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MEASURING SOCIAL INDICATORS IN OPINION
SURVEYS: A METHOD TO IMPROVE ACCURACY
ON SENSITIVE QUESTIONS

(Date accepted 8 June, 1991)

ABSTRACT. Asking sensitive questions, without risking a terminated interview or response bias, is a major problem in deriving accurate social indicators based on public opinion surveys. This problem has become particularly acute as the topics that interest researchers have become more personal in nature. Mail and telephone surveys, and methods such as the randomized response technique, have all been used to try and overcome this problem, with varying degrees of success. In this paper, we describe an alternative approach using a sealed booklet. We report results from a question-format experiment that asked respondents the same sensitive questions in a sealed booklet, completed in the presence of the interviewer, and in a standard face-to-face interview. The survey used for the experiment was a personal interview survey of drug use based on a national population sample. The sealed booklet format was found to produce more accurate estimates of drug use compared to direct questions. In addition to assuring the respondent greater anonymity, the sealed booklet permits a wide range of questions to be asked and does not limit the analyses that can be conducted on the data.

INTRODUCTION

From the birth of survey research in the 1930s and 1940s, a major problem has been to devise ways of asking respondents sensitive questions while ensuring the validity of their responses. Ensuring the accuracy in public opinion data relating to sensitive issues has become even more important, as the topics that interest survey researchers and policy makers become ever more personal and intrusive. This is particularly the case in the health and drug use areas, where understanding patterns of sexual and other behavior within the population is central to the success of intervention strategies (Fox, Day and Klein, 1989). Accurate and reliable social indicators are therefore central to the design of effective public policies to deal with them.

A variety of methods were devised in the 1950s to try and overcome the problem of asking sensitive questions in personal interview surveys. These involved varying the wording of the question to treat the subject

in a casual way ('Do you happen to have ...?'), linking it with what other people do ('As you know, many people have ... How about yourself?'), or using numbered cards ('Will you please read off the number on the this card ...') (Barton, 1958). These approaches had several serious drawbacks, the most important being that they did not guarantee the respondent anonymity, a factor often considered central to obtaining accurate responses on sensitive subjects (Hoinville and Jowell, 1978).

In the 1960s and 1970s, other methods which avoid face-to-face contact with the respondent have been used to deliver sensitive questions, such as mail questionnaires and telephone surveys. These methods, however, suffer several disadvantages, the most notable being the difficulty in convincing respondents that their answers are, as the interviewer claims, anonymous. One method which was devised specifically to overcome these problems and guarantee the respondent anonymity is the randomized response technique (RRT) (Warner, 1965; Fox and Tracy, 1986). Although it has been developed into a highly sophisticated survey technique in recent years, the RRT method does not permit other data to be linked to the respondent, thus inhibiting analysis and explanation concerning the phenomena under examination.

In this paper, we report results using a method designed to maximize respondent accuracy on sensitive questions, which uses a sealed booklet in the context of a personal interview. By using an alternative question-format experiment contained within a national population survey of drug use, we show that the technique has several significant advantages. Like the RRT method, it guarantees the respondent anonymity, but it is easier and less costly to administer and enables the sensitive data to be linked to other information about the respondent, thereby permitting more detailed analysis. In addition, the survey can include an extensive range of sensitive questions, which is particularly useful in surveys where researchers need to gain responses to a battery of sensitive items.

METHODS

The two major sources of potential error in surveys are sampling error and nonsampling error. Sampling error can normally be substantially

reduced by a number of statistical methods, such as altering the sample design of the survey or weighting the data after collection. Dealing with non-sampling error, however, is more problematic. This type of error can result from either nonresponse bias, with some respondents refusing to participate in the survey, or from response error, which arises when respondents deliberately falsify the information that is given to the interviewer (Fox and Tracy, 1986: 8—9).

A variety of methods have been used to try and reduce the response error arising from the inclusion of sensitive questions in surveys. A familiar technique is the mail questionnaire, which the respondent can complete at his or her convenience and which removes the bias inherent in asking sensitive questions within the context of a personal interview. However, respondents frequently disbelieve the guarantee of anonymity and assume that the questionnaire contains some form of identifier which can link them to the data. In any event, response rates for mail surveys are generally low without the use of extensive well-designed and well-timed follow-ups, which obviously necessitate the identification of individual respondents (Heberlein and Baumgartner, 1978).

