Making the Randomized Response Technique Work

S. M. ZDEP
ISABELLE N. RHODES

THE RANDOMIZED response technique first proposed by Warner (1965) has now undergone more than a decade of development. Prompting this effort has been the desire to obtain more reliable information when dealing with sensitive issues on surveys. As researchers in this area are fully aware, the two most frequently encountered problems when asking sensitive questions are refusals to respond and intentionally misleading responses designed to conceal socially undesirable behavior and attitudes.

The Warner technique uses two mutually exclusive statements dealing with a sensitive issue. Greater respondent cooperation is elicited through use of a device which selects, by chance, one of two statements to which the respondent is to reply, without revealing this selection to the interviewer. As an example, consider the following statements:

I am a member off Group A.

I am not a member of Group A.

The respondent is to answer "Yes" or "No" to the statement selected by the randomizing device. The interviewer is not told which statement was selected and hence does not know to which statement the reply referred.

This technique was subsequently modified by Abul-Ela *et al.* (1967), who provided for obtaining information on more than one sensitive issue through use of a randomizing device. This method could deal with three or more categories, at least one of which had to be of a nonsensitive nature. In addition to obtaining information on a greater number of sensitive topics, it was felt that a respondent might be more willing to reply

Abstract The ability of the randomized response technique to obtain sensitive information on surveys was compared to two other methods involving self-administered questionnaires. Using a national probability sample, and extending upon a number of developmental changes which have evolved over the years, the randomized response technique proved to be decidedly superior to the other methods.

S. M. Zdep is Vice President and Isabelle N. Rhodes is a Senior Research Director of Opinion Research Corporation, Princeton, New Yersey. POQ 40 (1976) 531-537

truthfully to one of three or more questions than to just two questions as in the Warner technique.

Further revision was suggested by Greenberg *et al.* (1969), who used a nonsensitive question *unrelated* to the sensitive one. This was considered even less threatening for respondents.

A modification by Moors (1971) introduced greater efficiency into the Greenberg model. It, too, employed the unrelated question technique, but by using a split sample, information on the frequencies for the nonsensitive question could be obtained without alerting respondents who used the randomizing device. Of course, if the proportion of people displaying the nonsensitive characteristic is already known, the second sample could be omitted.

Folsom *et al.* (1973) summarized the randomized response research to date by stating that in any survey where a sensitive question is to be asked, it is always preferable to use with the randomizing device an alternate question that is neutral and unrelated to the sensitive question. It is also preferable if the frequency of the alternate question in the sampled population is known beforehand. However, where this information is not available, they provide a new and interesting technique for obtaining the data. It, too, uses a split sample, a randomizing device, and direct questioning. It is illustrated below:

Questioning Techniques Used	*Sample 1*	*Sample 2*
Randomizing device which selects one of two questions to be answered	Sensitive question	Sensitive question
	Nonsensitive question 1	Nonsensitive question 2
Direct question asked of respondents	Nonsensitive question 2	Nonsensitive question 1

The idea is to ask nonsensitive question 2 *directly* with the first sample after they have responded to the randomizing device. Conversely, with the second sample, nonsensitive question 1 is asked directly after using the device. In this manner the frequencies of the nonsensitive questions in the sampled population can be determined without creating apprehension in either of the test samples.

Method

Data for the present study were gathered using Opinion Research Corporation's General Public Caravan, which is a shared-cost, omnibus-type, personal survey among a national probability sample of 2,000 adults aged eighteen and older. Two waves of Caravan scheduled eight weeks apart were used.

A child abuse question was chosen as the sensitive issue, and so it was

necessary to screen the sample for the presence of children in the household. The screened respondents were thereupon divided into random halves, with each half responding to the randomizing device as well as to a direct, nonsensitive question.

Sample 1 responded to the randomizing device (the toss of a coin) by answering either the child abuse or one of two nonsensitive questions. Sample 2, on the other hand, responded to the randomizing device containing the child abuse question and the other nonsensitive question. Each sample was also asked directly the nonsensitive question in the random response device of the alternate sample.

