

Characteristics of Respondents and Non-Respondents To a Mailed Questionnaire

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Abstract: In establishing a cohort of U.S. nurses, an assessment of response bias was made comparing respondents and non-respondents with regard to age, education, state of residence, employment status, field of employment, and major specialty. Overall, the 122,328 respondents (69.7 per cent) and 43,222 non-respondents were quite similar. Together with the reasonable response rate in a homogeneous population, this suggests that estimation of exposure-disease associations is unlikely to be affected by major bias due to non-response. (*Am J Public Health* 1980; 70:823-825).

Introduction

A major limitation of validity for studies using mailed questionnaires is non-response bias. Among procedures proposed to assess whether respondents differ from non-respondents are comparisons of ancillary information from available records.¹

In a prospective study of health effects of oral contraceptives, demographic and occupational information was available for all women to whom questionnaires were sent to establish the cohort. In this report, respondents are compared with non-respondents on selected variables.

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Methods

The study population consisted of all married, female, registered nurses, aged 30-55 in 1976, who resided in one of 11 states of the United States. They were identified from 1972 files provided by State Boards of Nursing and the American Nurses' Association (ANA).

In June 1976, each nurse was sent an introductory letter, a two-page questionnaire, and a prepaid return envelope. Identical materials were mailed in September and December 1976 in an attempt to enlist the participation of non-respondents. Further details have been reported elsewhere.²⁻⁵

To compare respondents with non-respondents, several socio-demographic characteristics of eligible nurses were evaluated. These data had been collected by the ANA to obtain manpower statistics on U.S. nurses.⁶ The Research and Statistics Department of the ANA provided information, with personal identifiers removed, summarized by response status, with removal of personal identifiers on age, education, state of residence, employment status and affiliation, and major practice area. Percentages of respondents were calculated within individual strata for each variable.

Results

Of 240,709 questionnaires sent, 64,789 were returned as unforwardable. Including deaths, 65,159 (27.1 per cent) were not contacted. This was due to the four-year interval between file creation and mailing, together with a one-year expiration date for forwarding addresses. Among the 175,550 women presumed to have received a questionnaire, 122,328 returned completed forms (69.7 per cent). (Elimination of duplicate records after receiving these data from the American Nurses' Association left 121,964 respondents among 172,413 eligible women, a response rate of 70.7 per cent. As data were aggregated, duplicates could not be eliminated from these analyses.)

TABLE 1—Percentage of Respondents by Five-Year Age Group among a Cohort of U.S. Nurses Surveyed in 1976

| Age in Years | Total Number | Percentage of Respondents ± Standard Error |
|--------------|--------------|---|
| TOTAL | 175,550 | 69.7 ± 0.1 |
| 30-34 | 27,738 | 72.8 ± 0.3 |
| 35-39 | 33,526 | 70.4 ± 0.2 |
| 40-44 | 36,853 | 68.8 ± 0.2 |
| 45-49 | 34,909 | 68.9 ± 0.2 |
| 50-55 | 42,524 | 68.4 ± 0.2 |

A slightly elevated response rate was found among younger nurses (Table 1) and nurses with academic degrees (Table 2). Apart from a low response rate in Texas, rates by state were generally similar (Table 3), as were those by employment status (Table 4). The response rate among the 46.9 per cent of nurses employed in institutions was slightly lower than for those in other fields (Table 5). There were no consistent differences in the major practice areas of respondents and non-respondents (Table 6).

Age stratification of these six variables showed differences from the overall response rate greater than 5.0 per cent in only six of 170 instances. Similarly, stratification by state indicated few differences between the distribution of respondents and non-respondents.

Discussion

Apart from slightly higher response rates among younger nurses, those with academic degrees, and those in academic, outpatient, or other fields of employment, respondents to this mailed questionnaire were generally similar to non-respondents. Although these findings provide no direct evidence against the existence of non-response bias, they are reassuring.

No detailed data are presented from women who could not be contacted by mail, as they were not potential cohort members in 1976. They represent a mobile subset of women who were younger than those receiving a questionnaire (61.4 per cent vs 34.9 per cent aged 30-39 years) and more likely to have resided in California (20.4 per cent vs 11.8 per cent). To

TABLE 2—Percentage of Respondents by Highest Degree Held among a Cohort of U.S. Nurses Surveyed in 1976

| Degree | Total Number | Percentage of Respondents ± Standard Error |
|----------------|--------------|---|
| TOTAL | 175,550 | 69.7 ± 0.1 |
| Unknown Status | 40,188 | 65.3 ± 0.2 |
| No Degree | 109,200 | 70.3 ± 0.1 |
| BA Nursing | 18,754 | 73.7 ± 0.3 |
| BA Other | 3,991 | 74.8 ± 0.7 |
| MA Nursing | 2,115 | 73.9 ± 0.9 |
| MA Other | 1,178 | 75.2 ± 1.3 |
| Doctorate | 124 | 61.3 ± 4.4 |