Another method which avoids face-to-face contact with the respondent is the telephone survey. Like mail questionnaires, telephone surveys are anonymous, but again suffer from the disadvantage that respondents have no guarantee that their personal details are not being linked to a telephone number or to an address. In addition, both mail and telephone surveys which are anonymous suffer from two major problems (Fox and Tracy, 1986: 14). First, because they are anonymous, the validity of the responses cannot be checked, an important consideration when data are being collected on a topic that has produced little prior empirical research. Second, anonymity precludes follow-up interviews with respondents. This makes it impossible to collect longitudinal data, which is often important where government interventions are to be evaluated. For example, longitudinal data are often crucial in analysing the impact of government interventions in the health area, particularly where sexual attitudes or behavior and their relationship to AIDS is concerned.

These drawbacks suggest that some form of personal interview remains the best method for asking sensitive questions in surveys. In

addition, as Fox and Tracy (1986: 14–15) report, personal interviews have two major advantages over alternative methodologies. First, they produce response rates which are typically 20 or more percent higher than either mail or telephone surveys, thereby reducing the risk of nonresponse bias. Second, personal interviews are generally favoured by the respondents themselves: a survey which asked respondents to state their preference for a survey methodology found that 51 percent favoured the personal interview, compared to 30 percent for the mail survey and only 7 percent for the telephone survey (quoted in Fox and Tracy, 1986: 15).

When personal interviews are used to collect sensitive information, two methods have been devised to reduce error, the randomized response technique (RRT) and the sealed booklet. The RRT method was originally proposed by Warner in 1965 and it guarantees the respondent anonymity by randomly selecting a question to which they are to reply, without the interviewer being aware to which statement the reply refers. Comparisons of RRT and other methods, plus a number of validation studies, have produced mixed results. Fox and Tracy's 1986 review of a number of studies showed that in five out of nine studies, and in one out of four validation studies, RRT produced more accurate responses to sensitive questions. It has been shown to produce more reliable responses on sensitive issues such as child abuse (Zdep and Rhodes, 1976), the prevalence of drug use (Zdep *et al.*, 1979; Goodstadt and Gruson, 1975) and abortion (Abernathy, Greenberg and Horvitz, 1970).

Although the RRT method has been extensively developed and refined over the past quarter century (see Fox and Tracy, 1986: 17ff; Greenberg *et al.*, 1969; Folsom *et al.*, 1973), to the extent that it bears little relation to the comparatively crude method originally devised by Warner, several drawbacks remain. First, it is often costly to administer in terms of the pre-testing that is required and in terms of interviewer time. Second, it cannot be linked to other information about the respondent, thereby limiting the analyses that can be conducted with the data. Finally, as with other methods which guarantee anonymity, follow-up interviews with respondents are not possible.

A method which overcomes these problems is the sealed booklet. This method guarantees the respondent a degree of anonymity within the context of a personal interview, yet permits other information about

the respondent to be linked to it, thereby increasing the analytic potential of the data. It also permits the validity of the responses to be checked, as well as leaving open the possibility of re-interviewing respondents at some later stage. In the remainder of this paper, we report the results of a test to validate the sealed booklet method within the context of a national population survey on drug use, conducted in Australia in 1988.

The sealed booklet method

The data used to test the sealed booklet technique are drawn from a personal interview survey of drug use and attitudes toward drugs conducted in March and April 1988 as part of the Australian federal government's National Campaign Against Drug Abuse (NCADA). A national population sample was drawn involving a systematic random sample of all dwellings in urban centres with a population of at least 5,000 people; the survey resulted in 2,225 completed interviews. To select the household member to be interviewed, a systematic procedure based on the age and gender of all people in the house was used. Since adolescents are a risk group for drug use an oversample of 14 to 19 year olds was obtained by interviewing a 14 to 19 year old in the house if one was available. The analyses reported in this paper exclude the oversample of 14 to 19 year olds and are based on the random sample of 1,823 respondents.

