

Validity of a questionnaire survey: response patterns in different subgroups and the effect of social desirability

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Questionnaire surveys are often used in epidemiology and survey research. However, investigations have shown that the method suffers from biases. If the intention is to examine differences between subgroups in a sample, studies have shown that people tend to give answers to questionnaires more according to a social norm than to the actual situation. This has been called *social desirability*. The aim of this study was to investigate response bias in subgroups of a sample in a large questionnaire survey ($n = 9,200$) and to study whether social desirability has an impact on survey results in dental research. The answers were divided into subgroups according to gender, age, and residence and were compared with corresponding data from dental insurance claims. The levels of agreement were found to vary considerably and the differences were highly statistically significant. The variation in agreement showed that bias on the group level increased when the distance from an anticipated social norm was larger. This implies that the divergence from a socially desirable mode of action influences the magnitude of the bias. □ *Age groups; gender; questionnaire biases; residential classification; social desirability*

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Questionnaires are widely used in epidemiology and survey research (1). This is to be expected, since questionnaire surveys are relatively inexpensive and relatively fast to do (1). Postal questionnaire surveys can easily cover a large population. However, questionnaire surveys have potential biases (1). The validity of questionnaire survey results will be affected by both non-response and response errors (2). Non-response may affect the external validity (representativity) of the responses. Response errors are incorrect answers caused either by a failure of memory or by a deliberate desire not to tell the facts. Non-response errors are well studied but studies on response errors are rare (3).

Data from questionnaire surveys are also used to study differences between subgroups within a material, for example, between gender and different age and socio-economic groups (4, 5). When subgroup analyses are made on questionnaire surveys, it is assumed that the validity of the data in the subgroups is the same as that in the total material. However, studies have shown that subgroups of gender, demographic background, socio-economic status, and so on may have different response patterns. Hebert et al. (6) found that women had a higher downward bias in reporting food intake than men. Campbell et al. (7) reported that poorly educated persons were more likely to give acquiescent responses than other persons. Singh et al. (8) found that answers from Seventh-Day Adventists were not more valid than answers from other groups regarding physical activity and Fennema et al. (9) that answers from drug-using prostitutes regarding sexually transmitted diseases were not reliable.

It has been hypothesized that people, when responding

to questionnaires, sometimes answer more according to a prevailing social norm than to the factual situation (2). By doing so, people adhere to what is socially desirable (10). Norms are rules of conduct shared by members of a society or participants in a social interaction and are based on cultural values. However, norms can be controversial and difficult to identify (11). Social desirability bias has been defined as 'answers which reflect an attempt to enhance some social characteristics or minimize the presence of some socially undesirable characteristics' (12). In sociology, social desirability is generally considered to be a major source of response bias in survey research (11). Phillips & Clancy (10) state that people's assessment of the desirability of various characteristics strongly influences their reports of presence or absence of such characteristics in themselves. DeMaio (11) stated that social desirability involves both 'Assert Good and Deny Bad', but that the 'Deny Bad' effect is stronger.

Social desirability obviously affects answers to questions concerning smoking (13), alcohol consumption (14), and sexual behaviour (9). However, the social impact could also be seen in other areas—for example, height and weight (alone and combined) (15), safety belt-use (16), voting behaviour (17), and distances to the nearest grocery store and drugstore (17).

The validity of questionnaire surveys in dentistry has been studied, sometimes with contradictory results. Heloe (18) compared answers given in questionnaires and interviews with results from clinical examinations and found that the reliability varied in different types of questions. Axelsson & Helgadottir (19) and Palmqvist et al. (20) studied the agreement between the number of teeth as

reported in a questionnaire survey and as counted in a clinical examination. While Axelsson & Helgadóttir found a very high correspondence, Palmqvist et al. found limited agreement and a systematic overreporting of the number of teeth in the questionnaire survey. Sjöström et al. (21) compared the result of a questionnaire survey with a study of insurance claims. The insurance data were used as a gold standard and the researchers found that there was both a non-response and an incorrect answer bias and that they together could reach substantial levels. However, the question is controversial and Locker (22) writes 'These data provide evidence of the consistency of people's reports of their health status and undermine the characterization of subjective measures as "soft" and unreliable'.

The aims of this study were to examine the occurrence of response bias in population subgroups and (since being a regular dental visitor and having a natural dentition appears to be socially desirable today) to analyse whether or not being in a socially desirable dental position influences response error.

