of late/non-response could help reduce bias when planning and analysing such surveys. The use of two reminders is an important factor in improving response.

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Background

Postal surveys are a popular and cheap way of conducting epidemiological studies, especially studies of symptom and disease prevalence. Such information is relatively easily obtained using standardised questionnaires, and the cost-efficiency is high in comparison with other techniques such as telephone and face-to-face surveys. However, the information yielded is subject to bias from a range of sources – most notably selection bias.[1] In order to assess whether there is selection bias, and whether results are representative of the whole population, two main factors must be considered: firstly, the response rate, which has been defined as the number of completed and partially completed questionnaires divided by the number of eligible sample units (subjects);[2] and secondly, the extent to which non-responders differ systematically from the study population.[2,3]

Response rates may be affected by factors related to the questionnaire or to population characteristics and mobility. Thus, important factors include questionnaire wording, sequencing, and questionnaire appearance and the use of reminders. Potential responders must have the means and the will to complete the questionnaire, which must have relevance and be of interest to them.[1,4]

The present study is based on the Wythenshawe

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Community Asthma Project (WYCAP), a survey concerning the natural history of respiratory symptoms in two general practice populations over a period of 11 years.[5] It examines trends in response and associated factors to a series of postal respiratory questionnaire surveys.

Method

Between 1993 and 2004, five postal questionnaire surveys were conducted in all adults (aged over 16 years) registered with two general practices situated in South Manchester, in an area with high rates of socioeconomic deprivation.[6] The same two practices have formed the sampling frame for all five surveys, with the data being combined for all analyses. The core questionnaire was based on the European Community Respiratory Health Questionnaire (ECRHQ).[7] The core questions and their format remained constant; however, in 1999, 2001 and 2004 a short generic health-related quality of life questionnaire (EQ-5D[8]) was also included. On each occasion individually addressed letters from the general practitioner (GP) were sent with reply paid envelopes. No compensation was offered for participation. Non-responders were sent two reminders after four and eight weeks which differed only with regard to the wording of the accompanying letter. Those who had still not replied included those no longer living at the mailing address (ghost patients, 'ghosts') and those still at the address and failing to reply (true non-responders). To estimate the proportion of ghost patients in these populations, for the first survey only, a 5% random sample of non-responders was taken. Subjects whose names did not appear on the electoral register of 1993, and whose names were not in the telephone directory and who had no record of a consultation with the primary care team in the previous year, were classed as ghosts. The proportion of ghosts for the whole population, extrapolated from this sample, was 5.4%, and an adjusted response rate was calculated by reducing the denominator accordingly.[9] The same proportion of ghosts was assumed for the subsequent surveys. Ordinal regression analysis with age, gender and smoking status as predictors was used to examine differences between responders according to whether they replied to the initial mailing or to a first or second reminder. Multiple logistic regression, adjusting for age, smoking and gender, was used to examine associations between the prevalence of respiratory symptoms and risk factors, and stage of response. Generalised Estimating Equations (GEE) were used to confirm the findings of earlier analyses – allowing for the overlap between the populations eligible for the 2001 and 2004 surveys – and a regression model was constructed to investigate the effect of repeated requests for participation in multiple surveys on response rates to these surveys. The GEE approach was used so that the model would take account of the within-subject correlation inherent in such repeated measures data.

Results

Crude and adjusted response rates are shown in Table 1. Overall, response rates decreased significantly over time, from 71.2% (adjusted 75.3%) in 1993 to 46.9% (49.6%) in the last survey in 2004 (p<0.001).

Age and gender of both responders and non-responders were only available for the 2001 and 2004 surveys. In both, responders were significantly older and more likely to be female than non-responders (p<0.001), with the difference in age appearing to widen over time (Table 2). The survey included all patients registered with the two general practices; thus, 77.2% (8503/11020) of those contacted in 2004 had also been sent the questionnaire in the 2001 survey. Separate analysis to include only those subjects eligible for both studies showed significant trends (p<0.001) in age and gender according to the number of surveys to which they responded (Table 3). The mean age of non-responders was almost 16 years younger, and the proportion of females was 13% lower, than in those who completed questionnaires on both occasions.

First reminders increased response rates by 16% and 10% respectively in the 2001 and 2004 surveys, and a second reminder added a further 7% to each survey (Table 4).

Table 1. Response rates by year of survey.