To test the effect of alternative question formats, the questionnaire contained two separate sections on drug use, each of which asked the respondent to report their experiences with 13 specific drugs. The first section of the questionnaire, delivered by the interviewer, asked the respondent three questions relating to each of the 13 drugs, involving whether or not they had been offered the drug in question, had tried it, and whether or not they would try it if it was offered to them by a trusted friend. The 13 drugs, as they were described to the respondent, and the exact question wordings are given in the Appendix.

The second drug use section consisted of a sealed booklet which was handed to the respondent by the interviewer. While handing the sealed booklet to the respondent, the interviewer was instructed to say the following:

I would now like to give you a section of the questionnaire for which I don't have either the *questions* or the *answers*. Please call out the right numbers to me and I will write them on my questionnaire. As you will notice, even the numbers have been jumbled.

This statement, coupled with the fact that the booklet had to be removed from a sealed envelope, reinforced the emphasis on anonymity.

The instructions to the respondent within the sealed booklet also emphasized anonymity:

The interviewer *does not* have a copy of this sheet of questions and answers. All the interviewer does have is a list of numbers on the questionnaire. Because we must have information on the extent of drug use and the community's attitudes to drugs, please answer the following questions honestly. Just call out the numbers to the interviewer.

We repeat, the interviewer *does not* know either the questions or the answers. To guarantee this, you will note that the numbers have also been jumbled. Your cooperation in this important national health research is greatly appreciated.

The booklet then asked the respondent to report the same information about their drug experiences as in the face-to-face section, with additional information about frequency of use, consumption, and if they had injected themselves with any drugs. The respondent then gave their answers to the questions by calling out a unique pre-coded random number which had been assigned to each response. This pattern continued until the end of the booklet.

In calling out numbers to the interviewer, the interviewer then marked the coding sheet with appropriate number (Porritt, 1990). For example, if the question was

- | | |
|--|---|
| 1. Have you ever injected yourself with an illegal drug? | CALL OUT NUMBER
Yes 121
No 5
Not sure 36 |
|--|---|

and the respondent called out the number '121', indicating a positive response to the question, the interviewer would then circle the code '1' on the coding sheet, as follows:

1.	121	5	36
	1	2	3

In pretesting the method, it was found to be preferable to scramble the response codes across all questions, and not just within questions. This had the advantages of reducing recording errors, so that responses were matched to the proper question; ensuring that all questions were answered; allowing interviewers to handle skips and jumps; and avoiding any obvious response patterns that might undermine the goal of anonymity (Porritt, 1990).

A final point is the placement of the sealed section within the course of the interview. It was considered possible that the placement of the sealed section could have some bearing on the results of the experiment. For example, asking the sealed booklet questions after the same face-to-face questions were asked by the interviewer could bias the results, even though they would be placed at opposite ends of the interviews, separated by some 40 minutes.¹ To test this hypothesis, half the sample was randomly selected to be asked the sealed booklet questions within the first 10 minutes of the interview, and then asked the similar face-to-face questions in the last 10 minutes of the interview. For the other half of the sample, this sequence was reversed.²

Comparing the sealed booklet and direct question formats

In presenting the results, we exclude three of the 13 drugs — alcohol, tobacco, and ecstasy.³ Alcohol and tobacco are considerably less sensitive than the other drugs, since they are licit, widely available, and used by significant proportions of the population. Ecstasy proved to have little penetration into the Australian population, and resulted in only a handful of positive responses. It adds little to our substantive findings and for parsimony is excluded from our results. For similar reasons, we exclude the questions relating to whether or not the respondent had been offered the drug in question, since this is less sensitive and considerably less important than either lifetime prevalence or potential future use of the drug.

It was hypothesized that the alternative questions formats, as well as the sequence in which they were delivered, would significantly affect the responses. To test these hypotheses, a multivariate analysis of variance (MANOVA) was conducted for all the drugs simultaneously. The results indicate that there is a significant difference in the responses

to the two methods used in the questionnaire, and in the sequence in which the answers are given. This was shown when the respondent scores across the nine drugs were combined to form a scale for each method and then the main effects for method and order, and the interaction between these two main effects, were tested using SPSS^x MANOVA (Tabachnick and Fidell, 1989). The repeated measures design for lifetime prevalence indicated that at the .01 level there were no significant order effects ($F = 1.7$; d.f. = 1,1821; $p = 0.19$) but there is a significant interaction effect between order and method ($F = 3.7$; d.f. = 1,1821; $p = 0.05$). The analysis was repeated with the potential future drug use scales which showed a significant effect for order ($F = 3.9$; d.f. = 1,1821; $p = 0.05$) but no interaction between order and method ($F = 0.08$; d.f. = 1,1821; $p = 0.08$). For both lifetime prevalence and potential use the method (face-to-face versus sealed) is shown to be highly significant for both lifetime prevalence ($F = 43.8$; d.f. = 1,1821; $p = 0.00$) and potential use ($F = 10.4$; d.f. = 1,1821; $p = 0.00$).⁴