On Wave 2, conducted eight weeks later among a new probability sample of adults, the child abuse question was asked directly of all respondents. In a split sample, half responded by marking their answer on a form, sealing it in an envelope, and then returning it to the interviewer. The other half responded in a similar manner, but instead of returning it to the interviewer, they were instructed to mail the response directly to Opinion Research Corporation's headquarters in an addressed, prepaid envelope.

Extensive pretesting of the questions revealed that the success of the randomized response technique depended heavily on the respondent's understanding and confidence about the method. It was also discovered that the technique seemed to work better when the nonsensitive question dealt with a socially positive activity. That is, a neutral, nonrelated question in a randomizing device resulted in less cooperation than when a question dealing with socially desirable behavior was used. The positive question, it would seem, results in the further removal of stigma associated with a "Yes" response to the question chosen by the randomizing device.

We also discovered that it was desirable to precondition the respondent to the substance of the sensitive question, the nonsensitive question, and the rationale for the randomizing thchnique *before* materials were presented and before the respondent was asked to do anything. It was found that, if written materials were presented to the respondent too early in the questioning process, the respondent would tend to concentrate on the materials, diverting attention from any oral explanation subsequently given by the interviewer. We surmised this was an anxiety reaction prompted by the sensitive question, but even greater anxiety seemed to be associated with a fear of the unknown—that unorthodox questioning process to which the respondent was about to be subjected.

In preconditioning a respondent it is also important not to present more information than can be assimilated. Too much information tends to confuse the respondent, making him even more apprehensive of the task with which he is expected to cope. Establishing *what* information is to be given and *how* it is to be presented can be determined through ade-

quate pretesting among the population in question. This obviously adds to expense, but it appears to be necessary to obtain truthful responses on sensitive issues.

Another fact that cannot be overlooked is the respondent's understanding of the randomizing device itself. An opaque bag or box containing different colored chips or marbles is likely to be regarded with great suspicion unless the respondent can assure himself that the "game" is not rigged in any way. In addition, when the probability of selecting the sensitive question is greater than that of selecting the nonsensitive question, respondent apprehension rises. Therefore, in spite of the greater inefficiency associated with equivalent probabilities for each question, it appears that this is still another consequence of putting the respondent at ease.

The questioning that was finally developed is presented below:

> The next question is one which some people find hard to answer. It deals with the use of physical force on children. We also have a question dealing with attendance at PTA meetings (church or synagogue attendance).
>
> I'm going to give you a nickel and a card with these two questions on it. I want you to take this coin and shake it in your hands. [DEMONSTRATE]. Let it rest on the palm of your hand. Don't let me see which side is up. If the *heads* side turns up, answer the question on the card next to the *heads-up* coin. If the *tails* side turns up, answer the question printed next to the *tails-up* coin. You are to answer "Yes" or "No" *without telling me* which question you are answering. [HAND RESPONDENT COIN AND EXHIBIT.].
>
> The first question reads, "Have you or your spouse ever *intentionally* used physical force on any of your children in an effort specifically meant to hurt or cause injury to that child?"
>
> The second question reads, "Have you attended a PTA meeting at school within the past 12 months (attended church or synagogue within the past week)?"

If the respondent hesitated or refused, the interviewer was instructed to offer this further reassurance:

> There is absolutely no way we can tell which question you are answering if you don't tell us. On the average, half of the people we interview will answer the "heads" question, and half will answer the "tails" question. By putting all the answers in our computer we can determine how many people answered "Yes" to each question, but we won't know *which ones* answered the "heads" question nor will we know which answered the "tails" question. Therefore, it is extremely important that you answer the question indicated by the coin.

In addition to the randomizing technique described above, each half of the split sample was asked directly the appropriate nonsensitive question.

> Have you attended church or synagogue within the past week?
> Have you attended a PTA meeting at school within the past 12 months?

During the second Caravan wave, the randomized response technique was replaced by handing the respondent a card on which the sensitive question was printed. The question was read to the respondent and he or she was instructed to answer by marking "Yes" or "No" on the card. The card was then sealed in the envelope provided and returned to the interviewer or directly to Opinion Research Corporation.

