

Extreme and acquiescence bias in a bi-ethnic population

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Background: Extreme and acquiescence biases are the tendency to give a positive or extreme answer regardless of the 'true' answer. These biases may compromise comparisons of attitudes regarding health between population groups. The aim of the study was to measure the extent of extreme and acquiescence biases and identify factors associated with them in two ethnic groups: Jews and Arabs in Israel. **Methods:** A random telephone survey was conducted during 2006, interviewing 2322 Jews and 809 Arabs. Three attitude questions were presented twice with opposite wording to measure extreme and acquiescence biases in these two groups. **Results:** Extreme bias ranged from 2 to 14% among Jews and from 6 to 29% among Arabs, depending on the question. Acquiescence bias ranged from 2 to 10% among Jews and 5–19% among Arabs. The less educated respondents gave more extreme biased responses for all items. The older respondents gave more extreme answers for two out of the three questions tested. After adjusting for age and education the odds ratio (OR) of giving more extreme biased answers was higher among Arabs compared with Jews for all three questions [OR=2.49, confidence interval (CI)=1.87, 3.31; OR=2.33, CI=1.75, 3.10; and OR=2.94, CI=1.83–4.71, respectively, for each question]. **Conclusions:** Levels of response biases are higher in the Arab minority population compared with the majority Jewish population and depended on the subject, age and education.

Keywords: acquiescent response bias, Arab, attitudes, extreme response bias, Jews, knowledge

Introduction

Biases caused by interviewees' response style are important for the interpretation of attitude measures in health surveys. Extreme response bias and acquiescence or agreement bias have been studied mainly in social research, where attitude scales serve as major research tools.¹ Acquiescence bias implies that there is a respondent's tendency to agree with survey items regardless of their 'true' preference or the question's content. Extreme response bias implies that respondents tend to select end-points of the response scale when answering questions. Three potential sources of these biases may exist,² respondent inattention, respondent acquiescence and item verification identification. The survey research literature describes a four-step model of response selection to survey questions where the respondent has to comprehend, retrieve, judge and select one of the responses presented to them.³ Each of these steps may influence the way respondents answer questionnaires.

The implications of these respondents-based biases may be considerable when studying health-related issues such as health behaviours and attitudes, and particularly when looking at cross-cultural differences between population groups.⁴

Little research has been published regarding these issues in the health arena. Most of the research has concentrated on satisfaction questionnaires,^{5,6} needs assessment and health economics.⁷ In a recent paper, acquiescence bias was studied in an oral health-related quality of life questionnaire: were the authors suggest that positively worded items were

unsatisfactory in quality of life indexes; however, this study did not look at attitude questions.⁸

Many researchers regard extreme and acquiescence bias simply as a non-systematic error. However, it has been suggested that it is an expression of the differing styles of communication that characterize specific cultures.⁹ Some cross-cultural studies have explored the extent of the biases across cultures^{10,11} and other studies have explored the association between response styles and cultural orientation.¹² Social scientists recommended using scales that have an equal number of positive and negative attitude items. They suggest this approach should eliminate the acquiescence bias, but this is not always the case.^{9,13,14} Cheung *et al.*⁴ suggested that multiple-group confirmatory factor analysis should be recommended as the most effective method for determining whether cultural groups can be meaningfully compared. However, this is only relevant when multiple item scales are used. In health surveys, where many different attitudes are measured in one questionnaire, it is not possible to build large scales for each context and frequently only one item is used to measure each specific domain. In addition, it is often difficult to differentiate between the attitude and the knowledge components which are integrated in one single question.

Cultural adaptation of interventions is crucial in order to decrease disparities in health, many surveys are conducted to identify target groups for intervention and much effort is put into tailoring health services and public health interventions for each community. Usually attitude studies serve as a basis for planning and implementing interventions for different

populations. However, cultural and ethnical biases in answering the questions may lead public health specialist to draw inaccurate conclusions about specific groups' attitudes and knowledge and therefore compromise the cultural adaptation of interventions.