Having established that there is a significant overall difference in responses between the sealed booklet and face-to-face methods when all of the drugs are examined simultaneously, and that there is also an order effect, the next question is whether these effects are evident for each individual drug or only for some of them. To investigate this, MANOVAs were calculated for each of the individual drugs. Table I shows the pattern of replies for lifetime prevalence of the nine drugs for the two methods, across the Australian population. The drugs are ranked according to the proportion reporting that they had used them, which ranged from a high of 66 percent for painkillers to a low of less than 1 percent for heroin.

Responses to potential use are shown to be much more straightforward in their interpretation than the lifetime prevalence measures. The multivariate analyses show a significant method effect for all the potential use measures plus a significant main effect for other on the potential use of tranquillisers. The frequency distributions in Table I indicated that the percentage who said they would use the drug if offered to them by a close friend increased when the sealed booklet was used, except for painkillers. In this instance there was a 5 percent decline in the percentage who said 'yes' in the sealed booklet. A more

TABLE I
Lifetime prevalence of drug use and potential drug use by method of questioning^a

	Total sample						Sealed answered prior to face-to-face						Sealed answered after to face-to-face						
	Face-to-face			Sealed			Face-to-face			Sealed			Face-to-face			Sealed			
	(N)	Yes	No	Yes	No	(N)	Yes	No	Yes	No	(N)	Yes	No	Yes	No	(N)	Yes	No	
Lifetime prevalence																			
Painkillers	(1794)	66	34	67	33	(902)	65	35	65	35	(892)	66	34	68	32				
Tranquillisers ^b	(1791)	26	74	36	64	(900)	25	75	34	66	(891)	28	73	37	63				
Marijuana ^c	(1799)	28	72	27	73	(903)	28	72	27	74	(896)	27	73	28	72				
Barbiturates	(1765)	7	93	7	93	(886)	6	94	6	94	(879)	8	92	7	93				
Hallucinogens ^{bc}	(1782)	6	94	7	93	(894)	4	96	5	95	(886)	6	94	8	92				
Amphetamines ^b	(1782)	5	98	6	94	(894)	4	96	5	95	(888)	5	95	7	93				
Cocaine	(1783)	2	98	3	97	(896)	3	97	3	97	(887)	2	98	3	97				
Inhalants	(1782)	2	98	2	98	(895)	2	98	2	98	(887)	2	98	2	98				
Heroin ^c	(1781)	1	99	1	99	(896)	2	98	1	99	(885)	1	99	2	98				
Potential use																			
Painkillers ^b	(1753)	40	60	35	65	(881)	39	61	33	67	(872)	42	58	37	63				
Tranquillisers ^{bd}	(1787)	9	92	10	90	(900)	7	93	9	91	(887)	10	90	11	89				
Marijuana ^b	(1774)	11	89	13	87	(894)	11	89	13	87	(880)	12	88	12	88				
Barbiturates ^b	(1795)	2	98	3	97	(906)	2	98	3	97	(889)	3	97	4	96				
Hallucinogens ^b	(1800)	2	98	4	96	(906)	2	98	3	97	(894)	2	98	4	96				
Amphetamines ^b	(1796)	1	99	3	97	(901)	1	99	2	98	(895)	2	98	3	97				
Cocaine ^b	(1800)	1	99	2	98	(904)	1	99	2	99	(896)	1	99	3	98				
Inhalants ^b	(1800)	0	100	1	99	(906)	0	100	2	98	(894)	0	100	1	99				
Heroin ^b	(1802)	1	99	1	99	(908)	1	99	1	99	(894)	0	100	1	99				

^a Row percentages. Figures may not sum to 100 due to rounding.