Year	Number sent	Number received	Percentage response rate (adjusted for ghosts)
1993	11206	7981	71.2 (75.3)
1995	10429	7357	70.5 (75.0)
1999	10581	6944	65.6 (69.4)
2001	10470	6835	65.3 (69.0)
2004	11020	5169	46.9 (49.6)

Table 2. Age and gender of responders and non responders in 2001 and 2004.

	Responders	Non-responders	
Mean age (SD) 2001	48.5 (19.4)	37.6 (16.3)	p<0.001
Mean age (SD) 2004	50.5 (19.2)	38.8 (16.6)	p<0.001
Number (%) female 2001	3753 (54.9)	1631 (44.9)	p<0.001
Number (%) female 2004	2861 (55.3)	2836 (48.5)	p<0.001

Table 3. Response among those eligible for both 2001 and 2004 surveys.

	Non-responders	Responded to 1 survey	Responded to 2 surveys	p for trend
Number	2203	2640	3660	
Mean age (SD) 2004	40.3 (13.8)	44.9 (16.8)	56.0 (17.8)	p<0.001
Number (%) female	940 (42.7)	1372 (52.0)	2048 (56.0)	p<0.001

Table 4. Response rates related to reminders.

	2001 [10470 eligible]		2004 [11020 eligible]	
	Number (%) responding	Cumulative %	Number (%) responding	Cumulative %
Initial mailing	4377 (64.0)	41.9	3221 (62.3)	29.2
First reminder	1708 (25.0)	58.1	1082 (20.9)	39.0
Second reminder	750 (11.0)	65.3	866 (16.8)	46.9
Total	6835		5169	

Comparison of responders according to whether they replied to the initial mailing or to a first or second reminder (Table 5), showed that early responders were significantly older than those who only replied after the first reminder, who in turn were older than those who only responded to the second reminder (p for trend <0.001). There were also significant trends in gender and the proportion of current smokers; those who responded to the first mailing showed a significantly higher proportion of females and less smokers than late responders. Those responding only to the second reminder had characteristics closer to non-responders than to first time responders.

There was no important association between the prevalence of respiratory symptoms and associated features and stage of response (Table 6).

Further analyses were carried out on the 2001 and 2004 survey data using the Generalised Estimating Equations (GEE) approach in order to take account of the overlap between the populations eligible for these surveys. Using data available for both responders and non-responders (17006 records from 8503 individuals), this confirmed the earlier finding that individuals were less likely to respond if they were male (odds ratio (OR) 0.41, 95% confidence interval (CI) 0.32 – 0.52), or if the year of survey was 2004 (OR 0.34, 95% CI 0.31 – 0.36). However, older individuals were more likely to respond (OR for one year increase in age 1.036, 95% CI 1.032 – 1.039). There was also an interaction between gender and age (OR 1.010, 95% CI 1.005 – 1.014), in that the lower response rate for males improved with age.

In order to examine the potential effect of repeated requests for participation in multiple surveys on the response rates in 2001 and 2004, a regression model was constructed including only those assumed to be eligible for all surveys and aged over 27 at the time of the first survey (14301 records from 70404 individuals). Male gender was still associated with a lower likelihood of response (OR 0.40, 95% CI 0.29 – 0.54), as was survey 2004 compared to 2001 (OR 0.34, 95% CI 0.32 – 0.36). Older individuals were more likely to respond (OR for one year increase in age 1.023, 95% CI 1.010 – 1.022) and the age/gender interaction remained significant (OR 1.016, 95% CI 1.010 – 1.022). The number of previous surveys (1993, 1995 and 1999) to which an individual responded was positively associated with the likelihood of response in 2001 or 2004 (OR 2.02, 95% CI 1.94 – 2.10).

The relationships between stage of response (initial contact, first reminder or second reminder) identified previously were also examined among the selected group of

Table 5. Differences between responders according to stage of response (initial mailing, 1st reminder, or 2nd reminder).

	Initial mailing	First reminder	Second reminder	p for trend*	Non responders
Mean age (SD) 2001	51.9 (19.6)	45.2 (18.4)	40.4 (16.4)	p<0.001	37.6 (16.3)
Mean age (SD) 2004	53.4 (19.2)	49.2 (19.1)	44.1 (17.2)	p<0.001	38.8 (16.6)
Number (%) female 2001	2456 (56.1)	918 (53.7)	379 (50.5)	p = 0.023	1631 (44.9)
Number (%) female 2004	1808 (56.1)	582 (53.8)	471 (54.4)	p = 0.86	2836 (48.5)
Number (%) smokers 2001	1312 (32.9)	665 (42.7)	346 (49.6)	p<0.001	
Number (%) smokers 2004	835 (34.2)	345 (41.0)	323 (44.6)	p<0.001	

*Ordinal regression analysis with age, gender and smoking status as predictors

Table 6. Number (%) reporting key respiratory symptoms and associated factors by stage of response.

