research note

Randomized Trial of Use of Incentive to Increase the Response Rate to a Mailed Survey

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Abstract Low response rates, especially among health-care professionals, are a common problem in mailed survey research. We conducted a randomized trial to examine the effects of cash incentives on response rates. A total of 3,335 Chinese medicine practitioners were randomized to one of two interventions accompanying a mailed survey - no incentive (n=1,667), and monetary incentives in two levels at HK$ 20, and HK$ 30 (n=834 in each group) on receipt of the returned questionnaire. The response rates were higher among those offered incentives than those without (34.7% vs. 28.5%, χ^2=14.34, p<0.001), but no significant differences were found between incentives at HK$ 20 and HK$ 30 (χ^2=0.16, p=0.69). Although offered incentives can increase response rates, no incentive was the most cost-effective, in terms of cost per respondent (HK$21.90 per respondent). However, this study focuses on CMPs, the findings may not represent the response rate for all health-care professions in Hong Kong. In fact, the largest population in the health care system in Hong Kong is nurses. Therefore, we cannot conclude that a money enclosure would have been more effective for all health-care professionals. Also, further systematic study of the effects of different incentive strategies in other related research should be encouraged.

INTRODUCTION

Self-administered mailed questionnaires are a major source of data for research studies, especially for cross-sectional surveys. Compared with other forms of survey techniques such as face to face interviews, mailed questionnaires are less costly. Their operational logistics are more efficient to organize, and are particularly well suited for population based study (Dillman, 1978; James & Bolstein, 1990) as for health care professionals (e.g. nurses and physicians). In addition, mailed surveys allow respondents to answer questions about sensitive subjects in their own environment with adequate time to reflect on their responses (Dillman, 1978; Semiatycki, 1979, Erwin & Wheelright, 2002). Also, because the interviewer does not influence the response when a questionnaire is mailed, interviewer bias is minimized (Semiatycki, 1979). However, a major traditional disadvantage of mailed surveys has been their low response rate, which potentially impairs study validity. Conversely, high response rates are necessary to minimize non-responder bias (Semiatycki & Campbell, 1984, Halpern, et al., 2002). As a result researchers often resort to more expensive data collection procedures.

Increasing the response rates to mailed questionnaires would enhance their attractiveness as a data survey collection tool. Several strategies to increase response rates have been tested over the last decades, mostly in sociologic and marketing research (Semiatycki & Campbell, 1984; Fox et al., 1988), and more recently in survey studies (Yammarino et al., 1991; Spry et al., 1989). Some of the strategies have involved small financial incentives for respondents. Repeated contacts and monetary incentives seem to have the greatest potential to increase response

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rates (Semiatycki & Campbell, 1984; Fox et al., 1988; Yammarino et al., 1991, Erwin & Wheelright, 2002; Halpern et al., 2002). However, results have shown wide variability in the effectiveness of the various incentives and prompts, suggesting that the generalizability of these interventions from one population and one survey to the next is limited.

The present study was part of a mailed survey conducted in July through August 2002 in Hong Kong. The focus of the survey was to explore the level of computerization of clinical and administrative tasks in a population-based, random sample of listed Chinese medicine practitioners (CMP). One offered a monetary reward of HK $20 and the other offered a reward of HK $30 to respondents. For this setting, our main objective was to determine whether the interventions increased target population participation when compared with the no incentive group. Although the target populations were the CMPs, its results may be useful as information or guidelines for other health-care professionals, like nurses who are the largest population in Hong Kong's health care system, when researchers intend to carry out a population based mailed survey.

METHODS

Sampling method

As part of a survey of health-care professionals in Hong Kong, we conducted a randomized trial of two types of incentive intervention to increase response rates (Chan et al., 2003). The randomized comparison of incentives and no incentives was conducted in the first mailing of the questionnaire, and a reminder (follow-up) was mailed to all three groups after 14 days (Perneger et al., 1993). Briefly, the sampling frame was all listed CMPs (N=7,677) who had registered with the Chinese Medicine Council of Hong Kong (CMCHK). We randomly selected 3,335 listed CMPs (43.4%) from the sample frame using a random digit generator (MS Excel) to generate 3,335 four digit numbers, no ties, to match with their listing number (e.g. L03004). If their last 4 digit is the same as the generated number, he/she will be selected. A one-page, two-sided questionnaire was mailed to the study sample. Questions explored their knowledge, attitudes and practices on computers and computer use in their clinical practices.

