

# Case finding in elderly people: validation of a postal questionnaire

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**SUMMARY.** A continuing concern of primary care is to produce economical methods of case finding among elderly patients to reduce unmet need in practice populations. This paper reports the use of a postal questionnaire to identify high dependency groups and the use of statistical methods to produce a formula which weights the relative importance of different items in identifying patients with a high level of dependency. It appears possible to identify such high dependency cases reliably at the cost of assessing between one half and two thirds of the population aged 75 years and over.

## Introduction

**I**NCREASING numbers of very frail elderly people have posed major problems for health and welfare services in the UK. Although the absolute number of pensioners is not expected to grow substantially over the next 20 years it is the number of people aged 75 years and over, 'the true elderly' and the major consumers of services, which is expected to grow substantially. In addition, between 1981 and 2011 the number of people aged 85 years and over is expected to double.<sup>1</sup>

Most surveys of elderly people have clearly demonstrated a hidden 'iceberg' of unmet medical and social need. For very frail elderly people such problems are frequently multiple, severe and inter-related.<sup>2-9</sup> In general practice, where such needs can be first identified, the service provided has been demand driven and although a high proportion of retired people see their general practitioner at least once a year,<sup>10</sup> a number of studies have demonstrated that this approach fails to identify many cases of quite severe need. A different type of systematic assessment may be helpful in alerting primary health care teams to this problem and to the need for expensive detailed assessments in particular individuals.

There is a substantial literature on the issue of 'screening' or more precisely, as Williamson has argued, 'case finding'.<sup>11</sup> Screening has been defined by epidemiologists as the detection of presymptomatic abnormalities in a population,<sup>12</sup> whereas case finding is concerned with the early detection of symptomatic problems before they would normally be presented.<sup>11,13</sup> However, opinion seems to be divided about the value of case finding, especially in terms of the costs involved, although most sources seem to argue that there are likely to be benefits to the elderly person in terms of earlier access to treatment for relatively minor incapacitating conditions, improved morale and possibly

reduced mortality rates.<sup>6,14-20</sup> Economic benefits result from reductions in the number of days spent in hospital and a shift to more planned workload with fewer out of hours crises in general practice.<sup>15,18</sup>

However, in order to mount comprehensive case finding and surveillance programmes of the high risk age group in general practice a considerable injection of new resources would be required, since expensive trained nursing staff or even general practitioners themselves have been used in most programmes.<sup>21</sup> In the present economic climate, a method that reduced costs, without reducing benefits, might become more attractive. Postal 'pre-screening' is one such method. The objective of this technique is to reduce the number of time-consuming assessments by cheaply and accurately identifying those individuals with a low probability of experiencing needs. The most well known attempt to validate this approach was undertaken in Glasgow by Barber and colleagues, who used a simple postal questionnaire where any single negative response made the patient eligible for a visit. The results from the questionnaire were compared with the 'problems' identified by practice nurses visiting the patients.<sup>22</sup> However, the exercise was only undertaken on a sample of 100 patients; the case definition criteria were unclear, referring to the presence of problems of unspecified degrees of severity; and the statistical method used gave equal weight to each item of the questionnaire, without taking account of their potentially differing discriminatory power. It is possible that a method using different weights and focussing more upon functional difficulties could be more sensitive in identifying appropriate cases.<sup>23</sup>

This paper describes a larger scale validation of a similar postal questionnaire in one health district in north east England, using a clearly understood method of case definition, based upon a standard measure of dependency, and using a more sophisticated range of statistical techniques to identify the relative importance of each questionnaire item.

## Method

### Postal questionnaire

The postal questionnaire was designed to be short and simple to complete, in order to maximize the response rate. It covered one side of A4 paper and had 18 questions, in a yes/no format, covering social support, disability, recent stresses, and mood state (Appendix 1). The validation of the postal questionnaire was undertaken as part of a project on case finding and surveillance in the district.

### Study practices

The study was carried out in three group practices (A, B and C) in an inner city district of north east England. The practices were self selected on the basis of having an age-sex register and being willing to participate. The smallest practice (practice A) had a substantial number of elderly people living in high rise accommodation while the largest (practice C) covered an area of relatively high social status.