Therefore, it is important to estimate to what extent differences in response styles may explain the disparities between population groups. The Israeli population consists of a majority and minority population: Jews and Arabs, and therefore may serve as a good setting for measuring these biases as both populations live in the same country and used the same health care services. The aim of this study was to identify and measure differences in extreme and acquiescence response bias in three questionnaire items in Arabs and Jews.

Methods

The study population

This was a cross-sectional study, based on a representative sample of the Israeli population aged 18 years and over, as part of ongoing, biennial national surveys to monitor trends in knowledge, attitudes and practices in health (KAP). The survey was conducted between November 2006 and July 2007 by the Israel Center for Disease Control. A random sample of telephone numbers was drawn from a computerized list of subscribers to the national telephone company, 6,869 eligible households were included in the total sample. Each household was contacted on at least six occasions at different times of the day before it was considered lost to follow-up; there were 1520 such households (22.1%), leaving 5349 households that were contacted. A total of 3154 respondents, men and women, completed the questionnaire, yielding a response rate of 59%. Non-responses due to refusal included outright refusals (1969), partially completed interviews (97) and repeated postponements (129).

Of the 3154 completed questionnaires 23 respondents did not report their ethnicity, therefore this analysis includes 3131 respondents—2322 by Jews and 809 by Arabs. All respondents answered the first set of items, however, when the opposite wording of the items was presented again at the end of the questionnaire, between 336 and 353 respondents refused to answer or had ended the interview before getting to these items. Therefore, the sample analysed for response bias included 1164–1876 Jewish respondents and 426–781 Arab respondents.

The questionnaire

The questionnaire covered socio-economic status, health status, health behaviours and attitudes. The questionnaire was translated into Arabic. Professionals speaking both Arabic and Hebrew and familiar with Israeli–Arab culture validated the translation of the questionnaire into Arabic, and confirmed that the questions had the same meaning as in Hebrew.

Variables

The Arab population included all those describing themselves as Arab Muslim, Arab Christian or Druze. Three age groups were formed from the self-reported age: 19–34, 35–55 and >55 years. Education was assessed by the highest certificate the respondent attained, and three categories were formed: respondents that have not finished high school, those with high school education or other non-academic studies, and those with an academic degree.

Two questions dealt with oral hygiene. The questions were phrased as attitude questions, respondents were first presented in the middle of the questionnaire with the items in the

following wording: 'To what extent do you agree with the next few sentences: (i) Brushing teeth helps prevent gum problems; (ii) Use of dental floss does not prevent gum disease'. At the end of the questionnaire the items were presented again as a reverse linguistic polarity: 'To what extent do you agree with the next few sentences: (i) Brushing teeth does not help prevent gum problems, (ii) Use of dental floss prevents gum disease'. In both cases three possible answers were read to the respondent: correct, partially correct and incorrect.

The third question referred to attitudes towards smoking in public places. It was presented 12 items after the oral hygiene questions: 'To what extent do you agree with the next few sentences: (i) it should be completely forbidden to smoke in malls'. At the end of the questionnaire the item was reversed with a negative polarity 'it should not be forbidden to smoke in malls'. Four possible answers were given: highly agree, agree, do not agree and do not agree at all. For all the items, the answer 'do not know' was not read out to the respondent, but it was recorded if this was the response. At the time of the survey there was no law forbidding smoking in malls.

Extreme and acquiescence biases were measured by comparing between the answers each respondent gave to the negative and positive items, with the assumption that inconsistent answers to the opposing worded items serves as a measure of biased responses. Extreme bias was measured by calculating the percent of respondents giving the extreme answer twice inconsistently: (i) Agreeing with the positive worded item and agreeing with the negative worded item, (ii) disagreement with the positive worded item and disagreement with the negative worded item. These possibilities were coded as giving an extreme biased answer. For the regression analysis the score (1) was given to the extreme biased answers (those giving inconsistent extreme answers), and any other response was coded as a non-biased answer (0). The percent of those giving an acquiescence biased response included respondents giving only a positive answer inconsistently to both negative and positive worded items. Respondents not knowing the answer were excluded from this analysis, the numbers giving a 'do not know' response are presented in the right hand column in tables 1 and 2.

