Cost-effectiveness of recruitment methods in a population-based epidemiological study: the Melbourne Visual Impairment Project

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Abstract: The cost-effectiveness of five recruitment methods was evaluated to determine the best method of encouraging eligible persons to participate in the Melbourne Visual Impairment Project (a population-based epidemiological study). The evaluation was divided into two phases. Phase 1 included one of two types of initial contact, by direct personal contact or by telephone. Phase 2 involved recruiting residents after an attempt had been made by either the telephone or the doorstep approach, and included a second attempt by a field interviewer, subsequent attempts by senior field staff, and finally, financial incentives. The cost-effectiveness of each method was determined by dividing the approach's cost by the effectiveness ratio. We identified 269 eligible households with 356 eligible residents. An 89 per cent response rate was achieved at the examination centre, comprising 61 per cent from Phase 1 and 28 per cent from Phase 2. Although both recruitment methods in Phase 1 were equally cost-effective, there was a significant difference in the effectiveness of each method in actually recruiting residents. The doorstep method was more costly per attender but was far more effective at 76 per cent recruitment than the telephone method at 47 per cent ($P < 0.001$). We have demonstrated a practical two-stage approach (the doorstep method in Phase 1 and follow-up strategies in Phase 2) to population-based recruitment involving the middle to elderly age group that should be relevant to many epidemiological studies. (*Aust J Public Health* 1994; 18: 314-18)

Formal evaluation of recruitment strategies is limited, despite recruitment having significant implications for the planning and success of population-based screening programs. Recruitment strategies are designed to encourage eligible persons

to participate in population-based epidemiological studies. Such studies have public health relevance in the investigation of disease prevalence and associated risk factors, the planning of health services and community education.

A problem in studies of vision in the middle to elderly age group is that of obtaining adequate participation to ensure that the sample is representative.^{1,2} Low participation rates may undermine the results of the population sample screened. Participants may

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differ from those who do not participate on important variables such as age, socioeconomic status, vision loss, and general health factors.⁷ Householders who refuse to disclose any information may contain a higher proportion of residents who are suffering from visual impairment and may not be aware of their impairment, have poor vision that has already been fully assessed, and more generally are socially disadvantaged, have poorer health, and higher mortality.^{7,9}

The Melbourne Visual Impairment Project is a population-based epidemiological study designed to increase our understanding of the prevalence and severity of major ocular disorders, for example, cataract, glaucoma and retinal diseases, in those 40 years of age and over. This will be achieved by offering a comprehensive eye examination at no charge to eligible residents at a local examination centre in each of the nine sample areas randomly selected as representative of the Melbourne statistical division.

The aims of the pilot study were to evaluate several methods of approaching persons to encourage participation at a local screening centre and to assess the feasibility and acceptability of the survey instruments and testing procedures.

Method

A pilot study was conducted in two adjacent census collector districts in the Albert Park area, a Melbourne metropolitan suburb. Albert Park was one of nine randomly selected areas. The examination centre was situated in a church hall within the sample area and screening was conducted from May through to August 1992.

Recruitment was divided into two phases and the cost-effectiveness of each was evaluated separately. Phase 1 involved two recruitment methods, either the 'doorstep' (field interviewers contacted households and interviewed eligible residents in person) or telephone (telephone interviewers contacted households and interviewed eligible residents only by telephone). The follow-up (Phase 2) involved three recruitment methods to secure the participation of those in the sample who had not taken part in the examination.

A computerised list of addresses in the sample area with corresponding telephone numbers was obtained from a software computer company. Households were randomly selected for either doorstep interview or telephone recruitment. Households without a telephone were automatically assigned to the doorstep approach. Two experienced telephone and field interviewers from the Roy Morgan Research Centre were allocated a weekly assignment of addresses within each of the two census collector districts, and the household census and interviews were conducted over the following week. A doorstep visit or telephone contact was attempted with all households. Up to ten repeat visits or telephone calls were made at different times (weekend, weekday evening, weekday p.m., weekday a.m.) to complete the assignment; however, most interviews were conducted at the time of the household census. In situations where the household or resident was known to be absent from the area for a period of time (less than three months), the file was retained by the interviewer until contact was made.