### Administration of the questionnaire

Patients aged 75 years and over were identified from the age-sex register of each practice. As this part of the age-sex register is not routinely used it is subject to a high degree of inaccuracy,

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particularly list inflation. The primary health care teams were asked to identify those patients who had died, moved (changed practice) or were in institutions, and these patients were excluded. All patients on the modified list were sent the postal questionnaire, a reply paid envelope, and an explanatory letter from their general practitioner. After three weeks, a second questionnaire was sent to those who had not responded to the first.

### Interviews

All patients, whether they had responded or not, were interviewed at home by either a health visitor or a district nurse recruited solely to work on this project. Following initial training the health visitor was involved in a small pilot study of the interview and postal questionnaire and was then involved in training the district nurse to standardize interview approaches. All interviews were carried out within three months of receipt of the questionnaire. This interview was a structured questionnaire which included standard items covering personal and domestic circumstances, individual items covering activities of daily living, and health status. Intellectual impairment was tested using the information/orientation sub-test of the Clifton assessment procedures for the elderly<sup>24</sup> and anxiety and depression were detected using the 12 item subset of the general health questionnaire.<sup>25</sup> Standard cut off points were used for these measures.<sup>24,25</sup> An assessment was made of the extent to which need was unmet, and whether the informal carers were under stress.

### Follow up

The data from the postal questionnaire and the interview were recorded on a microcomputer using a standard commercial database software package. All the information was fed back to the primary care teams, and any action or follow up was arranged by them. This was intended to provide baseline information for an ongoing programme of surveillance, run by the primary health care teams themselves.

### Validation

In order to validate the data obtained from the postal questionnaire against a readily understood measure of dependency, a composite measure of potential needs was derived from the interview data based upon the 'interval of need' concept developed in a survey of elderly people in Glasgow,<sup>26,27</sup> and used in subsequent studies.<sup>3,28</sup>

'Potential need was divided into three grades of severity, according to the interval elapsing between necessary periods of help. The least severe grade was "long interval need" when help was required at intervals of 24 hours or more. This grading was applied to subjects who were able to walk indoors, use the WC, boil a kettle, and prepare a light meal, but who could not do domestic work or go out to the shops. They needed relatively unskilled help for an hour or two a day.

Rather more disabled were those subjects who were not capable of providing themselves a hot meal or drink, but who were able to go to and use the WC unassisted. They needed two, three, or more periods of help every day at intervals of three to six hours. They thus had "short interval need".

The most severely disabled were those subjects who, as a result of immobility or instability, were unable to safely and without help or supervision rise from bed or chair, walk to the WC, use it and return. Their toilet needs might arise at any time by day or night, at short or unpredictable intervals... This group was therefore described as having "critical interval need".<sup>26</sup>

The interview data were analysed to develop a combination of the items from the postal questionnaire which best predicted

which patients were in a severe need category (short or critical interval need). This reflected the importance of the demands made by such patients on health and social services, particularly with regard to expensive resources, such as hospital and residential care beds. Data from the middle-sized practice (practice B) were used to develop this predictive model because of its intermediate size. The predictive value of these items was then validated upon the data from the other two practices. The most important properties of the model are its sensitivity (its ability to identify those in need), its specificity (its ability to identify those not in need), and its ability to reduce the number of interviews which might be required in a comprehensive case-finding scheme.

Logit analysis was used to estimate the probability of a patient being in the low dependency category. This technique can be used when the characteristic being predicted is binary, in this case high or low dependency where high is defined as short or critical interval need and low as long interval need or no dependency.<sup>29</sup> A number of equations were estimated and that considered best in terms of criteria of economy and statistical significance is reported here. Items with *t* values less than one were rejected since their inclusion did not contribute to improved explanation. The statistical package Questat was used.<sup>30</sup>

## Results

### Descriptive statistics

For the purpose of analysis patients aged 75 years and over from practices A and C have been considered together and compared with patients from practice B. A total of 1005 patients were expected from practices A and C and 465 from practice B. There were no significant differences between the patients in these two groups in terms of age and sex. Table 1 shows the response rates for the postal questionnaire and the interview. The different numerical base for the postal questionnaire and interview reflects further exclusions owing to death and institutionalization before the interviews were undertaken. The overall response rates of 91% for the postal questionnaire and 86% for interviews are very acceptable, particularly since all those patients who could not be positively excluded were considered to be potential respondents. Even if the response rate is based on the total expected population, the response rate to the postal questionnaire was 89% for practice B and 84% for practices A and C. This difference between practices could be explained by list inflation since in practice C 15% of patients were found to have died or have been institutionalized compared with only 5% in practice B. Similarly, it is likely that a number of patients could not be traced because the registers were not up to date.