Statistical analysis

Bivariate analysis was applied to determine the association between ethnicity, age, education and gender and the distribution of the responses to the items. The χ^2 -test was used to examine for statistically significant differences.

Multiple logistic regression models were run for the total population with extreme bias or acquiescence bias as the dependent variable. Arabs vs. Jews (Arabs were coded as 2 and Jews were coded as 1), education (as a categorical variable with less than a high school education as the reference) and age as a continuous variable were added to the model as independent variables. The statistical significance was set at a *P*-value ≤ 0.05 . SPSS version 14 was used for the analysis.

Results

Arab respondents were significantly younger than Jewish respondents (mean age 39.9, standard deviation 14 among Arabs; and mean age 50.5, standard deviation 17 among Jews) and significantly less educated: 38% of Arab respondent and 28% of Jewish respondents had not finished high school. These characteristics represent the Israeli population and are not a bias of the sample.

More than 80% of the study population (85% of Jews and 80% of Arabs) agreed with the positive item referring to brushing teeth as preventing gum problems.

Table 1 Distribution of answers to the positive and negative items regarding oral hygiene, among Jews and Arabs, % (N)

	Correct	Partially correct	Incorrect	Do not know
Jews**				
Brushing teeth prevents gum problems*	85.1 (1977)	9.0 (208)	2.8 (65)	3.1 (72)
Brushing teeth 'does not' prevents gum problems*	7.3 (146)	12.4 (248)	74.9 (1504)	5.5 (110)
Arabs**				
Brushing teeth prevents gum problems	80.2 (649)	8.8 (71)	9.1 (74)	1.9 (15)
Brushing teeth 'does not' prevents gum problems	20.9 (165)	6.6 (52)	71.0 (560)	1.6 (12)
Jews**				
Use of dental floss prevents gum problems*	33.7 (671)	17.5 (349)	13.7 (272)	35.2 (700)
Use of dental floss 'does not' prevent gum problems*	16.9 (391)	15.3 (354)	28.1 (652)	39.8 (923)
Arabs**				
Use of dental floss prevents gum problems	23.7 (195)	10.4 (82)	26.0 (205)	38.8 (306)
Use of dental floss 'does not' prevent gum problems	28.2 (228)	8.8 (71)	19.8 (160)	43.3 (350)

* $P < 0.0001$ comparing the same item between Arabs and Jews; ** $P < 0.0001$ comparing the positive item to the reverse of the negative item in each group

Table 2 Distribution of agreement with negative and positive items regarding smoking in malls, among Jews and Arabs, % (N)

	Agree very much	Agree	Do not agree	Do not agree at all	Do not know/refuse
Jews**					
It should be forbidden completely to smoke in malls*	55.5 (1289)	26.6 (612)	12.6 (292)	5.0 (117)	0.5 (12)
It should 'not' be forbidden to smoke in malls*	4.6 (93)	13.7 (274)	40.3 (807)	39.0 (780)	2.3 (47)
Arabs**					
It should be forbidden completely to smoke in malls	65.1 (527)	26.8 (217)	6.2 (50)	1.9 (15)	0
It should 'not' be forbidden completely to smoke in malls	8.3 (65)	11.4 (89)	37.4 (295)	42.5 (332)	0.4 (3)

* $P < 0.0001$ comparing the same item between Arabs to Jews; ** $P < 0.0001$ comparing the positive item to the reverse of the negative item in each group

Table 3 Percent of extreme bias^a, by education, age group and population group, % (N)^b

