Nonresponse Bias in a Survey of Ontario Dentists' Infection Control and Attitudes Concerning HIV

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Abstract

Objective: This study investigated late response and nonresponse bias in an HIV-related survey of dentists. **Methods:** Questionnaires with ID numbers were mailed to all dentists in Ontario (N=5,997) with additional mailings four and seven weeks later. **Results:** Proportionately more respondents who returned questionnaires less than four weeks after the first mailing reported that they knowingly treated (P<.05) or were willing to treat HIV-infected patients (P<.05); that they had an accurate perception of risk of HIV infection after a needlestick injury (P<.01), and preferred not to refer HIV-infected patients (P<.01). Linear extrapolation of cumulative percent responses indicated nonresponse bias in terms of attitude and knowledge items; however, the magnitude was low. **Conclusions:** The effects of late response and nonresponse bias on the results of this study were small. However, these results cannot be generalized beyond the study population, and obtaining high response rates and testing for nonresponse bias in surveys of attitudes related to HIV are recommended. [J Public Health Dent 1997;57(1):59-62]

Key Words: mail survey, dentist, nonresponse bias, HIV, attitudes, infection control.

Mailed questionnaires offer a relatively inexpensive method for gathering data. Most studies of dentists' attitudes concerning AIDS and HIV have used this method. However, there are major methodologic differences in these studies and great variations in sample size and response rate. Nonresponse bias can be a problem in surveys with low response rates. If nonrespondents are not representative of the study population, any estimate derived from the study will be a biased estimate of the true value (1). The issues relevant to the design and administration of mail surveys, including nonresponse error, have been reviewed recently (1).

Nonresponse bias ideally is assessed by contacting and collecting data directly from nonrespondents (2,3); however, the procedure can be time consuming and expensive. A frequently used method is to compare the sociodemographic distribution of re-

sponders with that of the relevant population; however, this approach does not provide information on other variables of interest, including major outcome variables (4). Another method used to investigate nonresponse bias is to determine late response bias by comparing responses of respondents who return questionnaires after an initial request with those who respond after follow-up requests. Investigations of late response bias as an indicator of nonresponse bias are based on the assumption that the characteristics and responses of late responders are more representative of nonresponders than those of early responders. When early and late responders are different, differences between responders and nonresponders are likely to exist (5). An indication of the magnitude of nonresponse bias can be obtained using linear extrapolation: the cumulative percent of respondents reporting a

given item is regressed against the cumulative percent of questionnaires returned after different time intervals. If there is a linear trend, the population prevalence value for a given item assuming a 100 percent response rate can be estimated (5,6).

Methodologic issues focusing on surveys of dentists related to HIV are discussed elsewhere (7,8); however, studies of nonresponse bias have not been reported. The objectives of this study were to investigate late response and nonresponse bias in a survey of dentists' infection control practices, knowledge, and attitudes related to HIV.

Methods

A 40-item survey instrument was mailed to all dentists licensed to practice in the province of Ontario (N=5,997). Those respondents who reported that they did not treat patients were considered ineligible. Items investigating attitudes incorporated a seven-point Likert scale that was collapsed to three categories for analysis (agree, no opinion, and disagree). The reliability of all items had been previously tested using a test-retest procedure: the kappa statistics ranged from 0.47 to 1.00 indicating adequate to excellent reliability (9). The completion rate was calculated by dividing the number of respondents by the number of persons who were sent a questionnaire. The adjusted response rate was estimated as the number of respondents, divided by the number in the sample minus the number of questionnaires returned without delivery.

The survey was administered using a confidential coded questionnaire, a personalized letter of explanation, and a stamped addressed envelope; a re-

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minder postcard one week later; and duplicate questionnaires to nonresponders four and seven weeks after the initial mailing (3). Dentists who returned questionnaires within four weeks of the initial mailing were considered to be early respondents. Those who returned questionnaires between four to seven weeks were middle respondents. Respondents who returned their questionnaires after 7 weeks were considered late respondents. All statistical analyses were carried out with SPSS/PC+.

Late Response Bias. Pearson's chisquare test was used to investigate differences among responses from early, middle, and late respondents. Differences among responses received less than four weeks after the initial mailing and those received four weeks or more after the initial mailing were investigated using a pairwise comparison.

