

Not another questionnaire! Maximizing the response rate, predicting non-response and assessing non-response bias in postal questionnaire studies of GPs

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Background. Non-response is an important potential source of bias in survey research. With evidence of falling response rates from GPs, it is of increasing importance when undertaking postal questionnaire surveys of GPs to seek to maximize response rates and evaluate the potential for non-response bias.

Objectives. Our aim was to investigate the effectiveness of follow-up procedures when undertaking a postal questionnaire study of GPs, the use of publicly available data in assessing non-response bias and the development of regression models predicting responder behaviour.

Method. A postal questionnaire study was carried out of a random sample of 600 GPs in Wales concerning their training and knowledge in palliative care.

Results. A cumulative response rate graph permitted optimal timing of follow-up mailings: a final response rate of 67.6% was achieved. Differences were found between responders and non-responders on several parameters and between sample and population on some parameters: some of these may bias the sample data. Logistic regression analysis indicated medical school of qualification and current membership of the Royal College of General Practitioners to be the only significant predictors of responders. Late responders were significantly more likely to have been qualified for longer.

Conclusions. This study has several implications for future postal questionnaire studies of GPs. The optimal timing of reminders may be judged from plotting the cumulative response rate: it is worth sending at least three reminders. There are few parameters that significantly predict GPs who are unlikely to respond; more of these may be included in the sample, or they may be targeted for special attention. Publicly available data may be used readily in the analysis of non-response bias and generalizability.

Keywords. General practice, non-response, postal questionnaire, response rate.

Introduction

Surveys of GPs' activities, attitudes and knowledge are an accepted part of clinical governance, educational

planning and needs assessment. To be useful, they must be returned in sufficient numbers: maximizing response rates is an important aspect of the total design of a survey.^{1,2} The degree of non-response bias depends essentially on two factors: the percentage of the sample not responding and the extent to which non-responders differ systematically from the study population.

Many of the behaviours and attitudes of interest to survey researchers correlate strongly with willingness to participate in research.³ The perceived salience of the subject matter is a strong predictor of response.^{4,5} Studies of GPs have identified correlations between non-response and lack of activity⁶ or lack of interest^{7–9} in

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the study area. This suggests that non-response may be biased in ways directly related to the purpose of a study.

Response rates in GP studies have been falling for many years.¹⁰ A review of published GP studies reported a mean response rate of 61%,⁶ and pointed out that the true situation is probably much worse, because surveys with low response rates are less likely to be accepted for publication. As the national policy of a primary care-led NHS has developed over recent years, GPs have been given an increasing role in service planning and provision: it is of concern, therefore, that response rates from GPs have been falling.^{7,11}

GPs have many reasons for not responding to questionnaires.¹² Many perceive a rising tide of questionnaires that they are too busy to complete.^{13,14} More than half of the non-responders contacted in one study indicated that the questionnaire had become lost in a pile of paperwork, or that they were too busy with other work.¹⁵ While practices may receive on average 16–24 research requests annually, only 20% of these come from academic or service general practice. The remaining 80% are largely commercial and satisfaction surveys.^{16,17}

The best predictor of response in surveys of the general public is the number of follow-up mailings.^{4,5} While standard advice in GP studies,^{12,15} the optimal number and timing of such mailings have been little studied.

Non-response is likely to persist, despite the best endeavours of total survey design.¹ Only on very rare occasions have all GP non-responders been persuaded to respond.⁷ One approach is the non-response survey, in which a survey of a sample of non-responders is undertaken, seeking to coax them into completing abbreviated forms of questionnaires often by telephone.¹⁸ Statistical corrections to the original data may then be made on the basis of the characteristics and responses of this subgroup of non-responders. The question remains, however, of how representative this subgroup is of non-responders as a whole.

An alternative approach in the assessment of non-response bias is the use of publicly available data,³ which permits a comparison of all responders and non-responders on a number of demographic variables. These variables may also be of use in the prediction of non-response from previously developed statistical models, thus permitting better focused follow-up of non-responders. Similarly, sample responders may be compared with publicly available data on the population studied, to permit evaluation of the generalizability of data from responders.

This study of GPs in Wales addressed the above issues and also offered the opportunity to investigate the effect of practice area deprivation on GP response. The valleys of South Wales have a long history of social deprivation, with high levels of unemployment since the closure of the coal and iron industries over the last 20 years. Furthermore, the 1991 census revealed that the valleys contain all of the nine areas of Britain with the highest

rates of chronic ill health. Many valleys GPs are approaching retirement age, and recruitment is proving increasingly problematic. The area is thus one of the most challenging and difficult for primary care in the UK.