	Jews			Arabs		
	Brushing teeth % (N) (1876)	Flossing % (N) (1164)	Smoking in malls % (N) (1658)	Brushing teeth % (N) (771)	Flossing % (N) (426)	Smoking in malls % (N) (781)
Total	7.5 (140)	14.3 (167)	2.1 (40)	15.4 (119)	28.9 (123)	5.8 (45)
Education						
Low	10.5 (50)	22.8 (51)	2.6 (13)	23.1 (67)	38.5 (52)	9.6 (28)
High-school	7.1 (50)	15.7 (71)	2.5 (18)	12.6 (39)	29.4 (52)	4.5 (14)
Academic degree	5.6 (39)	9.2 (45)	1.1 (8)	7.6 (13)	16.7 (19)	1.7 (3)
<i>P</i>	0.007	<0.0001	0.10	<0.0001	0.001	0.001
Age, years						
19–34	5.7 (25)	10.7 (33)	2.5 (11)	10.2 (30)	26.6 (49)	4.1 (12)
35–54	5.1 (36)	13.5 (66)	1.8 (13)	16.3 (59)	29.0 (56)	4.2 (15)
≥55	10.8 (79)	18.3 (68)	2.0 (16)	25.2 (30)	36.7 (18)	15.1 (18)
<i>P</i>	<0.0001	0.016	0.73	<0.0001	0.38	<0.0001

a: Extreme bias was measured by calculating the percent of respondents giving the extreme answer twice inconsistently for the positive and negative worded items

b: Not including 'do not know' and missing answers

When the item was worded in the negative, fewer respondents disagreed that brushing teeth did not prevent gum problems (75% among Jews and 71% among Arabs). Moreover, among Arabs 20.9% agree with the negative item while among Jews only 7.3% agree with it (table 1).

A large percent of respondents gave a 'do not know' answer to the question regarding use of dental floss (35–43%), compared with the question on brushing teeth (1.6–5.5%). When the item was worded in the negative form, fewer respondents disagreed with the item in both groups (table 1). A higher percent of Arabs agreed with the negative item (28.2%), compared with the Jewish respondents (16.9%).

A higher rate of Arabs (65.1%) agreed 'very much' with the item referring to forbidding smoking in malls, compared with

Jews (55.5%). When the wording was negative a lower percent disagreed in both groups (39.0% among Jews and 42.5% among Arabs) (table 2).

The answers in the middle of the response scale were more frequently given among Jews compared with Arabs (39.2 and 54% among Jews; and 33.0 and 48.8% among Arabs), suggesting higher levels of extreme response bias among Arabs.

The percent of respondents giving an inconsistently extreme response to the positive and negative items was calculated for each question (pair of items) and are presented for each population group by level of education and age group (table 3).

Generally, the lowest extreme response bias was for the smoking in malls item among Jews (2%) and the highest for the flossing item among Arabs (28.9%).

Table 4 OR and 95% CI of respondents giving extreme bias answers to the two opposite worded items (logistic regression)

Attitude questions	Brush teeth, <i>N</i> = 2643		Floss teeth, <i>N</i> = 1590		Smoking in malls, <i>N</i> = 2726	
	OR	95% CI	OR	95% CI	hOR	95% CI
Arabs vs. Jews	2.49*	1.87–3.31	2.33*	1.756–3.10	2.94*	1.83–4.71
Age	1.02*	1.01–1.28	1.01***	1.00–1.02	1.01	0.997–1.03
Education						
No high school degree	1.00	–	1.00	–	1.00	–
High school degree	0.68***	0.50–0.93	0.70***	0.51–0.97	0.71	0.43–1.17
Academic degree	0.46*	0.32–0.65	0.36*	0.25–0.51	0.30**	0.15–0.60

P* < 0.0001; *P* ≤ 0.001; ****P* < 0.05

When comparing Arabs and Jews, it seems that for all the questions Arabs gave more extreme biased answers compared with Jews.

The percent of respondents giving extreme biased answers depended significantly on the level of education—the higher the education, the lower the extreme bias in both population groups except for the question regarding smoking in malls among Jews (table 3). Similar results were calculated for the acquiescence bias (data not presented). Extreme bias was also higher among the older respondents in most cases. The question regarding smoking in malls was not associated with age among Jews and the question regarding flossing was not associated with age among Arabs. At each level of education and age extreme bias was higher among Arabs.