The results in Table 2 indicate that, as might be expected, significantly more non-respondents to the postal questionnaire were dependent and suffering from intellectual impairment than respondents. The non-respondents, therefore, formed an 'at risk' group of patients who would require follow-up.

Table 3 shows the prevalence rates of dependency, intellectual

**Table 1.** Response rates to postal questionnaire and interview for patients included in the study and the total expected practice populations aged 75 years and over.

	Total no. of patients contacted (% response rate)		Total expected practice population (% response rate)	
	Practices A and C	Practice B	Practices A and C	Practice B
Postal questionnaire	912 (91)	448 (91)	1005 (84)	465 (89)
Interview	891 (86)	433 (87)	1005 (77)	465 (81)

**Table 2.** Dependency and intellectual impairment among the 1141 interviewees according to whether they were respondents or non-respondents to the postal questionnaire

	% of patients	
	Respondents (n = 1105)	Non-respondents (n = 36)
Dependent (critical or short interval need)	20.4	44.5 **
Suffering intellectual impairment	2.3	19.4 ***

n = total number of patients. \*\*\*P<0.001; \*\*P<0.01.

**Table 3.** Prevalence of dependency, intellectual impairment and depression by practice.

	% of patients in practice:	
	A and C (n = 765)	B (n = 376)
Dependency level:		
None	38.8	40.4
Long interval need	39.3	39.9
Short interval need	10.1	9.6
Critical interval need	11.8	10.1
Intellectual impairment	2.9	2.7
Depressed mood/anxiety	14.1	8.2

n = total number of patients.

impairment and anxiety/depression among the interviewees in the three practices. Overall, 21.1% of the 1141 patients were in the short or critical interval need group. The level of dependency was higher among older patients — 37.2% of the 85 years and over age group were in the short or critical interval need group compared with 18.1% of those aged 75–84 years. Intellectual impairment was present in 2.9% of the group, rising from 1.9% in the 75–84 years age group to 7.3% in those aged 85 years and over.

*Predictive statistics*

The final model, based on practice B, is shown in Table 4. Negative coefficients are associated with high dependency and positive coefficients with low dependency. The only item which does not follow the expected pattern is bereavement. However, since this model is intended to predict high dependency, it is likely that the positive coefficient for bereavement represents the loss of a very dependent person by a less dependent one, and hence bereavement is associated with the relatively low dependency of the carer.

The probability of a patient being in the low dependency

**Table 4.** Predictive model using items from the postal questionnaire based upon practice B.

Variable	Coefficient	t-statistic
Age	-0.037	1.04
Male sex	-0.757	2.06*
Able to go out without help	1.532	3.99***
Cannot prepare meal on some days	-1.136	2.87**
Has difficulty making hot drink	-1.048	1.60
Needs help to wash or dress	-0.643	1.14
Needs help to use toilet	-2.308	2.16*
Someone close has died in last year	0.865	1.85
Has moved house in last year	-1.426	2.76**
Constant	4.373	1.52

\*\*\*P<0.001; \*\*P<0.01; \*P<0.05.

category may be estimated from the items in Table 4 using the formula:

$$\frac{\exp(\Sigma x)}{1 + \exp(\Sigma x)}$$

where  $\Sigma x$  is the sum of the coefficients for a particular case. The effects of different cut off points or probability levels on patients being in the low dependency category can then be examined (Table 5). It is clear that the probability level has to be set reasonably high to ensure that a sufficiently high proportion of patients with high dependency are detected.

Although the model in Table 5 was developed to detect the more severe degrees of dependency, most (75%) of the false positives at the probability level of 0.90 consist of patients with the less severe, long interval need. With a cut off point of 0.90 the model identified 46% of the responding population of practices A and C and of practice B as cases for interview. As well as those with predicted need it would be appropriate to attempt to interview all non-respondents to the postal questionnaire since these tend to be of higher dependency than respondents. Therefore a rather higher proportion of cases would be detected than these figures suggest. Using the most conservative response rates to the postal questionnaire in practices A and C gives a figure of 55% of patients who would have to be visited. Based upon the present study, the interviewees would include 86% of those with the most severe degrees of need (critical and short interval), and 58% of those with long interval need. In all only 16% of those identified for interview would lack some degree of need. Figure 1 illustrates how the approach might work in a general practice setting with 500 elderly patients over the age of 75 years.