	Initial mailing	First reminder	Second reminder	p for trend*
Wheeze 2001	1451 (33.9)	586 (34.9)	229 (31.1)	p = 0.066
Wheeze 2004	1081 (35.2)	363 (35.2)	277 (33.4)	p = 0.24
Chest tightness 2001	877 (20.4)	366 (21.7)	148 (19.9)	p = 0.42
Chest tightness 2004	668 (21.1)	254 (23.9)	193 (22.5)	p = 0.38
Shortness of breath 2001	610 (14.2)	251 (14.9)	94 (12.7)	p = 0.33
Shortness of breath 2001	448 (14.2)	162 (15.3)	134 (15.7)	p = 0.75
Cough 2001	1536 (35.6)	631 (37.4)	242 (32.6)	p = 0.05
Cough 2004	1034 (32.7)	365 (34.3)	295 (34.6)	p = 0.96
Family history asthma 2001	1966 (45.9)	794 (47.3)	367 (49.3)	p = 0.08
Family history asthma 2004	1412 (44.8)	472 (44.8)	421 (49.4)	p =0.43
Hayfever/eczema 2001	1204 (28.1)	467 (27.9)	192 (25.8)	p = 0.004
Hayfever/eczema 2004	959 (30.6)	328 (31.2)	264 (31.5)	p=0.17

* Multiple logistic regression, adjusting for age, smoking and gender

individuals who responded to at least one survey in 2001 or 2004. Gender was not a significant predictor of stage of response in the model. Smokers were more likely than non-smokers to respond only after they had been sent a reminder (OR 1.32, 95% CI 1.19 – 1.47), and late response rates were greater in 2004 (OR 1.29, 95% CI 1.17 – 1.42). However, older individuals were less likely to require a reminder (OR for one year increase in age 0.981, 95% CI 0.977 – 0.984). The number of previous surveys to which an individual responded was associated with a lower likelihood of requiring a survey reminder (OR 0.74, 95% CI 0.71 – 0.79).

Discussion

The results presented here provide evidence of a decline in survey response within a population over time. The use of reminders after four and eight weeks increased response rates by up to 16% and 7% respectively. Responders were older and more likely to be female than non-responders. There were similar differences when comparing first-time responders with those replying only to reminders. Characteristics of late responders were closer to those of non-responders than those of subjects who replied to the first mailing. The absence of any important association between the stage of response and respiratory symptoms, taking into account the trend for smokers to reply later, indicates that there is unlikely to have been a significant level of response bias when considering the prevalence of respiratory morbidity. This supports earlier findings from the English participants in the ECRHS.[10]

The differences in response by age and gender appear to have widened over time – but there are data only from two observation points, and some individuals were included in both surveys. Similar results were obtained when only those respondents eligible for both surveys were considered and when further analyses were conducted using the GEE approach, suggesting that this finding is unlikely to be artefactual. Although there were some changes to the questionnaires used in these surveys, the core questions remained the same, and the most marked drop in response rate did not occur at the same time as modifications were introduced.

Response rates to mailed surveys has long been a problem[11] and has been decreasing over time in general surveys.[12,13] The cause of this decline is likely to be multifactorial, and may have some similarities to other reductions in participation, e.g. turnout at elections. Such factors may include survey fatigue brought on by an increase in the number of surveys being conducted and an increase in the amount of unsolicited mail being received. Reduced motivation to take part may be associated with a reluctance to reveal personal information and an increased need/awareness of privacy. In addition, individuals and families have become more mobile, potentially resulting in inaccuracies of address details. In order to determine a true response rate it is important to correct for ghost patients – i.e. those no longer living at the address to which the questionnaire was sent. The estimate of 5.4% 'ghosts' was obtained from the first survey and has been assumed to remain the same over the whole observation period. This estimate also assumes that moving home is equally likely to occur among all groups of subjects and is independent of other causes of non-response. It is, however, likely to be a conservative figure.

Abolition of the monopoly of telephone service provision and changes to the public availablility of the full electoral roll mean it is impossible to re-estimate the prevalence of 'ghosts' with comparable parameters. Estimates of the proportion of 'ghosts' among non-responders have varied considerably and were up to 25% in studies in North East England.[9,14,15] Were there to have been an actual rise in the prevalence of ghost patients, our results would in fact underestimate the decline in survey response rates.