Gender was not associated with the levels of extreme bias response, neither among Arabs and nor among Jews.

Acquiescence response bias is included within the extreme bias and stands for 80–86% of the extreme bias for the brushing teeth question, 59–60% for the flossing teeth question and 83–93% for the smoking in malls question. The actual rate of acquiescence bias was 6.0, 8.7, 1.8% among Jews and 13.2, 16.9, 5.4% among Arabs, respectively, for each question (data not presented).

In order to compare between the two population groups, while controlling for age and education (as they did differ between the two populations), a multiple logistic regression model including the total population was run for each question (table 4). Giving an extreme response bias served as the dependent variable. The odds ratio (OR) of giving an extreme biased response was higher among Arabs compared with Jews, after adjusting for education and age, for all three questions. For the brushing teeth question: OR = 2.42, confidence interval (CI) = 1.83–3.20; for the flossing question: OR = 2.34, CI = 1.76–3.10; and for the smoking in malls question: OR = 2.94, CI = 1.83–4.71. Education was significantly associated with giving an extreme bias for the answers for all questions with similar ORs; those with an academic education had an OR of between 0.30 and 0.46 of giving an extreme biased answer compared with those not finished high school. Age was also significantly associated with extreme bias, the younger respondents were more consistent in their answers to the oral hygiene questions, but this was not apparent for the smoking in malls question, this may be due to the low number of respondents giving extreme biased answers for this question.

When acquiescence bias served as the dependent variable in the regression similar results were observed.

Discussion

In this study we evaluated three questions by asking them twice during the interview, once with a positive formulation and once with a negative formulation of the question.

We found that there is a higher tendency to agree with an item when a positive wording was used. The consequence is that the attitude will be evaluated as higher in the population when the question is presented in a positive rather than in a negative formulation. However, we do not know which of the responses represent the true attitude of the respondent. The comparison between each pair of items enabled us to assess the degree of bias in the answers given to the items. Most of the inconsistent responses were due to respondents' tendency to agree with the items regardless of the question's content, or acquiescence bias, and the rest to respondents' tendency to choose extreme answers to the two opposite worded items. The bias was found to be large, since 2–29% of respondents gave an extreme answer inconsistently, more so among Arabs than among Jews. Education and age influenced this tendency too.

The three questions do not represent one construct and each question is independent of the other. One of the questions relates to smoking in malls and is a typical attitude question measuring the respondent's opinion in reaction to an idea. This question was rated on a Likert scale of four. The other two questions regarding oral hygiene can be regarded as questions in which both attitudes and knowledge are involved in the response given. Since these are not typical items for measuring knowledge about the issue, the response seems to measure a combination of attitudes and knowledge. The respondent may agree with the item without knowing if there is scientific evidence behind it, or may disagree with the item knowing the existing evidence but believing there are many other factors involved in oral hygiene. Someone may agree that brushing teeth is good thinking about aesthetic considerations and not actually considering gum problems. We assume responses are strongly based on beliefs and not just on knowledge. Therefore, the oral hygiene items may be regarded as knowledge-based attitude questions. As a high percent of respondents answered that they do not know how to rate the item about flossing teeth, we may assume knowledge levels are low concerning this question. Most of the research literature measuring response bias studied clear attitudes which do not involve knowledge.^{8,14–16} One study looks at questions describing behaviour (eating and oral self-care), appearance and self-care, these items seem to be less dependent on knowledge.^{14,16}

It seems that when knowledge is high, as for the brushing teeth question, respondents find it easier to answer consistently when the item is reversed. When respondents seem to have less knowledge on the issue, as regarding flossing, respondents find it harder to remain consistent when the item is reversed, suggesting higher respondent bias. The findings in this study suggest that we cannot generalize level of extreme and acquiescence response bias from a single question to other questions, since the tendency to answer inconsistently changes from question to question. However, we can say that in questions with a three-level scale (the oral hygiene questions),