Figure 1 illustrates the random assignment of the 3,335 subjects into two groups - no incentive (n=1, 667) and incentive (n=1,668). The random assignment was carried out by MS Excel. First, we assigned a number (1 to 3335) for each subject, no ties. Subjects who had odd numbers were assigned to the incentive group, otherwise, to the no incentive group. The incentive group was further divided into two subgroups using the same method, odd numbers were offered a monetary reward of HK$ 20 and even numbers were offered HK$ 30, with n=834 in each subgroup, upon receipt of a completed questionnaire. The questionnaires were

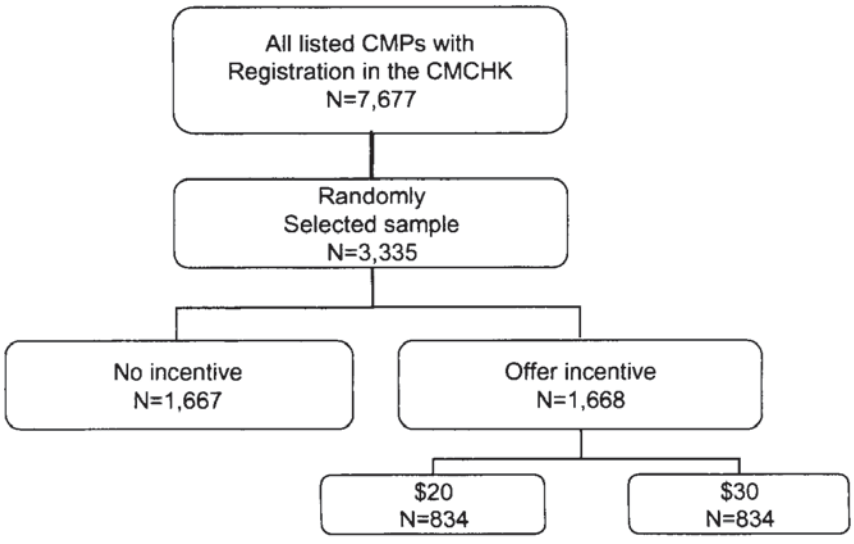

Figure 1. Study organization

accompanied by a cover letter explaining the purpose of the study, the investigator's contact number and an assurance that responses would be kept confidential. A prepaid business reply, self-addressed envelope was enclosed for return of the completed questionnaire. A second mailing, consisting of the questionnaire and a reminder letter, was sent to all CMPs who had not replied after 14 days. In total, we allowed 54 days as the cutoff period for return of questionnaires, although no further surveys were received after the designated period. All mailings were sent by first-class mail. Returned questionnaires with address corrections were mailed to the updated address, otherwise, mail returned due to unknown or incorrect address was both excluded from the analysis and discounted from the denominator when calculating the response rate. Deceased practitioners were similarly excluded, as were retirees who indicated on the returned questionnaire that they were no longer involved in clinical practice.

Statistical analysis

We computed cumulative response rates across the 2 mailings for each of the 3 incentive arms and within-arm subgroups. Bivariate associations and between group differences in response rates were analyzed using Pearson's chi-square test for frequency variables. The stamped date indicating official receipt of the completed questionnaire was another dependent variable in the analyses presented here. The main predictor variables were the three incentives (no incentive, HK$ 20, and HK$ 30). Separate analyses were conducted for the two phases of the trial (days 1-14 and days 15-54) and overall (days 1-54). The cumulative participation of each group was assessed using the Kaplan-Meier estimation procedure for time-failure data (Kaplan & Meier, 1958). Cox regression was used to examine the effect of the independent variable (incentive) with respect to the dependent variables (response or no response). Lastly, we calculated the total costs associated with each of the different incentive groups. Dividing these costs by the final number of responders yielded a cost-effectiveness ratio for each study strategy by each time frame. All analyses were carried out using SPSS (SPSS, 1997). The study received approval from the Research Ethics Committee of the Hong Kong Polytechnic University.

RESULTS

The study sample included more men than women (Table 1). The majority of participants were middle aged, 40-59 years old (58.2%). The main streams of their practices were 72.2% herbalists (general practice), 21.7% bone-setters, and 6.1% acupuncturists, and no significant difference was found between the study sample and the database from the CMCHK (p=.17).