Nonresponse Bias. The regression method with the least squares approach was used to extrapolate the value of a specific item given a 100 percent response rate (5,6). Cumulative values of responses after less than four weeks, four to seven weeks, and more than seven weeks were used for the extrapolation. These models estimate the 100 percent response category based on the three cumulative estimates. F statistics were calculated to determine if the slopes of the regression equations were significantly different from zero. A significant slope suggests nonresponse bias.

Results

The completion rate was 69.7 percent. The final adjusted response rate was 70.3 percent. The adjusted response rate for the initial mailing was 52.7 percent. The second and third mailings increased the response rate by 12.8 percent and 4.8 percent, respectively.

All variables for which a statistically significant difference was found by response time are presented in Table 1. No significant differences in terms of infection control variables including HBV vaccination, use of gloves, mask, protective eyewear, heat sterilization of handpieces, and use of extra precautions for patients with HIV were found.

For the pairwise comparison participants who responded within four weeks of the initial mailing were more

TABLE 1						
Examination	of	Late	Res	ponse	Bias	

		Percent			
Variable	Category	Early* (<i>n</i> =3,052)	Middlet (n=704)	Late‡ (n=247)	<i>P-</i> value
Sex	Male	85.4	81.8	85.4	
	Female	14.8	18.2	14.6	.049
Years since graduation	<10	25.4	30.1	28.9	
0	10–19	35.4	34.4	26.3	
	2029	25.6	23.2	26.7	
	30-39	10.9	10.1	14.2	
	>40	2.8	2.3	3.9	.046
Believe HIV patients	Yes	35.3	38.2	35.7	
should be treated in	No	62.3	57.4	61.3	
hospital/spec. practice	Not sure	2.4	4.3	2.9	.029
Believe AIDS patients	Yes	57.3	61.3	62.3	
should be treated in	No	38.6	32.5	31.8	
hospital/spec. practice	Not sure	4.1	6.2	5.9	.003
Attend dentist who	Yes	60.5	54.9	53.8	
treats HIV/AIDS	No	14.2	17.1	18.1	
patients	Not sure	25.3	28.0	28.2	.030
I am willing to treat	Agree	67.6	64.4	65.8	
HIV patients	No opin.	5.9	9.4	5.8	
[Disagree	26.5	26.3	28.4	.019
I prefer to refer patients	Agree	54.7	58.3	59.4	
with HIV to profession-	No opin.	6.9	8.9	7.1	
al colleagues	Disagree	38.4	32.7	33.5	.031
Do you knowingly treat	Yes	35.4	28.1	30.7	
HIV patients?	No	35.8	40.0	35.3	
	Not sure	28.8	31.9	34.0	.003
Infection control proce-	Yes	87.4	84.6	81.3	
dures for hepatitis B	No	4.2	4.2	8.7	
are adequate for pro- tection against HIV	Not sure	8.4	11.3	10.0	.002
Risk of contracting HIV	>50%	18.5	24.8	23.0	
from an HIV-contam-	11-50%	14.5	13.8	15.1	
inated needlestick	1–10%	25.4	24.2	25.1	
injury	<1%	40.6	36.3	36.0	
	Don't know	1.0	0.9	0.8	.036

*Early refers to responses received less than four weeks after the initial mailing.

[†]Middle refers to responses received between four and seven weeks.

‡Late refers to responses received after seven weeks.

likely to knowingly treat HIV-infected patients (P<.001); to disagree that patients with HIV who do not have AIDS (P<.05), or AIDS patients should be treated in a hospital/special practice (P<.001); be willing to treat HIV-infected patients (P<.05); and disagree that they prefer to refer patients with HIV to professional colleagues (P<.01). These early respondents also were more willing to attend a dentist who treats HIV/AIDS patients (P<.01), to believe that the risk of contracting HIV from a contaminated needlestick injury is less than 1 percent (P<.01), and to believe that infection control procedures for HBV are adequate for HIV (P<.05).