From a postal questionnaire study of GPs in Wales, we report:

- (i) The effectiveness of follow-up procedures.
- (ii) The use of available data in assessing non-response bias and in the development of regression models predicting response behaviour.

Method

A sampling frame of all the GP principals in Wales was drawn up from lists supplied by Health Authorities. To permit comparison of valleys and non-valleys GPs, power calculations indicated that at least 100 responders would be needed from each area to obtain 80% power to detect a 20% difference between groups at an alpha level of 0.05. A lower response rate was anticipated from valleys GPs. The sampling frame was therefore stratified, and disproportionate random samples drawn from the two strata: 62.5% (200/320 valleys) and 28.2% (400/1416 non-valleys).

Of this sample of 600, 10 were ineligible (retired, sick leave, etc.), leaving a sample of 590 GPs who were sent a questionnaire investigating their training and knowledge in palliative care. Following standard survey methodology,^{1,2} the questionnaire was brief (limited to the four sides of a sheet of folded A3 paper), and had been used previously.¹⁹ Covering letters were addressed individually and personally signed²⁰ by four members of the research team. A stamped addressed return envelope was enclosed. Incentives offered^{21,22} were 1 hour Post-Graduate Education Allowance (PGEA) for all responders, and a crate of wine (or equivalent in garden tokens) for one randomly selected responder: research team members personally funded the latter.

A cumulative frequency plot (Fig. 1) was used to identify the point at which to send out follow-up mailings: each comprising a personalized covering letter, a copy of the questionnaire and a stamped addressed return envelope. A final mailing was sent on working day 61, with a brief scanned handwritten covering note that overtly appealed for more replies: "... the study just needs some more [replies] to push the response rate up to make this a powerful study."

Non-response bias was assessed by the use of publicly available data that permitted the comparison of responders and non-responders according to seven demographic variables. Gender, medical school and year of qualification were obtained from the Medical Register,³ practice location and number of partners from Health Authority lists, trainer status from the Regional Postgraduate office and current membership of the Royal College of

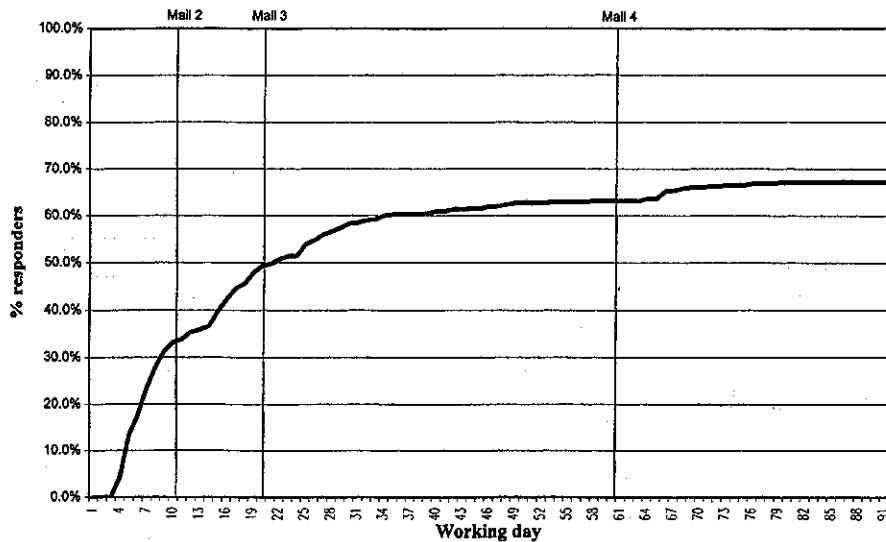


FIGURE 1 Cumulative response rate (%)

General Practitioners (RCGP) from the members' reference book.²⁴ (The Medical Register does not list MRCGP. While the Medical Directory does list MRCGP, it is incomplete as there are no data concerning the 25% of doctors who do not reply to the annual questionnaire. The RCGP members' reference book only lists current members of the college, and does not include those whose membership has lapsed.) The age of GPs is not publicly available. Some of these variables have been identified previously as characteristics of non-responders.^{10,11}

Generalizability may be assessed by comparison of responders with publicly available data concerning the national GP workforce.²⁵ Aggregate data concerning medical school and year of qualification are not available.