^b Method significant at $p < 0.05$.

^c Interaction between method and order significant at $p < 0.05$.

^d Order significant at $p < 0.05$.

Source: 1988 NCADA Community Survey, population sample ($N = 1,823$).

detailed analysis of the significant order effect for potential tranquilliser use showed that respondents gave higher 'yes' answers in the sealed section than in the face-to-face section, regardless of order.

The results are more complex for the lifetime prevalence measures. There is some change in the answers given by respondents to lifetime prevalence between the two methods for all nine drugs, however the analyses show that only tranquillisers and amphetamines had significant method effects, while hallucinogens had a significant method effect plus an interaction between method and order, and marijuana and heroin showed a significant interaction between method and order. From Table I it can be seen that for both tranquillisers and amphetamines the percentage who said 'yes' they had tried the substances increased for the sealed booklet. A more detailed study of the interaction effect for hallucinogens showed that there was no significant difference between the methods if the sealed booklet was asked prior to the face-to-face, but if the sealed booklet was asked after the face-to-face the proportion who indicated 'yes' increased. As asking the sealed booklet early does not change the proportions responding in either the sealed or the face-to-face, and asking the sealed section later results in a significant increase in the proportion stating 'yes', this at least suggests that a sealed methodology will not result in a significant decline in the number of respondents admitting to use.

In the case of prevalence for heroin and marijuana a more detailed study of the interaction between method and order showed that a lower 'yes' response was elicited when the sealed booklet was asked prior to the face-to-face section while a higher 'yes' response was elicited when the sealed booklet was completed after the face-to-face section. For example, in the case of marijuana, when the sealed booklet was asked after the face-to-face section the means show that 27 percent of respondents stated they had tried marijuana in the face-to-face section while 28 percent gave a 'yes' response to the sealed booklet. The figures were reversed when the sealed booklet was asked early in the questionnaire. These two findings suggest either two possibilities — there could be a carry-over effect where asking the question early promotes memory recall and results in a higher response later. Alternatively, asking the question later in the questionnaire allows enough time for trust to be established between the respondent and interviewer resulting in a higher response rate.

As the same respondents have been asked the question in two different ways, the possibility of carry-over effects influencing the results is a serious consideration. To overcome this we have undertaken a between subjects analysis. This was done by comparing those who answered the sealed booklet prior to the face-to-face section with those who answered the face-to-face section prior to the sealed booklet. Taking all of the substances from Table I with a significant method effect for the within subjects analysis, t-tests were calculated; the analyses are presented in Table II.

The t-values indicate that the proportion who said that they had tried one of the three lifetime prevalence measures was higher using the sealed booklet rather than the face-to-face methodology. Tranquilliser use shows the highest change, with an additional 12 per cent of the sample admitting to use under the sealed method. The lifetime prevalence rate for amphetamines increases by a significant 3 percentage points with the use of the sealed booklet. However, lifetime prevalence for hallucinogens was not found to differ significantly between the two methods.

TABLE II
T-tests for sealed and face-to-face method

	<i>Mean</i>		<i>T-value</i>	<i>(N)</i>
	<i>Sealed</i>	<i>Face-to-face</i>		
Lifetime prevalence				
Tranquillisers	0.37	0.25	5.64**	(1805)
Hallucinogens	0.08	0.06	1.54	(1800)
Amphetamines	0.07	0.04	2.7**	(1798)
Potential use				
Painkillers	0.38	0.39	-0.12	(1784)
Tranquillisers	0.11	0.07	3.05**	(1803)
Marijuana	0.13	0.12	0.94	(1788)
Barbiturates	0.04	0.02	3.29**	(1809)
Hallucinogens	0.04	0.02	2.83**	(1809)
Amphetamines	0.03	0.01	0.03**	(1805)
Cocaine	0.03	0.01	3.57**	(1807)
Inhalants	0.01	0.00	1.29	(1809)
Heroin	0.01	0.00	1.08	(1811)

* statistically significant at $p < 0.05$, ** $p < 0.01$

Source: 1988 NCADA Community Survey, population sample ($N = 1823$).