The first step in the recruitment process was hand-delivery of an unpersonalised letter of introduction and language insert to each household in the sample area, three to four days before the doorstep or telephone household census and interview commenced. A household was defined as all people usually living at an address or residence, who may or may not be related. The letter of introduction provided a general explanation of the project, its purposes and the benefits of attending the free eye examination. The language insert (translated into 11 common languages) invited non-English-speaking residents to contact the Telephone Interpreter Service for further details. Translators from the service were briefed about the project.

The goal of the private household census was to determine the number, names and ages of all those eligible, that is, all persons 40 years of age or over resident in the sample area for six months or more. The 1991 census definition of a 'permanent resident' was used.¹⁰ A short interview was attempted with all eligible residents to elicit demographic data and collect essential information on eye symptoms and use of eye health care services. An invitation to attend a free eye examination at the local examination centre was offered. The interview took approximately ten minutes per eligible person.

All households or eligible residents who did not provide any household information, answer general questions, or attend the eye examination were allocated to the Phase 2 recruitment procedure, and in the first instance, contacted by doorstep interviewers on up to two separate occasions to recruit them. For example, if the telephone interviewer was unsuccessful in recruiting the eligible resident or household, or the resident could not be contacted by telephone after 10 attempts, the file was handed over to a doorstep interviewer to attempt recruitment. If a doorstep interviewer was unsuccessful in an initial recruitment attempt, the file was handed over to the second doorstep interviewer. The second attempt was conducted within three weeks of the initial refusal or noncontact. If the second doorstep attempt was unsuccessful, Department of Ophthalmology senior field staff continued with the recruitment process, and attempts to recruit nonparticipants by either approach were made after two weeks had lapsed.

If this strategy was unsuccessful, a financial incentive of \$10 cash (including a set appointment to attend the examination centre) was offered in a personalised letter forwarded to the household or to the eligible resident which could be collected following the eye examination. If there was no response, a second letter was sent with another appointment scheduled and an incentive of \$25 cash was offered.

Home visits, transport and a modified screening service for ineligible relatives or friends were offered at all stages of the recruitment process to encourage eligible residents to participate.

A successful recruitment was defined as the attendance at a local examination centre by an eligible resident after an appointment had been secured by a Roy Morgan Research Centre interviewer or a Department of Ophthalmology senior field staff member.

To estimate the costs of the various strategies, interviewer costs comprised salary (including

Of those residents (11 per cent) who declined to participate, 40 per cent cited personal reasons; 16 per cent were not interested; 5 per cent were apprehensive; 4 per cent referred to language difficulties, and 34 per cent specified other reasons, for example, satisfaction with current ocular care, a recent eye examination, they were too busy or had a family or a physical illness.

Discussion

An evaluation of the cost-effectiveness of recruitment strategies is important to the rational planning of screening programs. Success in recruiting residents for population-based studies is often a factor in determining whether or not a study will proceed.⁴ When the proposal involves the recruitment of a population sample of 'healthy participants',¹¹ the task of recruiting poses a significant challenge for researchers. Participants are unlikely to be found in the more traditional sources of recruitment, that is, hospital settings or clinics, and it is therefore necessary to develop imaginative strategies to recruit from the general population.

Despite the potential influence recruitment methods have on public health programs, few epidemiological studies have evaluated the effectiveness of their recruitment methods.¹¹⁻¹⁵ The difficulties associated with recruitment are magnified in surveys dealing with issues such as eye disease because of the equipment necessary for an adequate ophthalmic examination and the time the examination takes, especially if dilating drops are needed for a fundal examination.

In this study, we demonstrated that the direct personal or doorstep approach in Phase 1 was the most effective method of encouraging the middle to elderly age group to participate, and that the Phase 2 strategies proved useful supplements to the recruitment process.

The success of the doorstep method may be attributed to four factors. Firstly, interviewers had an opportunity to develop a rapport with the resident, not always possible using the telephone. Secondly, time spent at the door may have helped to convince a reluctant resident to participate; it is easier for a resident to terminate a telephone call with an unknown caller. Thirdly, the interviewer, by providing visible identification, had the opportunity to allay concerns about validity of the project or interviewer, an important consideration for a person living alone or an elderly resident. And finally, the doorstep interviewers were aged over 40; residents may have more readily identified with and trusted the interviewers and therefore agreed to participate in the project.