Parametric or non-parametric statistical analyses as appropriate were conducted using SPSS for Windows Version 10.0. Chi-squared tests reported below have one degree of freedom, and when appropriate use Yates's correction.

Results

The first three mailings on working days 0, 11 and 20 generated 218 (36.9%), 88 (14.9%) and 67 (11.4%) replies, respectively (Fig. 1). The final mailing generated a further 26 replies, raising the response rate by 4.4% to 67.6%. The response rate from non-valleys GPs (70.8%, 279/394) was significantly greater than that from valleys GPs (61.2%, 120/196; Fisher's exact test $P = 0.020$).

When compared with the national GP workforces, responders were similar in terms of gender and trainer status (Table 1). They were less likely to work in single-handed or small practices, and were more likely to be under 45 years of age.

Table 2 summarizes the univariate analysis of responder behaviour at two levels of analysis:

- (i) respond to any of the four mailings versus never respond: (respond/never respond); and
- (ii) respond to first mailing versus not respond to first mailing but respond to any one of the follow-up mailings: (early respond/late respond).

For model 1 (respond versus never respond), there was no significant difference between responders and non-responders in terms of gender or mean number of practice partners. Responders are significantly more likely to be GP trainers, graduates of Cardiff or other UK medical schools, members of the RCGP and more recently qualified: these four variables were therefore entered into the logistic regression analysis. (While responders were significantly more likely to work in non-valleys practices, this variable was not entered into the regression analysis, as it is specific to Wales: the aim was to develop a general model for the UK population of GPs.)

For model 2 (early respond versus late respond), early responders are significantly more likely to be graduates of Cardiff or other UK medical schools and to be more recently qualified: only these two variables were entered into the logistic regression analysis.

Having identified potential predictor variables in the univariate analysis above, a logistic regression analysis was undertaken, using the 'forward stepwise' procedure, the results of which are shown in Table 3.

Only two variables were significant predictors of response in model 1: non-UK graduates ($P < 0.001$) and current membership of the RCGP ($P = 0.001$). Thus, independently of all the other variables, non-UK graduates are approximately one-third as likely to respond to any mailing as graduates from the rest of the UK medical schools (the reference group). Cardiff graduates did not

TABLE 1 Sample compared with available data for GPs in Wales, and England and Wales

	Sample (n = 399)	Wales (less sample) (n = 1346)		England and Wales (less sample) (n = 28 222)	
Age group					
<35	63 (16.2%)	228 (16.9%)		4304 (15.3%)	
35-39	83 (21.3%)	289 (21.5%)		5730 (20.3%)	
40-44	95 (24.4%)	226 (16.8%)	chi square = 13.77	5156 (18.3%)	chi square = 13.43
45-49	58 (14.9%)	226 (16.8%)	d.f. = 5	4935 (17.5%)	d.f. = 5
50-54	43 (11.0%)	203 (15.1%)	P = 0.017	3862 (13.7%)	P = 0.020
55+	48 (12.3%)	174 (12.9%)		4214 (14.9%)	
Gender					
Male	285 (71.4%)	1017 (76.1%)	P = 0.065*	19 958 (70.7%)	P = 0.782*
Female	114 (28.6%)	320 (23.9%)		8270 (29.3%)	
Trainer					
Yes	56 (14.0%)	203 (12.1%)	P = 0.311*	3419 (12.1%)	P = 0.247*
No	343 (86.0%)	1477 (87.9%)		24 803 (87.9%)	
Practice size					
1 partner	22 (5.5%)	122 (9.1%)	P = 0.023*	2863 (10.1%)	P = 0.002*
2+ partners	377 (94.5%)	1224 (90.9%)		25 725 (89.9%)	
1-3 partners	114 (28.6%)	466 (34.6%)	P = 0.025*	10 768 (38.1%)	P < 0.001*
4+ partners	285 (71.4%)	881 (65.4%)		17 464 (61.9%)	

*Fisher's exact test.