In the case of potential use, significant increases of 2–4 percentage points in the potential use of tranquillisers, barbiturates, hallucinogens, amphetamines and cocaine are produced when the sealed booklet method is used. Given that these activities are confined to a very small percentage of the population, the increases are in fact substantial, representing in almost a 50 percent increase in the rate of use for some substances. The results from the within — and between — subject analyses are indicative that respondents will generally give higher responses when the sealed booklet method is used, as opposed to asking questions in a face-to-face situation.

Finally, to determine if age and gender are associated with the respondent's propensity to conceal their drug use, logit analyses on the two lifetime prevalence measures and the five potential use measures that showed significant differences between the methods in Table II were conducted. Our primary concern is to examine those who increased their responses in the sealed section versus consistency; those whose responses decreased in the sealed section have been excluded from the analyses. The first part of the logit analyses was intended to identify the best fitting model for each of the drugs and this was accomplished using the standard procedure of comparing a series of unsaturated models with the saturated model, resulting in the optimal models presented in Table II. This model-fitting stage of the analyses indicated that neither gender, age nor the interaction between age and gender significantly improved the fit of any of the potential use measures. However, age and gender were a significantly better fit for concealment of lifetime prevalence of tranquillisers and amphetamines.

In the second part of the analyses, Table III provides the odds ratio for each parameter. The odds ratio presents a summary measure of the conditional odds for one group relative to the conditional odds of another group (Bohrstedt and Knoke, 1988: 336). For example, the ratio of the odds of males concealing lifetime prevalence of tranquilliser use, as opposed to not concealing, to that of the female odds of concealing as opposed to not concealing, is just over half or, to be exact, 0.64. Our conclusion from this is that men are less likely to conceal tranquilliser use than women, given the model being fitted. The odds of respondents aged 30 and older are 2.1 times more likely to conceal than adolescent. Concealment of tranquillisers is much more

TABLE III
The effects of age and gender on concealment^a

<i>Effects</i>	<i>Odds ratio</i>
Lifetime prevalence of tranquillisers (<i>n</i> 1,726)	
<i>Gender</i>	
Female	1.00
Male	0.64
<i>Age</i>	
15–19	1.00
20–29	1.55
30+	2.08
(G ² , d.f.)	(1,363,1722)
Lifetime prevalence of amphetamines (<i>n</i> = 1,775)	
<i>Gender</i>	
Female	1.00
Male	3.17
<i>Age</i>	
15–19	1.00
20–29	1.17
30+	0.21
G ² , d.f.)	(295,1771)

^a Logit models were developed using GLIM (Generalised Linear Interactive Modelling system). See text for further details.
Source: As for Table I.

likely to occur if the respondent is female and older and it is these groups which other research has shown to be a greater risk from tranquilliser use (Cooperstock and Parnell, 1982; Ashton and Golding, 1989).

Age and gender also have a significant effect on concealment of amphetamine use. Unlike tranquillisers, the odds of males concealing is considerably greater than the odds of females. The odds ratios in Table 2 show that men are more than three times as likely to conceal lifetime use of this drug as compared to the women in this sample. Those aged between 20 and 29 years have slightly greater odds of concealing than adolescents, while those aged 30 years and over have considerably lower odds of concealing than the adolescent age group.

DISCUSSION

Eliciting responses to sensitive questions is a perennial problem in survey research. Phillips (1971) has shown that response bias is likely to occur even in surveys involving the collection of comparatively innocuous data. When sensitive issues are involved, we could expect systematic patterns of over or under-reporting to seriously impact on the validity of the results. Yet, as Fox and Tracy (1986: 9–10) conclude, this possibility is rarely taken into account by survey researchers. All the established methods of dealing with the problem by ensuring respondent anonymity involve significant drawbacks. Perhaps the most widely known and used method, the randomized response technique, has been shown to yield generally superior results to other methods, but involves additional administrative costs and limits the potential use to which the data can be put.

In this article we have reported results from an experiment using a simple, easily managed, sealed booklet approach to mitigating the error resulting from asking sensitive questions. This method guarantees the respondent anonymity in their answers, while permitting a large number of sensitive questions to be asked with relatively little additional costs in field resources. By experimenting with two methods of asking sensitive questions about drug use in Australia, the sealed booklet and a direct face-to-face question, we have demonstrated that the booklet method does increase the number of respondents who admit to either lifetime use or potential willingness to use a variety of illegal drugs.