TABLE 3—Percentage of Respondents according to State of Residence among a Cohort of U.S. Nurses Surveyed in 1976

| State | Total Number | Percentage of Respondents ± Standard Error |
|---------------|--------------|---|
| TOTAL | 175,550 | 69.7 ± 0.1 |
| California | 20,785 | 70.6 ± 0.3 |
| Connecticut | 6,993 | 69.8 ± 0.5 |
| Florida | 3,855 | 66.4 ± 0.8 |
| Maryland | 4,604 | 71.7 ± 0.7 |
| Massachusetts | 17,759 | 71.1 ± 0.3 |
| Michigan | 12,307 | 72.5 ± 0.4 |
| New Jersey | 12,656 | 68.2 ± 0.4 |
| New York | 34,932 | 66.5 ± 0.3 |
| Ohio | 18,007 | 72.3 ± 0.3 |
| Pennsylvania | 34,074 | 71.6 ± 0.2 |
| Texas | 9,578 | 64.1 ± 0.5 |

the extent that these characteristics are associated systematically with both exposure and disease, estimates of relationships in cross-sectional data may be biased. Although we have no direct means to assess this issue, we will have exposure data for women with whom we lost postal contact as the study progresses, and among whom we will ascertain mortality, and determine the degree to which such a potential bias may be present.

Assessment of non-response bias is necessary because differential participation by members of the target population can result in erroneous estimates of rates of exposure or disease, or relative risk. In theory, relative risk will be affected only if response is related to both exposure and disease.¹ If response is associated with only one of these variables (or both, but independently of one another), then the relative risk will not be affected.

Evaluation of non-response bias requires consideration of the overall response rate, as there is an inverse relationship between the two. Response rates to mailed questionnaires vary widely,⁷⁻⁹ with that reported here (69.7 per cent) being consistent with other health studies.¹⁰⁻¹³ However, for some studies with similar response rates, selective factors may have produced biased samples.¹³

Various techniques have been used to improve response to mailed questionnaires.^{10, 14-16} Response is influenced by the study focus, methods of contact and data collection, and characteristics of the target population, including its interest

TABLE 4—Percentage of Respondents according to Employment among a Cohort of U.S. Nurses Surveyed in 1976

| Employment Status | Total Number | Percentage of Respondents ± Standard Error |
|-------------------|--------------|---|
| TOTAL | 175,550 | 69.7 ± 0.1 |
| Full-time | 58,548 | 67.3 ± 0.2 |
| Part-time | 51,785 | 71.5 ± 0.2 |
| Not in Nursing | 64,421 | 70.5 ± 0.2 |
| Unknown | 796 | 68.1 ± 1.3 |

TABLE 5—Percentage of Respondents by Field of Employment among a Cohort of U.S. Nurses Surveyed in 1976

| Field of Employment | Total Number | Percentage of Respondents ± Standard Error |
|-----------------------------------|--------------|---|
| TOTAL | 175,550 | 69.7 ± 0.1 |
| Institutional | 82,377 | 67.5 ± 0.2 |
| Outpatient | 17,845 | 74.6 ± 0.3 |
| Academic | 8,338 | 74.2 ± 0.5 |
| Other | 514 | 74.1 ± 1.9 |
| Unknown (includes not in nursing) | 66,476 | 70.4 ± 0.2 |

in the research topic.^{8, 17} If the interest is similar throughout the population, as should be the case for nurses, it is probable that those who respond will be representative.⁸ The similarities noted here between respondents and non-respondents support this assumption. Further, it has been suggested¹⁸ that the more homogeneous the target population, the lesser the potential for non-response bias. The present study was restricted to married women of common professional and educational background. (Respondents generally have more education than non-respondents.)^{8, 17, 19}

No clear association between age and response has been established by others, who have reported a direct relationship,²⁰ an inverse association,^{10, 21} and no relationship.^{13, 22} In this investigation, there was little differential response by age.

In a similar study, Criqui, et al,²² quantitated the error introduced by response bias, demonstrating that a good response and general similarity of the two groups on relevant exposure variables produced accurate estimates of prevalence. This was true also for relative risk estimates, although to a lesser extent.²³ We will use data from respondents in 1976 to see how response in later years can be predicted by exposure and disease status in 1976.

In conclusion, the combination of a reasonably high response rate (69.7 per cent) in a homogeneous population, and the similarity between respondents and non-respondents, suggest that estimates of exposure-disease associations in these cross-sectional data are unlikely to be distorted due to non-response bias.

TABLE 6—Percentage of Respondents according to Major Clinical, Teaching or Practice Area among a Cohort of U.S. Nurses Surveyed in 1976

| Area | Total Number | Percentage of Respondents ± Standard Error |
|-----------------------------------|--------------|---|
| TOTAL | 175,550 | 69.7 ± 0.1 |
| Geriatric | 10,336 | 66.8 ± 0.5 |
| Ob/Gyn | 10,217 | 72.6 ± 0.4 |
| Med/Surg | 40,303 | 68.5 ± 0.2 |
| Pediatric | 8,315 | 72.6 ± 0.5 |
| Psychiatric | 5,128 | 65.5 ± 0.7 |
| Other | 26,130 | 71.0 ± 0.3 |
| Unknown (includes not in nursing) | 75,121 | 69.8 ± 0.2 |

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