TABLE 2 Univariate analysis of potential predictor variables

	1. Respond/never respond			2. Early respond/late respond		
	Respond	Never respond		Early respond	Late respond	
Gender						
Male	285 (67.2%)	139 (32.8%)		159 (55.6%)	126 (44.4%)	
Female	114 (68.7%)	52 (31.3%)	P = 0.770*	60 (52.2%)	54 (47.8%)	P = 0.579*
GP trainer						
No	343 (65.7%)	179 (34.3%)		181 (52.9%)	162 (47.1%)	
Yes	56 (82.4%)	12 (17.6%)	P = 0.006*	36 (55.5%)	20 (34.5%)	P = 0.108*
Medical school						
Cardiff	158 (72.1%)	61 (27.9%)	$\chi^2 = 33.405$	85 (53.5%)	73 (46.5%)	$\chi^2 = 6.213$
Rest of UK	185 (74.3%)	64 (25.7%)	d.f. = 2	111 (59.8%)	74 (40.2%)	d.f. = 2
Non-UK	56 (45.9%)	66 (54.1%)	P < 0.001	23 (41.1%)	33 (58.9%)	P = 0.045
MRCGP						
No	222 (60.3%)	146 (39.7%)		112 (50.7%)	110 (49.3%)	
Yes	177 (79.7%)	45 (20.3%)	P < 0.001*	106 (59.7%)	71 (40.3%)	P = 0.085*
Mean years qualified	19.9	23.2	P < 0.001**	19.1	20.9	P = 0.026**
Mean no. of partners	4.5	4.2	P = 0.123**	4.6	4.3	P = 0.132**

*Fisher's exact test; ** independent samples t-test.

differ significantly from the rest of the UK graduates. Current members of the RCGP are approximately twice as likely to respond as non-members. None of the other variables are of value in predicting responder/non-responder behaviour.

Among GPs who do respond (model 2), the only significant predictor of responding to the first mailing versus the reminders is years since qualification ($P = 0.006$). The greater the number of years qualified, the less likely

a GP is to respond to the first mailing. Very similar results were obtained when the logistic regression was repeated, using a weighting procedure in the statistical package STATA, to take into account the disproportionate sampling strategy. The unweighted results obtained in SPSS are thus presented here.

Examples of the probability of responding, as predicted by these models, are shown in Table 4. The greatest probability of receiving a response (0.85) is from graduates of

TABLE 3 Logistic regression model of GP response to postal questionnaire

Group	Model 1 (respond/non-respond) Exp. B = OR of response (95% CI)	P-value	Model 2 (early respond/late respond) Exp. B = OR of response (95% CI)	P-value
Medical School group		<0.001		
Rest of UK	1			
Non-UK	0.37 (0.23-0.59)	<0.001		
Cardiff	0.87 (0.56-1.32)	0.514		
Years qualified			0.97 (0.95-0.99)	0.006
Currently MRCGP				
No	1			
Yes	2.19 (1.34-3.04)	0.001		
Constant	2.19		2.07	

TABLE 4 Predicted probability models

	Rest of UK	Non-UK	Cardiff
Model 1. Predicted probability of responding: respond versus never respond			
Not currently MRCGP	0.69	0.45	0.66
Currently MRCGP	0.85	0.62	0.79
Years qualified			
Model 2. Predicted probability of responding: early respond versus late respond			
10 years	0.61		
20 years	0.55		
30 years	0.50		
40 years	0.41		

the rest of the UK medical schools who are members of the RCGP. The smallest probability (0.45) of receiving a response is from non-UK graduates who are not members of the RCGP. Among those who do respond, the second model predicts an increasing likelihood of needing reminders the longer a GP has been qualified.

Discussion

While maximizing response rates is an important aspect of survey design, the total design^{1,2} needs to bear in mind all stages of data collection and analysis: a chain is as strong as its weakest link. Compromise and trade-off will be required as resources are balanced against minimizing survey error, bearing in mind how important it is to include poorly responding subgroups, and how much accuracy and detail is necessary in the context of the use of the data.

Response rates are falling from GPs, with mean non-response rates of 39% in published studies.⁶ It is therefore pertinent to ask how much time and resources should be put into reminders to non-responders, and to seek to develop statistical models that facilitate better prediction and targeting of non-responder GPs.

The number of contacts has been found to explain 42% of the variance in response rates of questionnaires of the general public, this figure rising to 51% when salience is added to the regression equation.^{4,5} The plotted cumulative response rate from this study enabled decisions on the timing of reminders once the curve seemed to be 'flattening out'. The graph demonstrates the gains that one may expect from successive mailings: this may be of use to researchers planning future questionnaire studies of GPs. The final 'pleading' reminder was less conventional, with its computer-scanned handwritten covering note and overt appeal to maximize the response rate. We submit that the increase of 4.4% in responses made the effort worthwhile.