TABLE 1. Listed CMP characteristics in the study sample *vs.* population from CMCHK

	Sample from main study		CMCHK		Chi-square test	
Characteristics	n	(%)	n	(%)	χ^2	Sign.
Sex						
Male	847	(81.8)	5,824	(75.9)	17.34	p<.001
Female	189	(18.2)	1,853	(24.1)		
Age (years)						
39 or below	80	(7.9)	958	(12.5)	22.37	p<.001
40-59	587	(58.2)	4,485	(58.4)		
60 or above	342	(33.9)	2,234	(29.1)		
Main stream in practice						
General practice	630	(72.2)	5,374	(70.0)	4.30	p=.171
Bone-setting	189	(21.7)	1,689	(22.0)		
Acupuncture	53	(6.1)	614	(8.0)		

During the randomized intervention phase of the trial (days 1-14), the response rates varied according to the incentives offered in the initial mailing. In phase one, the highest response rate was observed in the group that was offered a monetary reward of HK$30 (response rate = 21.8%), then the HK$20 responder group (response rate=18.5%), and finally the lowest response rate occurred in the group that received no incentive (12.9%). The differences between the response rate groups were highly statistically significant (p<.001), with the exception of differences between the two groups that offered different incentives (χ^2=2.48, p=.12). In the reminder phase of the trial (days 15-54), response rates were similar between groups, but the lowest rate was observed in the group that had initially had the highest response rate (HK$30, 15.9%). The differences between the groups in the 1st reminder phase were not statistically significant (p>.09), except between the two incentive groups (χ^2=4.44, p=.04). By the end of data collection (day 54), the response rates in the three groups were close to each other but highly statistically significant (Table 2). Only the two groups that had received incentives were not statistically significant (χ^2=.16, p=.69). The final response rates (days 1-54) for the no incentive group and the incentive groups, one offered HK$20 and the other offered HK$30 was 28.5%, 34.7%, 35.2%, and 34.2%, respectively, and the overall response rate was 31.6 per cent. Similar to the first mailing phase, the differences between the response rates

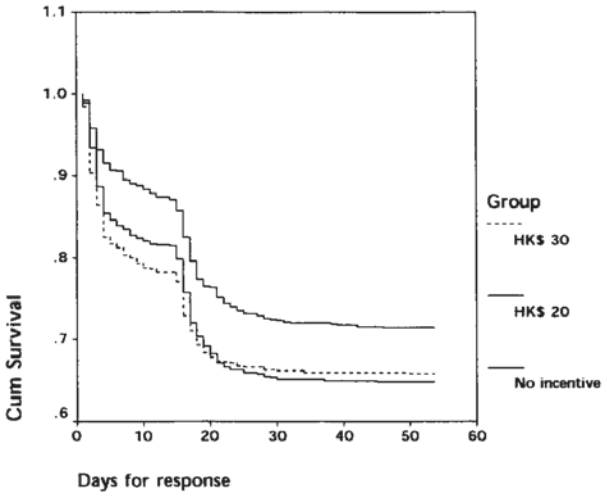

Figure 2. Kaplan-Meier survival curves on incentive and no incentive groups

TABLE 2. Response rates in the randomized trial of different incentives and a reminder to improve response rates to a mailed TCM survey: Hong Kong, 2002

Initial allocation	After first mailing (days 1-14)			After reminder (days 15-54)			Overall (days 1-54)		
	Total	Responded	(%)	Total	Responded	(%)	Total	Responded	(%)
Total	3,277[d]	542	(16.5)	2,735	494	(18.1)	3,277	1,036	(31.6)
No incentive	1,635[a]	211	(12.9)	1,424	255	(17.9)	1,635	466	(28.5)
Incentive	1,642	331	(20.2)	1,311	239	(18.2)	1,642	570	(34.7)
HK$20	820[b]	152	(18.5)	668	137	(20.5)	820	289	(35.2)
HK$30	822[c]	179	(21.8)	643	102	(15.9)	822	281	(34.2)
Chi-square test	A(χ^2=34.34, p<.001); B(χ^2=30.70, p<.001); C(χ^2=13.30, p<.001); D(χ^2=31.57, p<.001); E(χ^2=2.48, p=.12)			A(χ^2=4.83, p=.09); B(χ^2=.03, p=.87); C(χ^2=1.85, p=.17); D(χ^2=1.16, p=.28); E(χ^2=4.44, p=.04)			A(χ^2=14.84, p<.001); B(χ^2=14.34, p<.001); C(χ^2=11.34, p<.001); D(χ^2=8.08, p=.004); E(χ^2=.16, p=.69)		

a, 32 returned mails are unknown or incorrect address
b, 14 returned mails are unknown or incorrect address
c, 12 returned mails are unknown or incorrect address
A, no incentive *vs.* HK$20 *vs.* HK$30
B, no incentive *vs.* incentive
C, no incentive *vs.* HKS20
D, no incentive *vs.* HKS30
E, HK$20 *vs.* HK$30
1 US dollar=HK$7.78

of the groups were highly statistically significant ($p<.001$), except for the two groups offered different incentives ($\chi^2=.16$, $p=.69$).

