Continued Medical Education

Modified randomized response technique to detect respondent reticence

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In survey research sometimes the need arises to determine the prevalence of certain sensitive behaviours like corruption, drug use, sexual promiscuity or cheating. These behaviours due to their value-laden and sensitive nature are less likely to be expressed candidly by the respondents. Therefore, accurate estimation of the prevalence of such 'controversial' or 'sensitive' behaviour in survey research remains a challenge. Various techniques have been developed to ensure anonymity and encourage candour by minimizing the respondent's feelings of risk, of which the randomized response technique (RRT) is one of the commonly used methods.

Randomized response technique

RRT was first introduced by Warner in 1965 (1) and was subsequently developed by Greenberg and colleagues (2). Since then, the technique has been used in a variety of settings and populations to explore a wide range of sensitive behaviours such as corruption and bribery (3), illicit drug use (4-5), and dishonesty and cheating (6-7).

In RRT, when the sensitive question is posed, the participant is instructed to toss a coin and answer depending on the result of the coin toss. If the participant obtains "heads", the question is answered as "yes" irrespective of the actual answer. If they obtain "tails", the question is answered honestly. The number of 'yes' answers obtained per question is therefore made up of those who obtained 'heads' at coin toss and those who practise the sensitive behaviour out of those obtaining 'tails' at coin toss. Therefore, if the participants in the sample are truthful, the number of "yes" answers should be higher than the number of "no" answers obtained for

each question. The analysis is aimed at calculating the proportion of participants who actually engage in the sensitive behaviour concerned. Therefore, for each question in the RRT, using the following notations:

$P(Y)$ = proportion of participants answering 'Yes'

$P(H)$ = proportion of participants who obtain 'Heads' at the coin toss

$P(T)$ = proportion of participants who obtain 'Tails' at the coin toss

P = proportion of participants practising the sensitive behaviour in the sample

The proportion answering "yes" ($P(Y)$) is made up of the proportion of participants who got "heads" at coin toss ($P(H)$) and the proportion of participants who answered "yes" due to actual practice of the behaviour among those who obtained 'tails' at coin toss *($P(T)*P$).*

$$P(Y) = P(H) + P(T)*P$$

Since the event of 'heads' and 'tails' at coin toss occur with equal probabilities of 0.5,

$$P(H) = 0.5, \ P(T) = 0.5$$
$$P(Y) = 0.5 + 0.5P$$
$$P = 2(P(Y) - 0.5)$$
$$P = 2P(Y) - 1$$

The rationale behind the randomized response questions is that they would encourage respondent candour because only the respondent knows whether an answer of 'yes' reflects the sensitive activity or the coin toss. In order to RRT to be successful, the participant should be able to comprehend this logic and comply with the instructions.

Modified RRT to detect reticence

Evidence suggests that despite the use of RRT, respondent reticence persists and affects the results of most studies employing this methodology. Synthesizing the results from a number of studies using RRT, Lensvelt-Mulders et al. (8) show that RRT is able to reduce the underreporting of sensitive acts only to 38% from 45% on average. Hence, respondent reticence does not seem to be fully overcome by the RRT. A modified version of RRT has been developed recently with the aim of identifying reticent participants.

A reticent respondent is defined as "one who gives knowingly false answers with a non-zero probability when honest answers to a specific set of survey questions could lead to the inference that the respondent might have committed a sensitive act" (9). It is assumed that the reticent respondents give untruthful answers intentionally and therefore would take possible precautions to conceal the fact that they are reticent.

The modified RRT presents survey participants with a series of ten sensitive questions (Table 1), giving the standard instruction of answering based on coin toss.

The series of ten random response questions includes three questions on less sensitive behaviours (shown in bold type). It is expected that the answers of reticent participants be driven by two forces – the need to answer the sensitive questions in negative and the need to conceal their reticence. The three less sensitive questions will provide them the opportunity to hide their reticence and answer 'yes' occasionally. Therefore, a pattern of answering 'no' to all sensitive questions and 'yes' to one or more of the less sensitive questions suggests that a participant is likely to be reticent. Such possibly reticent participants can be excluded from the analysis as well as their characteristics can be compared with the possibly candid participants.

This modified version of RRT has been successfully used to detect reticence related to corruption behaviours in different settings (9-10). Whilst the success of standard RRT depends on the participants understanding the randomization process and how it protects the truthful respondents, the modified RRT does not have this pre-requisite. On the contrary, it is more likely to identify the reticent when the respondents are unaware of the protection of the randomization process. With these positive characteristics, the modified RRT seems to be a promising methodology for estimating prevalence of sensitive behaviours as well as the detection of respondent reticence with regard to them.

Table 1. Statements used in a study using modified RRT to assess corruption-related behaviours of health care workers

Statements on work practices	Response	
1. I sometimes give priority to my relatives when I am treating hospital patients.	Yes	No
2. I sometimes use the telephone facility in the public hospital for my private calls.	Yes	No
3. I give priority to job activities that will enable me earn per-diems.	Yes	No
4. I sometimes go visit homes of patients of the public clinic to treat them for a fee.	Yes	No
5. I make more money from my supplementary sources at work than from my salary.	Yes	No
6. I sometimes accept money or gifts from patients to give them priority treatment.	Yes	No
7. I have referred patients from the public hospital to my private practice.	Yes	No
8. I have taken drugs and supplies from the hospital to help my patients at my private practice.	Yes	No
9. I sometimes have to leave some hours early from work to do my business.	Yes	No
10. I am sometimes one hour late to work.	Yes	No

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