Materials and methods

The target population included all inhabitants in Göteborg and Bohuslän County who were 20 years and older in 1990, 1991, and 1992. A sample was drawn using a systematic birthday selection. The sample contained 9,283 individuals. A questionnaire was sent to every subject in the sample (for details, see 22); 3,949 subjects answered the questionnaire (43%). At the time, almost all dental care for adults in Sweden was performed within the National Dental Insurance System. All insurance claims for the sample were collected and information on three of the questions in the questionnaire was collected and counted. The results are reported elsewhere (24).

The sample was divided into subgroups with regard to gender, age, and residence area (Table 1). The age groups were 20–29 years, 30–39 years, 40–69 years, and 70 years and older. Göteborg and Bohuslän County was divided into six areas: North Göteborg, South Göteborg, South

Table 1. Sample and subgroup sizes

Total sample	9,283
Gender	
Men	4,424
Women	4,859
Age groups	
20–29 years	1,929
30–39 years	1,667
40–69 years	4,196
70 years	1,491
Residential classification	
North Göteborg	1,741
South Göteborg	3,442
South Bohus County Council	1,651
Inland, Bohus County Council	1,330
South Coast, Bohus County Council	526
North Bohus County Council	547

Bohuslän, inland Bohuslän, South coast area of Bohuslän, and north Bohuslän. The northern and southern areas of Göteborg differ socio-economically. The southern region of Bohuslän is separate from the rest of Bohuslän and is a suburb of Göteborg. The inland area is characterized by industries and the south coast by fishing and tourism. The northern region is the most rural area. Some socio-economic and epidemiological data regarding the different areas are presented in Table 2.

The three key questions from the questionnaire were: 'Have you received dental care during the period?', 'Do you have regular dental check-ups?' and 'In your most recent dental visit, were you treated by a dental hygienist?' The answers were compared with corresponding data from the insurance claim study.

Visiting the dentist yearly, being a regular visitor, and seeing a dental hygienist preventively were determined to be indicators of social desirability. According to the hypothesis, it was to be expected that a person who did not comply with the socially desirable norms of dental visits would 'improve' his or her answer. Further, on the subgroup level, the more persons within the group who did not comply with the norms, the higher would be the tendency on the group level to answer in a socially desirable way. Empirically, therefore, on the subgroup level the 'social norm' for treatment was set to 100%; for

Table 2. Some socio-economic and epidemiological data from the six areas

	Born abroad (%)	Average life exp. (women)	Subjects with supplementary benefit (index)	Subjects with a low education (index)
North Göteborg	25.7	79.8	200.5	99.2
South Göteborg	14.0	81.0	117.9	61.3
South Bohus CC	9.9	82.1	72.9	90.2
Inland, Bohus CC	7.7	81.4	86.6	92.6
South Coast, Bohus CC	5.8	81.4	93.8	109.5
North Bohus CC	8.0	81.4	93.8	127.4

Source: Västsvensk folkhälsorapport 1998 (in Swedish). ISBN 1402-9332.

Average life expectancy for women at the age of 0 years, 1990–1996.

Subjects with supplementary benefit: Subjects 16–65 years old. Index, 100 = V Götaland.

Subjects with a low education: Subjects 16 years or older, formal education 9 years or less. Index, 100 = V Götaland.

regular treatment, 90%; and for treatment by a hygienist, 30%.

Statistical analyses

The differences between answers in the questionnaire study and the insurance claim study were analysed on the group level using a normal distribution test. The correlation between the actual difference (Table 2, column 3) and the social norm difference (Table 3, column 5) in each subgroup was calculated using Pearson's correlation coefficient.

Approvals

The study was approved by the Data Inspection Board, by the Ethics Committee of Göteborg University, and by the National Board of Social Insurance, regional offices in Göteborg and Bohuslän.

Results

The distribution of answers in percentages according to subgroup and study and the differences between them are presented in Table 3. It appears that the differences are substantial (column 3). The differences vary from 7.2% to 33.6%; most of them are between 10.4% and 24.7%. Without exception, they are highly significant ($P = 0.0003$ or less). No pattern in the variation between or within subgroups could be seen.

In Table 3, the differences between the social norm and the actual dental visits (claim study) are presented in column 5. It appears that the differences were substantial and varied from 4.4% to 42.7%. No obvious pattern in the variation between or within subgroups was found.