Hazard analysis provided additional insights into the mechanisms of response in terms of the number of days. In the total study sample, the overall hazard for responding to the survey decreased sharply after the initial and reminder mailings (Figure 2). Each subsequent mailing produced a noticeable peak on the hazard function curve, but the magnitude of the mailing effect decreased with each additional mailing. The hazard curves were also analyzed by incentive groups for days 1-14 (first mailing), days 15-54 (reminder), and days 1-54 (overall). During the initial phase of the mailing (days 1-14), the hazard of response was highest in the group that received both incentives (Log rank test: $\chi^2=19.01$, df=2, $p<.001$). After the reminder mailing, which produced a peak of similar magnitude in all three groups (days 15-54), the hazard curves diverged again. Here, the group that had responded best in days 1-14 had the lowest hazard of response. After day 54, the patterns of response changed. Cox regression was conducted. Results showed that incentive is a risk factor ($\chi^2=18.49$, df=2, $p<.001$) for response rate levels (Table 3). Demographic variables affected overall response rates (Perneger et al., 1993). However, no demographic information is available (e.g. sex and age) on the non-responders, thus no further analysis can be carried out.

TABLE 3. Cox regression of the mailing survey

Variable	B	Wald statistics	Sign.	Exp(B)	95% CI for Exp(B) Lower	Upper
Incentive						
No incentive*		18.38	p<.001			
HK$20	0.27	13.20	p<.001	1.31	1.13	1.52
HK$30	0.26	12.14	p<.001	1.30	1.12	1.51

* reference

-2 Log Likelihood: 16414.237, $\chi^2=18.49$, df=2, $p<.001$

TABLE 4. Costs of mailing the survey

Group	Study sample	Respondent 1st mail	reminder	total	Costs[a,b,c,d] 1st mail[e]	reminder[e]	total[e]	Cost per respondent 1st mail[e]	reminder[e]	total[e]
No incentive[f]	1,667	211	255	466	HK$4,629.6	HK$4,372.7	HK$9,002.3	HK$21.9	HK$17.1	HK$19.3
Incentive										
HK$ 20[g]	834	152	137	289	HK$5,634.0	HK$5,076.2	HK$10,710.2	HK$37.1	HK$37.1	HK$37.1
HK$ 30[h]	834	179	102	281	HK$8,039.6	HK$5,265.7	HK$13,305.3	HK$44.9	HK$51.6	HK$47.3

a, mailing HK$1.3 per letter (bulk service more than 1,000)

b, returned mail HK$1.4 per letter

c, mailing HK$1.4 per cheque

d, printing cost (1 x cover letter, 1 x questionnaire, and 1 x self-addressed envelope) HK$ 1.3 per letter

e, 1 US dollar = HK$ 7.78

f, 32 returned mails are unknown or incorrect address

g, 14 returned mails are unknown or incorrect address

h, 12 returned mails are unknown or incorrect address

Table 4 shows the total and per respondent costs associated with the various incentive strategies. The no incentive control was more cost-effective than either of the incentive groups in both the first mailing (no incentive: HK$21.9 per respondent; HK$20: HK$37.1 per respondent; HK$30: HK$44.9 per respondent) and the second mailing (no incentive: HK$17.1 per respondent; HK$20: HK$37.1 per respondent; HK$30: HK$51.6 per respondent). Further, the no incentive control (HK$19.3 per respondent) remained the most cost-effective, in terms of cost per respondent, throughout the study compared to incentive groups (HK$20: HK$37.1 per respondent; HK$30: HK$47.3 per respondent).