Although significant order effects were noted in four cases, in two of those responses to the sealed booklet increased. Of the remaining two cases the changes in marijuana resulted in either an increase or decrease of 1 per cent. Given that the overall rate of use for marijuana is in the boundary of 27 per cent the finding is not too problematic. The significant order effect for heroin does raise some concern as the rate can double depending on the placement of the question. If the result has been produced by a carry over effect then the sealed booklet asked on its own will not affect the result. However, if the result is a product of the question not being asked till later, this suggests that sensitive questions, such as heroin use, should not be asked early in an interview situation.

As we are dealing with an illegal activity to begin with, the numbers who actually engage in such activity are the exception rather than the rule. Thus even a slight increase in numbers can be seen as a significant improvement in measurement. However, the 'more is better' syndrome is not necessarily the correct assumption (Midanik, 1982). In the absence of some other source of collateral reports, this issue of validation cannot be addressed here. However, the patterns of responses between the two question formats, the direction of the bias, and its relationship to age and gender, all provide circumstantial evidence that the sealed booklet format produces more accurate responses to sensitive questions about drug use. This is particularly the case for the drug which has the highest rate of concealment, the lifetime prevalence of tranquillisers.

Perhaps the best application of the technique would appear to be sensitive questions concerning those drugs which are less clearly defined and publicized by society as drugs of major concern — amphetamines and tranquillisers — rather than drugs such as cocaine, marijuana and heroin which society has stigmatized. Our results show that the technique produces what we assume to be significantly better estimates of both lifetime prevalence and potential use of tranquillisers and amphetamines. Evidence to support the claim that they are more accurate estimates come from the logit analyses, which show that the propensity to conceal lifetime prevalence of these drugs is related to different age and gender groups with the acknowledged risk groups having greater odds of concealing than the non-risk groups. In this context, the sealed booklet technique is a substantial improvement on currently used methods.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the financial assistance of the Commonwealth Department of Community Services and Health, who sponsored the research under a grant from the National Drug Information Centre. Our thanks to Roger Jones, Ian Diamond, Yvonne Pittelkow, Don Porritt, and an anonymous reviewer for this journal for their comments; the usual disclaimer applies.

Appendix

The 13 drugs about which information was collected in the survey, together with some 'street' names which were also given in the questionnaire, were as follows.

1. Marijuana/hash
2. Tobacco/cigarettes
3. Heroin
4. Barbiturates
5. Alcohol
6. Tranquillisers
7. Glue/petrol/solvent/rush to sniff
8. Amphetamines (speed)
9. Cocaine/crack
10. Hallucinogens (LSD/magic mushrooms/trips)
11. Painkillers and analgesics
12. Quadrines
13. Ecstasy/designer drugs

The first section of the questionnaire, delivered by the interviewer, asked the respondent three questions relating to each of the 13 drugs:

1. 'Have you ever been offered . . .? Just answer "yes" or "no"'
2. 'Have you ever tried . . .?'
3. 'If a friend you trust offered you . . . would you take it?'

The second section of the questionnaire relating to drug use began as follows:

'The interviewer *does not* have a copy of this sheet of questions and answers. All the interviewer does have is a list of numbers on the questionnaire. Because we **MUST** have information on the extent of drug use and the community's attitudes to drugs, please answer the following questions honestly. Just call out the numbers to the interviewer.

We repeat, the interviewer *does not* know either the questions or the answers. To guarantee this, you will note that the numbers have also been jumbled. Your cooperation in this important national health research is greatly appreciated.

Have you ever been offered any of the following? (PLEASE CALL OUT THE CORRESPONDING NUMBER FOR 'YES' OR 'NO' FOR EACH DRUG. For example, if you have ever been offered Alcohol, call out 117. On the other hand, if you have never been offered hallucinogens, call out 74).'

The 13 drugs were then listed, together with numbers ranging from 4 to 409 matching 'yes' and 'no' responses. Subsequent questions asked whether the respondent would take the drug if it was offered by a trusted friend, whether they had tried any of the drugs, and if so, when it has last taken place, and how often they took the drug at that time.

NOTES

¹ Just over half the respondents (54 percent) completed the interview in less than one hour.