Sender recognition may be a further factor affecting response.[16] The fact that the questionnaires in the present study were sent with a personal letter of invitation from the GP may have helped to increase the response rates, although the decline over time may be a reflection of a decrease in the sense of responsibility to society and the health service which was seen in earlier generations.

Two general practices, both multi-partner and situated in a suburban area with socioeconomic deprivation, have been included in all five surveys. The data have been combined throughout, since the aim of the analyses was to examine changes in response over time rather than any associations between response rates and practice characteristics. It is, of course, possible that practice characteristics may have contributed to the decline in response rates over time.

Crude comparison of response rates between different surveys is likely to be misleading, since the adequacy of the response rate to a particular survey can only be judged by whether or not it was sufficiently high to suggest that there was no significant response bias in that particular survey. However, other studies using similar questionnaires have reported similar response rates. The UK arm of the original European Community Respiratory Health Survey is the closest comparable study, and reported a rate of approximately 60%. A review of US mail surveys reported in medical journals (all morbidities) reported a mean response rate of approximately 60% but with a wide tolerance of ±20%.[17]

Strategies to counteract the decline in response rate are necessary if epidemiological data obtained via surveys are to continue to be representative. It may be necessary to pursue potential respondents more aggressively[12,18] but this has both ethical and cost implications. The reluctance to reveal telephone contact details, and the frequency with which these change, renders telephone reminder strategies largely impractical in general practice. The provision of incentives to respond has been explored as a way of maximising response rate, but this may alienate some potential participants (thereby introducing bias) and may lead to a situation where an incentive is expected. Mailed reminders remain the standard method of maximising response rate to postal surveys,[2,19,20] although this has not been a universal finding.[21,22] In the present study, first reminders increased response rates by 10 to 16% and second reminders by a further 7%. Stratified sampling (targeting) of groups known to be less likely to respond is undertaken in some national and commercial surveys, but this presents additional difficulties with analysis in population-based methods designed to examine prevalence.

Issues regarding consent to participate in NHS research were explored in a Scottish study,[23] revealing serious implications for this kind of research if prior agreement to be approached is required. Agreement to be approached for research (keeping the option to decline consent) as a part of the 'contract' for receiving/providing NHS healthcare would allow the wider re-use of information and would substantially improve the accuracy of epidemiological research. However, careful regulation would still be required to ensure that individuals were not over-burdened.

This study was only able to compare early and late responders using a limited number of variables, principally due to the fact that the questionnaire was designed to be as brief as possible, with the hope of maximising the response rate. Attempting to make contact with non-responders – to ascertain why they chose not to respond – provides valuable information, but is difficult owing to the fact that initial non-responders are by nature more difficult to contact and less likely to respond to further enquiries. A request to explain refusal to participate was not found to affect significantly the response rate in either direction.[24]

Although the results presented here provide reassurance of the absence of significant response bias affecting the reporting of respiratory symptoms and associated features, the apparent reluctance of smokers to respond requires further investigation. Qualitative exploration of the reasons for late and non-response will enable potential response bias to be taken more fully into account when planning such surveys, as well as when analysing results. Reversing the downward trend in willingness to participate in such surveys is important to ensure that healthcare planning decisions made on the basis of survey results are adequately patient-centred.

Conclusion

Declining response rates may represent reduced motivation and reluctance to share personal information. Late responders are similar to non-responders, but there was no evidence of significant response bias in the reporting of respiratory symptoms and associated factors (hay fever/eczema and family history). Qualitative exploration of late and non-response could help reduce bias when planning and analysing such surveys.

Conflicts of interest

M Hazell has received a fee from Boehringer Ingelheim for speaking and travel grants from GSK, Boehringer Ingelheim and MSD.
J Morris has no conflicts of interest.

What is already known about this topic

- Postal questionnaires are widely used in the collection of epidemiological data.
- Non-response reduces the effective sample size and can introduce bias.
- Response rates in postal studies have been falling for several years, although reports of temporal trends in the same population are scarce.

What this study adds

- The present study confirms falling response rates in two general practice populations observed over an 11-year period.
- The use of two reminders was an important factor in maximising response rates.
- Age, gender and smoking habits of subjects were prognostic factors in assessing response.
- Qualitative exploration of late and non-response is needed to aid in the planning and analysis of future surveys.

Policy implications

- Postal questionnaire surveys should include provision for the sending of two reminders.
- Increasing the willingness of patients to participate in surveys is necessary to reverse the downward trend in response rates over time.

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