To analyse whether deviations from a social norm were related to dental visits, column 3 was correlated with column 5 (Table 3). Fig. 1 shows a positive correlation between deviation from a social norm and the difference between actual and reported behaviour. When the difference between the social norm and the claim study was low, the difference between the questionnaire survey and the claim study was low and vice versa. There was a high correlation between these differences ($r = 0.876$) and the result was highly significant ($P < 0.01$).

Discussion

This study has clearly shown that there are differences between subgroups in the agreement between questionnaire and claim study response. The magnitude of the difference varied, but the direction was always the same: the reported level of visits in the questionnaire survey was always higher than the level in the claim study.

These differences varied between 7.2% and 33.6%. If this questionnaire survey had been used to study dental

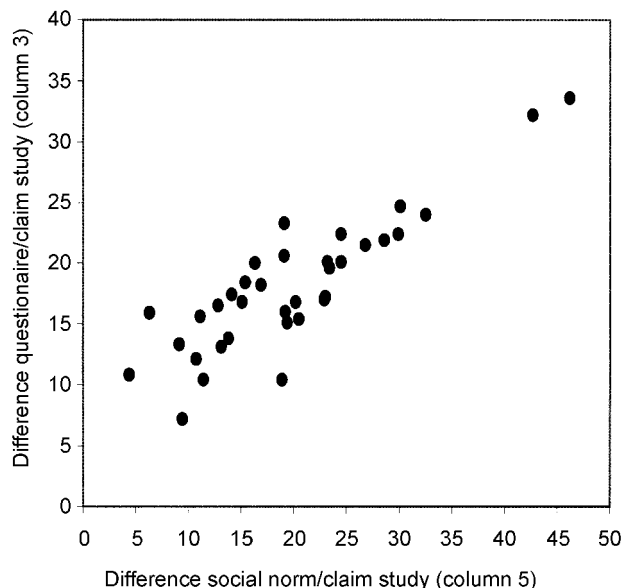


Fig. 1. Scatter diagram showing the results for each question and subgroup. Each dot represents one question in one subgroup. The x-axis represents the share (in percent of the subgroup) that should have answered yes to the question according to the social norm minus the share that had actually done so according to the claim study (Table 3, column 5). The y-axis represents the share (in percent) that answered yes in the questionnaire minus the share that had actually done so according to the claim study (Table 3, column 3).

attendance differences between age groups, it would have been misleading, not only about the average level but also about differences between age groups. While, for example, according to the questionnaire survey, 70-year-olds received 9.2% less care than 40–69-year-olds (87.4% compared to 96.6%, Table 3, column 1), the claim study showed that the actual difference was almost three times as high, 26.0% (Table 3, column 2).

The subgroup differences varied but it is difficult to find a pattern within the subgroups (for example, that the difference is higher among old groups than among young groups). One conclusion could be that age, gender, or residence itself cannot explain the variation in the answer. However, a test of the relation between, on the one hand, the distance between the questionnaire answer and the claim value and, on the other hand, the distance between a social norm and the claim value revealed a very high correlation (see Fig. 1).

In Sweden, children are taught in school to visit a dentist and to do so regularly. The Swedish Dental Health Association recommends regular attendance to dentists. In the dental insurance system dentists were urged to use a recall system. Therefore, a social norm concerning dental attendance was assumed to exist. This norm was obviously higher than the actual attendance. The social norm seems to affect the answers to a questionnaire. The bigger the difference between this social norm and the actual level in the subgroup is, the bigger will be the difference between

Table 3. Subgroup results in the questionnaire and claim studies and subgroup differences between the questionnaire and the claim study and between the social norm and the claim study.