² All rotations were pre-specified, with questionnaires being batched into sets of six. There were eight combinations possible in the questionnaire — sex, order of presentation and rotation — thus two of the eight combinations were excluded from each batch. Six interviews were obtained for each start point.

³ A fourth drug was included in the list presented to respondents — quadrines. This was a fake drug used to test for inaccurate responses.

⁴ Although a sequence effect was not found for all the drugs simultaneously, we explored the possibility that a sequence effect might be found for the drugs individually. Using loglinear models, we tested for an interaction between the sequencing and responses to the sealed versus the face-to-face questions. The results indicated that there was a sequence effect for lifetime prevalence of hallucinogens at the 0.01 level ($G^2 = 11.36$, d.f. = 3), but no statistically significant effects for the other drugs.

REFERENCES

- Ashton, Heather and John F. Golding: 1989, 'Tranquillisers: prevalence, predictors and possible consequences. Data from a Large United Kingdom Survey', *British Journal of Addiction* 84, 541—546.
- Barton, J. A.: 1958, 'Asking the embarrassing question', *Public Opinion Quarterly* 22, pp. 67—68.
- Blaiock, Hubert: 1972, *Social Statistics* (second edition) (McGraw-Hill, New York).
- Bohrnstedt, G. W. and D. Knoke: 1988, *Statistics for Social Data Analysis* (second edition) (F. E. Peacock, Illinois).
- Bungey, J. et al.: 1987, *Survey of South Australian School Childrens' Use of Tobacco, Alcohol and Other Drugs* (Drug and Alcohol Council: Adelaide).
- Chou, Ya-lun: 1975, *Statistical Analysis* (second edition) (Holt, Rinehart and Winston: New York).
- Cooperstock, Ruth and Penny Parnell: 1982, 'Research on Psychotropic Drug Use' *Social Science and Medicine* 16, 1179—1196.
- Folson, Ralph E. et al.: 1973, 'The Two Alternate Questions Randomized Response Model for Human Surveys', *Journal of the American Statistical Association* 68, 525—530.
- Fox, Daniel, Patricia Day and Rudolf Klein: 1989, 'The Power of Professionalism: Policies for AIDS in Britain, Sweden and the United States' *Daedalus* 112, 93—111.
- Fox, James Alan and Paul E. Tracy: 1986, *Randomized Response: A Method for Sensitive Surveys* (Sage Quantitative Applications in the Social Sciences: Beverly Hills, Calif).
- Greenberg, Bernard G. et al.: 1969, 'The Unrelated Question Randomized Response Model Theoretical Framework', *Journal of the American Statistical Association* 64, 520—539.
- Heberlein, T. and R. Baumgartner: 1978, 'Factors Affecting Response Rates to Mailed Questionnaires: A Quantitative Analysis of the Published Literature', *American Sociological Review* 42, 447—62.
- Hoinville, Gerald and Roger Jowell: 1978, *Survey Research Practice* (Heinemann: London).
- Newcomb, Michael, Ebrahim Maddahian and P. Bentler: 1986, 'Risk Factors for Drug Use Among Adolescents: Concurrent and Longitudinal Analyses', *American Journal of Public Health* 86, 525—531.
- O'Malley, Patrick, Jerald Bachman and Lloyd Johnston: 1988, 'Period, Age and Cohort Effects on Substance Use Among American Youth, 1976—82', *American Journal of Public Health* 74, 682—688.
- Phillips, D. L.: 1971, *Knowledge from What?* (Rand-McNally: Chicago).
- Porritt, Don: 1990, 'Asking survey questions about sensitive issues'. Paper presented to the Social Research Conference, University of Queensland, December.
- Tabachnick, B. G. and L. S. Fidell: 1989, *Using Multivariate Statistics* (second edition) (Harper and Row, Publishers: New York).

- Warner, Stanley M.: 1965, 'Randomized response: a survey technique for eliminating evasive answer bias', *Journal of the American Statistical Association* 60, 63—69.
- Zdep, S. M. and Isabelle Rhodes: 1976, 'Making the randomized response work', *Public Opinion Quarterly* 40, 531—537.
- Zdep, S. M. et al.: 1976, 'The validity of the randomized response work', *Public Opinion Quarterly* 43, 544—549.

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