In a practice setting this approach could appear complicated to use. Accordingly, the rather more simple scoring adopted by Barber and colleagues, where a 'risk' response to any item indicates the need for an assessment visit,<sup>22</sup> has also been employed using those items from the postal questionnaire which were

**Table 5.** Predicted and assessed dependency of patients by practice for different probability levels of predicted need.

Probability level of predicted need	No. of patients in practices A and C				No. of patients in practice B			
	Low need	High need	Sensitivity (%)	Specificity (%)	Low need	High need	Sensitivity (%)	Specificity (%)
0.85 No predicted need	431	36			212	11		
Predicted need	154	122	77	74	83	56	84	72
0.90 No predicted need	376	29			185	10		
Predicted need	209	129	82	64	110	57	85	63
0.95 No predicted need	234	13			98	6		
Predicted need	351	145	92	40	197	61	91	33

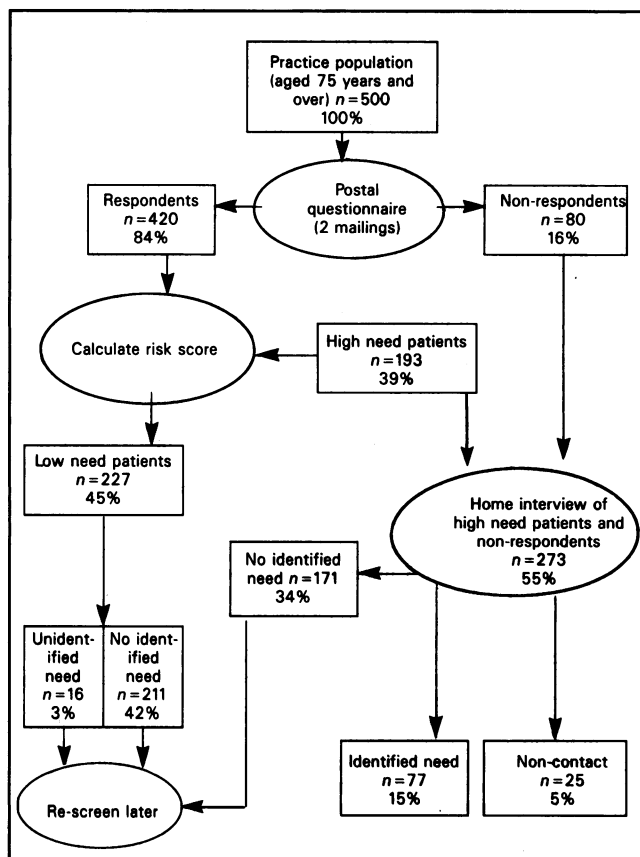


Figure 1. An outline of the use of the method in a hypothetical general practice using the predictive model with a probability level of 0.90.

predictors of dependency in the equation (items 4,6,7,9,10,11 and 15 from the postal questionnaire). Of these items those with the best predictive value were the ability to go out (4), the ability to prepare meals (6) and the need for help to wash and dress (9). Table 6 indicates the predictions of need using this method. Comparing Tables 5 and 6 it can be seen that the simpler approach has an effect similar to setting the probability level at between 0.90 and 0.95. Using this technique for practices A and C a sensitivity of 0.87 was achieved, and a specificity of 0.50. Allowing for non-respondents who would require an interview, 65% of the population aged 75 years and over would need to be visited and 90% of the very disabled would be detected.

**Discussion**

In this study the overall response rate to a short postal questionnaire was high at about 91% of the eligible population. This is particularly encouraging given that conservative assumptions were made in calculating response rate. Factors contributing to

this would seem to be the use of second mailing, provision of reply-paid envelopes and the positive response of elderly patients to a request from their general practitioner. Comparison of the dependency levels found in this study with those of other studies is difficult although those found here appear to be a little higher than those observed by Isaacs and Neville who found 14.2% of the 75–84 years age group and 30.6% of those aged 85 years and over in the short or critical interval need group. This compares with 18.1% and 37.2% respectively in the present study, which is closer to the findings of Bond and Carstairs, although direct comparison is difficult since the latter include institutional populations in their figures.