DISCUSSION

Our data indicate that response rates to mailed questionnaires can be increased by the offer of incentives to a specific group of CMPs when compared to a no incentive control (χ^2=14.34, p<.001). The study's overall response rate for a simple monetary incentive effect was 34.7 percent within 54 days of the first mailing with a follow-up. The different monetary incentives that were used had no difference on overall response (χ^2=.16, p=.69), but had differences at the follow-up stage only (χ^2=4.44, p=.04). This finding supports the findings of others that the inclusion of different monetary incentives can be costly and usually do not gain the expected benefits (Linsky, 1975). In this study, an offer of HK$20, equivalent to 2.6 US dollars, was the most effective incentive. However, overseas studies have found that increasing the monetary reward beyond a symbolic amount yield little additional benefit (Semiatycki & Campbell, 1984; Fox et al., 1988; Church, 1993). It has even been suggested that a reward that is interpreted as salary for the time devoted to the survey can have a negative effect, because participation in the survey may be viewed as a commercial transaction and, as such, is easier to refuse (Everett et al., 1997; Deehan et al., 1997). Our results also question the suggestion that only actual money enclosures, not merely promises, effectively improve participation (Church, 1993). Overseas studies found that sending 1 US dollar (=HK$ 7.78) to survey participants had a similar, but small, effect on response (Spry et al., 1989). However, we cannot say whether a money enclosure would have been more or less effective for other health-care professionals, like nurses.

This randomized intervention trial did have an increased overall final response rate. Our experience is that, in addition to inducing earlier responses, the incentives (34.7%) did have an overall positive effect on participation, as our response rate exceeded 6.2 percent, which is more than the no incentive (28.5%) group (χ^2=14.34, p<.001) (Table 2). This 'improved' response rate (6.2%) could be the result of the offered incentives. However, it could also be the result of other factors. For instance, it could be the reminder itself instead of the incentive, because some of the respondents in the incentive group refused to accept the cash incentive. They said it was their responsibility, some others said the reason for delay was because they were not in Hong Kong, and some were too busy to reply, but the reminder reminded them to send back the questionnaire, but not the incentive. However, this study did not collect reasons why the respondents were willing to reply to our questionnaire. Further study is suggested to explore this issue. At this point, researchers may wish to select the combination of incentives that is best suited for their particular situation (i.e. budgets, time, and manpower) and to share their experience. An offer of HK$20 was the most efficacious, but not the most cost-effective strategy among the various strategies tested.

Other potential limitations of the study include the generalizability of the results and the inability of the present data to address the promise of payment debate. The effectiveness of monetary incentives may depend on cultural context, in spite of the lack of solid evidence to substantiate this hypothesis. Although we have no reason to believe Hong Kong CMPs should respond differently to cash inducements than American or European practitioners, given the paucity of reports in this area and our 31.6 per cent response rate in general, further extrapolation from the results requires repeated testing in other health-care professions, like nurses. Second, our data belie the traditional belief that post-payment alters the response rate significantly. However, we did not experiment with pre-payment timing to study its effects on response behavior. Third, the use of an appropriate level of cash incentives appears to be more costly than not offering any

inducement. Last, our sample can not represent the main stream in health-care professionals in Hong Kong, as nurses are the largest population in the health care system in Hong Kong. Thus, we can not make further conclusions about this effect to other health-care professions, and study on nurses is encouraged. In addition, more systematic study of marketing principles to the specific problem of increasing response rates in mailed surveys should be carried out and published, leading to a better understanding of respondent behavior.

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以獎勵方式提升問卷的回覆率之隨機研究

不少醫護理專業人員在進行問卷調查時，均面對回覆率低的煩惱。在這個研究中，我們嘗試以隨意抽樣的方式，探討金錢獎勵對回覆率的效應。

研究員向三千三百三十五名中醫師，採隨意抽樣方式發放了郵遞問卷。問卷分兩類，第一類是回覆問卷後，沒有金錢獎勵的(n=1,667)。第二類是回覆問卷後，會獲金錢獎勵的，這類分成兩個層次：港幣二十元(n=834)及三十元(n=834)的金錢獎勵。

研究結果顯示獲發金錢獎勵組的問卷回覆率，較沒有金錢獎勵的爲高(34.7% vs . 28.5% ， χ^2=14.34 ， p<0.001)。不過獲港幣三十元金錢獎勵組的回覆率，相比獲港幣二十元一組，沒有明顯增加 (χ^2=0.16, p=0.69)。

儘管金錢獎勵確實能增加問卷的回覆率，但不設獎勵的方式更合符成本效益 (每位研究對象的成本爲港幣二十一元九角)。不過，由於這項研究對象只包括中醫師，研究結果可能未能反映香港的醫療專業人士，特別是在醫療系統中人數佔大多的護士之情況。因此，我們不可以下定論，稱在護理專業界別中使用金錢獎勵的方式是較有效。至於金錢以外的其他獎勵方式與回覆率的關係則有待日後研究探討。

摘要