Both methods of recruitment, nevertheless, have advantages and disadvantages. The disadvantages of the doorstep method are all cost related: additional salary costs incurred by the field interviewers and travel expenses. The advantages of direct personal contact and the resultant high response rate have been discussed above. One disadvantage of using the telephone approach is that households without telephones (4 to 5 per cent) or subscribers with silent lines (10 to 12 per cent) cannot be reached.¹⁶ Consequently, doorstep recruitment would always be necessary for at least 10 per cent of the sample popu-

lation. Another disadvantage is the limited rapport that is developed by the telephone interviewer.

The advantages of telephone interviewing are that first, it is less costly to conduct the questionnaire on the telephone, because there are no travel costs and recontact is a matter of a telephone call. If the resident is not home, it is a simple matter to dial the next telephone number and attempt to contact the next household or eligible resident. Second, time spent conversing with the respondent is limited, so more residents can be contacted in a given time.

The success of Phase 2 as an adjunct to the initial recruitment process can be attributed to several reasons. Firstly, the location of the examination centre within the sample area provided the opportunity for residents to walk or drive a short distance to the centre; it proved to be an important consideration for reluctant respondents. The distance of the screening centre was considered an important reason for the failure of the Visual Acuity Impairment Survey Pilot study,⁴ and explained in part the low participation rate achieved by the Framingham Eye Study.¹ Secondly, the benefits of a thorough eye examination (regarded as an important feature in the recruitment process in the visual acuity study¹) were re-emphasised during the second and subsequent attempts. Thirdly, some who initially declined to participate reconsidered a home visit as an attractive alternative to attending the screening centre. Home visits were not offered by Gibson et al., a possible reason for the study's low response rate,⁷ and a likely deterrent to attendance by the frail.⁸

Many other factors reinforced at the second and subsequent attempts contributed to the success of Phase 2: the significance of a free screening service and emphasis on altruistic motives; the importance of improving our understanding of eye disease within the community; the availability of transport to and from the screening centre; the availability of out-of-hours appointment for full-time and shift workers, and modified eye tests for ineligible relatives or friends.

Recruitment by senior field staff was both cheaper and more effective than the doorstep approach in Phase 2. This may have been because of the different staff involved, or because of the time between the second and subsequent attempts, enabling reluctant residents to reconsider and hear positive feedback from neighbours who had attended the screening centre. The identification of senior field staff as university employees allowed the people approached to verify the authenticity of the project. Repeated telephone and/or doorstep visits by the senior field staff proved beneficial, with 130 telephone or doorstep attempts made.

Although financial incentives were not cost-effective nor effective, we believed that those who attended the free eye test after receiving an incentive letter were atypical of the population sample, and as discussed in the introduction, their participation will provide valuable information on the types of citizens who would otherwise not have participated in the project. For example, pathology was evident in 50 per cent of those who attended following a financial incentive.

This approach will continue to be employed in the future. Information collected on the reasons why

Table 1: Age and sex distribution of residents who participated at the screening centre

	40 to 49		50 to 59		60 to 69		70 to 79		80 to 89		90+	
	n	%	n	%	n	%	n	%	n	%	n	%
Males	48	15	32	10	32	10	18	6	7	2	1	0.5
Females	54	17	41	13	43	14	27	8	11	3	2	1

472 households in the sample area						
Doorstep 256 (54%)			Telephone 216 (46%)			
Household	EL ^a	IE ^b	NC ^c	EL	IE	NC
	139	112	5	130	86	-
Eligible residents	174			182		
Phase 1						
First attempt success	132			85		
Nonparticipants					139	
Phase 2						
2nd doorstep attempt		84				
2nd doorstep success		38				
Nonparticipants					101	
Senior field staff attempts		98				
Senior field staff success		51				
Nonparticipants					50	
Incentive (\$10)		63 ^d				
\$10 success		6				
Nonparticipants					44	
Incentive (\$25)		42 ^d				
\$25 success		4 ^e				
Nonparticipants					40	

Figure 1: Success of each method of recruitment from 472 households

- (a) EL = eligible household
 (b) IE = ineligible household
 (c) NC = no contact
 (d) Includes letters to households which had refused to provide any information and where it was known that at least one person was eligible to participate
 (e) Two residents from two households attended

oncosts), travel, telephone (including repeat attempts) and administration expenses; printing costs associated with both methods were determined; senior field staff costs were estimated by dividing the salary by the hours spent recruiting, which was then divided by the number of attempts to convert a resident to participate. This amounted to \$15 for each attempt. Financial incentive costs included administrative costs and reimbursement to participants. The cost per recruitment strategy was calculated by summing the costs incurred divided by the number of successful recruitments for each strategy. The effectiveness ratio was calculated by dividing the number of successful recruitments by the number of eligible residents for each strategy.