Column	1	2	3	4	5
Subgroup (<i>n</i>)	Yes answers in the questionnaire survey (%)	Yes answers in the claim study (%)	Difference questionnaire/claim study	Social norm (%)	Difference social norm/claim study
Gender subgroups					
<i>Issue: Received dental care during the period</i>					
Men (1,452)	93.3	71.4	21.9	100	28.6
Women (1,891)	95.6	75.5	20.1	100	24.5
<i>Issue: Attend dentist regularly</i>					
Men (1,468)	86.9	66.8	20.1	90	23.2
Women (1,909)	91.5	70.9	20.6	90	19.1
<i>Issue: Have also been treated by a dental hygienist</i>					
Men (1,460)	34.5	18.9	15.6	30	11.1
Women (1,893)	31.4	19.3	12.1	30	10.7
Age subgroups					
<i>Issue: Received dental care during the period</i>					
20–29 years (624)	92.5	70.1	22.4	100	29.9
30–39 years (648)	94.9	79.5	15.4	100	20.5
40–69 years (1,749)	96.6	79.8	16.8	100	20.2
70+ years (310)	87.4	53.8	33.6	100	46.2
<i>Issue: Attend dentist regularly</i>					
20–29 years (623)	84.1	67.1	17.0	90	22.9
30–39 years (653)	90.0	76.2	13.8	90	13.8
40–69 years (1,779)	93.0	74.6	18.4	90	15.4
70+ years (322)	79.5	47.3	32.2	90	42.7
<i>Issue: Have also been treated by a dental hygienist</i>					
20–29 years (601)	21.5	11.1	10.4	30	18.9
30–39 years (641)	27.8	20.6	7.2	30	9.4
40–69 years (1,758)	39.6	23.7	15.9	30	6.3
70+ years (307)	31.3	13.1	18.2	30	16.9
Residence subgroups					
<i>Issue: Received dental care during the period</i>					
N Göteborg (577)	91.5	67.5	24.0	100	32.5
S Göteborg (1,180)	94.6	69.9	24.7	100	30.1
S Bohus (684)	96.8	80.8	16.0	100	19.2
Inland, Bohus (510)	94.2	77.0	17.2	100	23.0
S Coast Bohus (193)	95.7	80.6	15.1	100	19.4
N Bohus (184)	96.2	76.6	19.6	100	23.4
<i>Issue: Attend dentist regularly</i>					
N Göteborg (582)	84.7	63.2	21.5	90	26.8
S Göteborg (1,196)	87.9	65.5	22.4	90	24.5
S Bohus (687)	93.3	75.9	17.4	90	14.1
Inland, Bohus (515)	90.0	76.9	13.1	90	13.1
S Coast Bohus (193)	93.7	73.7	20.0	90	16.3
N Bohus (189)	94.2	70.9	23.3	90	19.1
<i>Issue: Have also been treated by a dental hygienist</i>					
N Göteborg (567)	31.7	14.9	16.8	30	15.1
S Göteborg (1,184)	33.7	17.2	16.5	30	12.8
S Bohus (674)	36.4	25.6	10.8	30	4.4
Inland, Bohus (511)	29.0	18.6	10.4	30	11.4
S Coast Bohus (190)	34.2	20.7	13.5	30	9.3
N Bohus (184)	34.2	20.9	13.3	30	9.1

the questionnaire and claim result. This can be explained as follows: individuals adapt their answers to the social norm. If there are many individuals in a subgroup that do not behave according to the social norm, there will be many who adapt their answers and subsequently the influence on the result of the subgroup will be higher. Put in another way: Because individuals adapt their answers, subgroups tend to reduce their own deviation from the norm when they answer questionnaires.

This pattern of response has been noted previously in other areas where social desirability might be more obvious, as in smoking (14), alcohol consumption (15), height and weight (16), and safety-belt use (17). Obviously, dental attendance is a variable in self-report surveys that is affected by social desirability bias. This must be kept in mind when surveys are planned and reported, and the results of such surveys must be interpreted in this light.

The results of the claim study were used as the gold

standard. The correctness of this was discussed in a previous paper (23). It was compulsory for the dentists to send claims for every treatment to the insurance office and, at the same time, it was the method by which the dentist received payment from the National Dental Care Insurance system. Still a few claims might be missing due to administrative errors. It was concluded that the non-registration rate could be estimated at approximately 5%.

The questionnaire study had a low response rate and it can be questioned whether the differences would have been lower if the response rate had been higher (60%–75%). We assumed that the results would have been approximately the same. Another random sample questionnaire survey from the same population was performed half a year earlier. The response rate to this survey was 62%. The results were similar. In 25 cases of 37 the difference in the results was 1.0% or less. In no case was the difference more than 5.0%. It was concluded that the differences were of low or no clinical or administrative importance (24). It can be added that the results of the present questionnaire survey are similar to those of questionnaire surveys made in neighbour counties (25, 26).

There has been discussion among politicians and dental administrators whether dental attendance in the years directly after people have left the organized dental care free of charge (20 year) are specially low. This is why the youngest age groups are smaller than the others.

In conclusion, differences in response rate between subgroups may be masked and neglected in questionnaire surveys because of social norm biases such as social desirability. This should be kept in mind in the interpretation of results from questionnaire surveys.

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