~7–15% of responses can be attributed to extreme bias among Jews and 15–30% among Arabs. The smoking in malls question had a four level scale and extreme bias was calculated differently, this explains the much lower levels of extreme bias compared with the oral hygiene questions, between 2 and 6%. Most other studies have looked at scales built from large numbers of items and did not compare single items.¹⁶

Biased responses are not randomly distributed among the population and were found to depend on age and education. The less educated and older respondents tend to give more extreme answers to the items, disregarding the 'true' answers. Answering a negative worded item may demand a higher level of cognitive ability. The younger age group and those respondents that have formal education and experience with exams or other forms of verbal tests, may have better resources to answer consistently. In a study of 80 countries, it was reported that both acquiescent and extreme biases were higher in older and less-educated respondents.¹⁷ Results from some studies have suggested it is related to intelligence.¹⁸

As Arabs were less educated and younger compared with Jews, it was important to eliminate this difference when comparing the extent of the biases between groups. After adjusting for age and education, the OR of Arabs to give an extreme response compared with Jews was much higher. The same result was found for acquiescence bias.

Two main explanations for the higher levels of acquiescent and extreme bias among Arabs can be provided. First a stronger cultural norm may exist among Arabs compared with Jews, where people avoid disagreeing and tend to agree with anything presented to them. This may express avoidance of confrontation or social desirability. Secondly, the fact that Arabs are a minority¹⁹ may add to their unwillingness to provide negative answers to questionnaires as they do not trust strangers.^{20,21} Other studies have also reported that minorities tend to give more extreme responses, such as the black population in the USA, even though they used a different method for measuring extreme bias.²²

It seems that a relatively high percent of answers to questions in standard questionnaires may be biased, however, we cannot estimate which of the items (positive or negative) is a better measure of the actual attitude. It also seems that the percent of the biased answers may be influenced by the number of options available for the question. In this study, when a higher number of options was available, a lower levels of extreme bias was calculated, however this needs further research. Sociologists and psychologists have been advocating using both negative and positive items²³ with the idea that this will decrease 'non-attending' respondents.^{8,23} However, from the findings presented here, it is not clear if this claim is correct since in some cases the negative item may confuse the respondent and decrease the validity of the scale. Other studies have raised these questions too and suggested that it is best to prefer positive worded items.

This study has a few limitations, only three questions were used in this study and each represented a different type of attitude, in addition a small number of respondents gave biased responses to one attitude question (smoking in malls), decreasing statistical significance in analysing this question by population group, age and education. It seems that further research is needed to understand what causes people to answer in a biased way. Furthermore, it is not possible to generalize from one attitude question to another.

Conclusions

Arabs give more biased answers to attitude questions than Jews, even after taking into account their lower levels of education and age. We estimate that a minimum of around 2% of

Jews and 6% of Arabs give an extreme biased response, and in specific cases these biases may be much larger. Deleting these percentages from each group may give a more accurate assessment of the differences between the groups. However, it is not possible to generalize from one question to another as the rates of the biases were very different for each question and it is not clear which factors influence how respondents answer the questions. It seems that being a minority and having a different culture compared with the majority population (Jews) may explain the higher levels of bias among Arab

The implications of this study are important in order to accurately identifying the differences in attitudes between population groups, which will enable to provide suitable targeted public health interventions.

Conflicts of interest: None declared.

Key points

- Extreme and acquiescence bias ranged between 2 and 15% among Jews; and 6 and 29% among Arabs depending on the question.
- The older and less-educated respondents gave more extreme and acquiescence biased responses.
- After adjusting for age and education the OR of giving more extreme biased answers was higher among Arabs compared with Jews.
- Levels of response biases depended on the subject, ethnicity, age and education.
- Health surveys comparing between minority and majority population groups should take into account extreme and acquiescence biases that may compromise the differences between them.

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