Table 2: The cost-effectiveness of two recruitment methods employed in Phase 1

Recruitment type	Number attempted	Cost \$	Effectiveness n	Effectiveness %	Cost-effectiveness \$
Doorstep	174	41	132	76*	54
Telephone	182	25	86	47*	53

$\chi^2 = 31.26$, * $P < 0.001$

The cost-effectiveness of each strategy was determined by dividing the approach's cost by the effectiveness ratio. The lower the cost-effectiveness demonstrated by a particular recruitment method, the greater return for each dollar spent.

Information was also collected on the reasons provided by residents who declined to participate.

Ethical approval was obtained from the Royal Victorian Eye and Ear Hospital Human Research and Ethics Committee to carry out the recruitment procedures and comprehensive eye examination, prior to commencing the pilot study.

Results

In total, 472 households were approached in the two census collector districts, and eligibility status was determined in 467 households during the initial doorstep or telephone contact (Figure 1). Of those approached, 269 eligible households and 356 eligible residents were identified.

A total of 174 eligible residents was identified by the doorstep recruitment method, and 182 by the telephone approach. Overall, 316 residents (89 per cent) participated at the screening centre, 217 (61 per cent) from the Phase 1 recruitment methods and 99 (28 per cent) from Phase 2 efforts. Of these, 32 per cent were aged between 40 and 49 years and 21 per cent were over 70; the mean age was 58 years (Table 1). The ethnic origins of participants were: Australian (57 per cent), Greek (17 per cent), British (11 per cent), Italian (3 per cent) and other (12 per cent).

In Phase 1, both approaches were equally cost-effective (Table 2). Although the doorstep method was more costly per participant, it was far more effective in recruiting residents (76 per cent compared with 47 per cent for the telephone method ($\chi^2 = 31.26$, $P < 0.001$)). In Phase 2, doorstep interviewers successfully recruited a further 38 (45 per cent) of the 84 who had originally resisted recruitment by either method in Phase 1, or who could not be contacted by telephone (Table 3). Senior field staff recruited a further 51 (52 per cent) out of 98 who had been approached earlier, and financial incentives succeeded in converting a further 10 (9 per cent)—six for \$10 and four for \$25).

Table 3: Marginal cost-effectiveness of follow-up recruitment methods used in Phase 2

Recruitment type	Number attempted	Cost \$	Effectiveness n	Effectiveness %	Cost-effectiveness \$
2nd doorstep	84	44	38	45	98
Senior field staff	98	38	51	52	73
\$10 incentive ^a	63	40	6	9	444
\$25 incentive ^{a,b}	42	59	4	9	655

Notes:

(a) Includes household refusals where it was known that at least one person was eligible to participate in the examination.

(b) Residents of households ($n = 15$) who contacted the screening centre and cancelled the \$10 incentive appointment were not sent a \$25 incentive.

residents did not participate will also be important in ascertaining the barriers to screening attendance.

Based on these pilot results, we have chosen a two-stage approach: the doorstep method in Phase 1, and follow-up strategies in Phase 2, for the Melbourne Visual Impairment Project. The evaluation has demonstrated the relative effectiveness of a two-phase approach to recruitment (an initial contact using a doorstep or personalised approach, and follow-up strategies) that should be relevant to many health research settings.

Acknowledgments

The MVIP is supported by the Victorian Health Promotion Foundation and the NHMRC Sir John Eccles award to Professor H.R. Taylor.

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Livingston, Patricia M.;Guest, Charles S.;Bateman, Angela;Woodcock, Norman;Taylor, Hugh R.

Title:

Cost effectiveness of recruitment methods in a population-based epidemiological study: the Melbourne Visual Impairment Project

Date:

1994

Citation:

Livingston, P. M., Guest, C. S., Bateman, A., Woodcock, N., & Taylor, H. R. (1994). Cost effectiveness of recruitment methods in a population-based epidemiological study: the Melbourne Visual Impairment Project. *Australian Journal of Public Health*, 18(3), 314-318.

Publication Status:

Published

Persistent Link:

<http://hdl.handle.net/11343/34444>