Results

Table 1 presents the rates of noncooperation for each of the three methods. As expected, the fewest usable responses were obtained from the sample required to return their responses by mail. With this method it was possible for respondents to exercise passive refusal merely by failing to return the ballot.

The randomized response technique, on the other hand, resulted in a very insignificant rate of refusal which, in fact, surprised us, given the very sensitive nature of the question.

The unbiased estimates of the proportions of households having engaged in child abuse were calculated using the following formulas:

$$\underset{\eta_A}{\Lambda}(1) = \frac{\lambda_1{}^r - (1\text{-}P)\lambda_2{}^d}{P}$$

$$\underset{\eta_A}{\Lambda}(2) = \frac{\lambda_2{}^r - (1\text{-}P)\lambda_1{}^d}{P}$$

where

η_A = the proportion of households having abused their children

$\lambda_i{}^r$ = the probability of obtaining a "Yes" response to the question selected by the randomizing device

$\lambda_i{}^d$ = the probability of obtaining a "Yes" response to the direct question

Table 1. Rates of Respondent Noncooperation

Method	*N*	*Refusals*	*Nonreturners*	*% Usable Responses*
Randomized response technique				
Sample 1	515	9	—	98%
Sample 2	480	4	—	99
Self-administered, sealed, returned to interviewer	538	65	—	88
Self-administered, sealed, mailed back	465	—	117	75

Table 2. Percent of Child Abusers Identified Using Different Methods

Method	*% Identified*
Randomized response techniques	15%
Self-administered, sealed, and returned to interviewer	3
Self-administered, sealed, and mailed back	4

P = the probability of responding to the sensitive question in the randomizing device

The obtained values were as follows:

Sample 1	*Sample 2*
$\lambda_1^r = .24$	$\lambda_2^r = .30$
$\lambda_1^d = .33$	$\lambda_2^d = .44$
$P = .5$	$P = .5$
$n_1 = 515$	$n_2 = 480$

Substituting values into the formulae, we obtain

$$\underset{\eta_A}{\Lambda}(1) = \frac{.24 - (1 - .5)\,.33}{.5} = .15$$

$$\underset{\eta_A}{\Lambda}(2) = \frac{.30 - (1 - .5)\,.44}{.5} = .16$$

The values obtained above indicated that remarkable consistency was obtained in estimating the proportions of child abusers in the split sample. A weighted average of the two estimates gives an overall proportion of 15 percent.

In comparing the different methods, the results presented in Table 2 clearly indicate that the randomized response technique was more successful in getting people to respond affirmatively than were either of the self-administered techniques. What is most striking about the self-administered results is that they did not differ appreciably from zero. This would indicate to us that the sensitive question selected for this study carries with it considerable social stigma. Based on this we might speculate that, had this question been asked directly, virtually no one would have admitted to it.

It appears that the randomized response technique can serve as a very important tool when dealing with sensitive issues on surveys. It is clear that, if the technique is to be successful, a great deal of care must go into designing both questions and methodology. Perhaps some standardization ought to be introduced into the nonsensitive questions that have been determined to work. Not only should this involve using the identical questions in an identical manner, but in time, the frequencies of the nonsensitive behaviors in different populations ought to be thor-

oughly documented. If this can be accomplished, the economies involved will indeed be considerable.

References

Abul-Ela, Abdel-Latif A., Bernard G. Greenberg, and Daniel G. Horvitz
1967 "A multi-proportions randomized response model." Journal of the American Statistical Association 62:990-1008.

Folsom, Ralph E., Bernard G. Greenberg, Daniel G. Horvitz, and James R. Abernathy
1973 "The two alternate questions randomized response model for human surveys." Journal of the American Statistical Association 68:525-530.

Greenberg, Bernard G., Abdel-Latif A. Abul-Ela, Walt R. Simmons, and Daniel G. Horvitz
1969 "The unrelated question randomized response model theoretical framework." Journal of the American Statistical Association 64:520-539.

Moors, J. J. A.
1971 "Optimization of the unrelated question randomized response model." Journal of the American Statistical Association 66:627-629.

Warner, Stanley L.
1965 "Randomized response: a survey technique for eliminating evasive answer bias." Journal of the American Statistical Association 60:63-69.