The results of the investigation of nonresponse bias are shown in Table 2. The extrapolation analyses resulted in four statistically significant equa-

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Variable	Category	Early* (n=3,052) Response Rate=52.7%	Middle† (n=3,756) Cum. Response Rate=65.5%	Late‡ (n=4,003) Cum. Response Rate=70.3%	Adjusted Estimate If Response Rate=100%
Believe HIV patients should be treated in hospital/special practice.	Yes	35.3	35.8	35.8	36.8
Believe AIDS patients should be treated in hospital/special practice.	Yes	57.3	58.0	58.3	59.9¶
Attend a dentist who treats HIV/AIDS patients.	Yes	60.5	59.4	59.1	56.6 °
Am willing to treat HIV patients.	Agree	67.6	67.0	66.9	65.7
Prefer to refer patients with HIV to professional colleagues.	Agree	54.7	55.4	55.6	57.2¶
Do you knowingly treat HIV patients?	Yes	35.4	34.1	33.9	31.1
Infection control procedures for hepatitis B are adequate for protection against HIV.	Yes	87.4	86.8	86.5	85.1 9
Risk of contracting HIV from an HIV-contaminated needlestick injury.	<1%	41.0	40.2	39.9	38.1

 TABLE 2

 Extrapolation of Variables to Examine Nonresponse Bias

*Early refers to responses received less than four weeks after the initial mailing.

†Middle refers to responses received between four and seven weeks.

‡Late refers to responses received after seven weeks.

¶Slope of regression significantly different from 0: P<.05.

tions: preferring to refer patients with HIV, unwillingness to attend a dentist who treats HIV/AIDS patients, believing AIDS patients should be treated in a hospital or special practice, and knowledge that infection control procedures for HBV are adequate for HIV.

Discussion

The results of this survey and a follow-up survey to assess time changes are presented elsewhere (10-13). Survey methods that improve response rates are likely to decrease nonresponse bias. Dillman (3) advocates the Total Design Method, which includes the use of follow-up for nonresponders. This method frequently achieves response rates of 60 percent to 80 percent for well-educated, homogeneous groups (1). Financial incentives also have been used; however, they are best used in conjunction with reminder postcards and additional mailings of questionnaires to nonrespondents (1,14). Some researchers have claimed that the use of follow-up surveys to increase response rate and representativeness might not be necessary (15), or that follow-up surveys are worthwhile only if nonresponse bias is reduced (16). Other investigators have found little evidence of late response or nonresponse bias in professional populations and attribute this to the fact that these groups are homogeneous and well educated (15,17). However, others have noted that early responders are usually more interested in the survey topic (1,4,5). The results of our study tend to confirm this finding, as dentists who preferred to refer patients with HIV or who did not treat patients with HIV/AIDS were more likely to be late responders.

In previous HIV-related surveys of dentists reports of investigations of nonresponse bias have been absent or extremely brief. Little evidence of nonresponse bias has been reported using measurements of late response bias (18,19) or differences between the sociodemographic attributes of respondents and the relevant population (20-23). However, caution is required in the interpretation of these results because of the paucity of information or methodologic concerns. When early and late respondents in this study were compared, the differences in the percent of respondents who knowingly treated HIV patients or who preferred to refer patients with HIV was approximately 5 percent. The results of the extrapolation analysis indicate that nonresponse bias was present in attitude and knowledge items. However, the magnitude of the bias was small, and the prevalences ranged from 35 percent to 85 percent: the detection of small but statistically significant differences can be explained by the very large sample size. Furthermore, the results of extrapolation outside the range of known values should be interpreted with caution.

In this study, the response rate after the initial mailing was 52.7 percent and this increased by 17.6 percent after follow-up. The effect of late response or nonresponse bias would be larger if the response rate to the initial mailing had been lower. The results obtained in this investigation cannot be generalized to other studies and more research is required.

Surveys using single mailings usu-

ally have lower response rates and preclude examination of nonresponse bias except for sociodemographic distributions. Our research suggests that nonresponse bias may be more prevalent in terms of knowledge and attitudinal variables than sociodemographic characteristics. Investigations of late or nonresponse bias in studies of the provision of dental care for HIV-infected patients should include all predictor variables and not be limited to sociodemographic items. Although the use of follow-up mailings does not always result in the reduction of nonresponse error, it is a sound methodologic practice to try to attain a response rate as high as possible and to test for nonresponse bias.

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