The regression model of response may also be of use in future research. Given limited resources, it would be helpful to identify a few characteristics of a GP sample that would predict non-response. In addition to standard mailing of two or three reminders to all non-responders, it appears to be of value to identify GPs who are non-UK graduates and/or not currently members of the RCGP as needing particular attention. Handwritten letters, telephone calls or visits to the practice may all be worth considering. An alternative approach would be to draw disproportionately large random samples from population strata predicted by this model to have lower response rates. Similar special attention may be needed to generate responses to follow-up mailings from doctors qualified longer ago.

All of the sample were informed of the incentives of PGEA and a prize draw. While this may have raised the number of male responders, the literature suggests no influence on the age structure of responders.²¹ It is unknown whether the influence of incentives is affected by membership of the RCGP or clinical school.

The perceived salience of the substantive area addressed by a questionnaire is an important predictor of response rates in surveys of the lay public, and appears to pertain also to GPs. Such salience may in part be influenced by practice and patient population variables: a large proportion of elderly patients on a practitioner's list with well-developed home nursing services may well increase a GP's interest in palliative care, thereby raising response rates. However, such variables are not publicly available, and may adversely affect response rates to questionnaires in different substantive areas. While the seven demographic variables may be somewhat limited as a tool to assess the characteristics of responders and non-responders, they do have the advantage of being readily available, and of not being linked to the substantive focus of any particular questionnaire.

Response rates of 100% will rarely be achieved without tactics that may influence the quality of data obtained, and affect the potential for future collaboration. The potential for non-response bias will thus remain in most surveys. The degree of bias present will depend on the percentage of those not responding, the degree to which they differ systematically from the study population and the degree to which biases identified as statistically significant are also relevant to the study aim.

While it may be true that a 95% sample is still very similar to the population even if the non-responding 5% are very distinctive,² there is no 'acceptable' response rate.²⁶ Some have argued that non-response is a predominantly random process, and that when the response rate is increased to >70%, most non-response biases seem to disappear.¹⁷ Most, however, would agree that even with a high response rate, a representative sample is not necessarily guaranteed, especially any representation of low-responding subgroups.²⁷ Two of our previous studies, both with high response rates, have found very different results in analysis of non-response bias. No significant difference was found between responder and non-responder GPs in one study with a response rate of 84.4%,²⁸ but significant differences on all demographic parameters were found in a second study with a response rate of 86.7%.¹⁹ A high response rate does not obviate non-response bias.

It is therefore important to examine the characteristics of responder and non-responder groups to determine the degree to which they differ from each other, and thus the degree to which the sample may be said to be representative of the population. This will permit the legitimization of generalization to the population, or indicate the degree of caution needed in such induction.

Previous studies have identified non-responder GPs to be older, more experienced, single handed, more stressed and less well qualified than responders.^{10,11} Similar differences are found in the present study, with non-responders having qualified longer ago, working in valleys practices, and being neither trainers nor current members of the RCGP. To what extent are these

demographic differences of relevance to the study aim of investigating GPs' training and knowledge in palliative care? The disproportionate representation in the sample of trainers and current members of the RCGP may suggest an overestimation of such training and knowledge. The significance of differences in medical school and years since qualification may also be important sources of bias as regards training as clinical students. Whilst palliative care has been taught in most UK medical schools over the last 15 years, it is only in the last decade that it has been included in the curricula of all schools,^{29,30} it still does not feature in the curriculum of some medical schools outside the UK.

The comparison of the sample with available data on the national GP workforce permits a degree of assessment of the generalizability of these data. Compared with GPs in Wales, and in England and Wales, responders are more likely to be in their early 40s, and not to be in single-handed or small practices.

It has been suggested that the time has come to move on from placing too much emphasis on questionnaire surveys in general practice research.³¹ We submit that well-designed surveys will remain an important part of primary care research and development, and that approaches can be used to minimize non-response bias. However, the 'geologists' of academic general practice need to be mindful of the pressures and sentiments of their colleagues 'mining' at the coalface.

We suggest that postal questionnaires of GPs should be important, interesting and answerable;³² then, with respectful reminders and (probably) remuneration, they are more likely to be answered.

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