Both techniques used for identifying high dependency patients in this study worked relatively well. The choice of probability level for patients being in a high dependency category can be seen as a cost-benefit decision; the higher the probability threshold chosen, the greater the chance of identifying all dependent people, but also the greater the cost as more interviews are required. There is thus a trade-off between sensitivity, the proportion of 'true positives', and specificity, the proportion of 'true negatives' identified. For an exercise such as screening it is likely that the user would wish to exchange a lower specificity for a higher level of sensitivity to ensure that the highest number of patients in need are identified. It is noteworthy that the item concerned with living alone did not enter the equation since other studies have indicated that it has a high predictive value in screening.<sup>31</sup> This is probably due to the focus upon functional deficits in the present study.

If the approach described here is compared with the work in Glasgow it can be seen that the approach of Barber and colleagues would be markedly more expensive. In the Glasgow study, 77% of a practice population would be expected to have problems, albeit of an unspecified and probably varied severity, and 81% of the population would have to be seen.<sup>22</sup> Using one of the methods described here, either 55% or 65% of the population aged 75 years and over would have to be interviewed. Thus, whereas the approach used by Barber and colleagues is simple and detects morbidity in lower dependency groups it is more costly than the present approach and provides no information about the severity of the problems detected. Further studies could usefully examine the effectiveness of such a screening technique in detecting other target populations, such as those with psychiatric disorders, although it is likely that for such conditions non-respondents would prove to be an even more important group.

It is not possible to argue from this study whether case finding is a more effective approach than awaiting the symptomatic presentation of problems. However, concern to increase preventive health care among the elderly and growing pressure to target health care services more effectively make this the central question for further work. If case finding is superior to symptomatic presentation then the benefits must be largely due to a more structured and wide-ranging approach to assessment since the majority of patients see their general practitioner at least once a year and non-consulters tend to have good health.<sup>8,10,20,32,33</sup> However, the cost of implementing such detailed structured

Table 6. Predicted and assessed dependency of patients by practice using the simpler approach of a positive response to certain items on the questionnaire.

	No. of patients in practices A and C				No. of patients in practice B			
	Low need	High need	Sensitivity (%)	Specificity (%)	Low need	High need	Sensitivity (%)	Specificity (%)
No predicted need	294	21			151	7		
Predicted need	291	137	87	50	144	60	90	51

assessment of all those over the age of 75 years could well prove excessive. The postal questionnaire approach is based on the assumption that further investigation would be dependent upon the results of home interviews and it is possible that a less staff-intensive form of opportunistic case finding might be more cost effective. Indeed, this was the approach chosen by practice B for the continuing surveillance of their patients following this study. However, it must be remembered that the content of such opportunistic screening must be different from a normal consultation in order to obtain additional benefits.<sup>15,18,19</sup> Furthermore, opportunistic screening in the surgery would be unlikely to yield as much information about home circumstances as domiciliary assessment. In addition, a planned approach using nurses to undertake home visits may make greater use of the knowledge of those already in contact with the patient and improve the structure of their information collection. Consultation based screening using simple predictive information in day to day practice, may include advantages from both approaches.<sup>31</sup>

The new contract for general practice proposes that annual reviews be undertaken of people aged 75 years and over living in their own homes.<sup>34</sup> However, the findings of this study, like others,<sup>16</sup> raise the question of whether home visits to all patients are the best use of resources, particularly if 'high risk' patients can first be identified by other means. However, even under the new contract there remains the question of which members of the practice should visit which patients and in what order patients should be seen. Postal screening offers a means of focussing the scarce and most expensive resources on those patients at greatest risk.

**Appendix 1.** Questions used in the postal questionnaire survey of patients aged 75 years and over.

1. Do you: live alone?  
live with husband/wife?
2. Do you look after anyone?
3. Do you have a relative or friend who you can rely on for help?
4. Can you usually go out by yourself, without anyone to help you?
5. Can you walk around inside the house without someone helping you?
6. Are there days when you are unable to prepare a meal for yourself?
7. Is it difficult for you to get a hot drink when you need one?
8. Do you usually need help with getting in or out of bed?
9. Do you usually need help to get yourself washed or dressed?
10. Do you usually need help to use the toilet?
11. Has anybody you were fond of died in the last year?
12. Are there often days when you don't see anyone at all?
13. Can you easily get help in an emergency?
14. Have you had any serious illnesses or accidents in the last year?
15. Have you moved house in the last year?
16. Do you find that you have much less energy than you did last year?
17. Do you find that you get a lot of problems with your memory lately?
18. Do you often feel sad or lonely?

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