Findings from sexual behaviour surveys tend to generate a great deal of public and scientific interest. There is also much scepticism. A common criticism is that surveys of sensitive issues suffer from participation bias, where people who volunteer are thought to differ systematically from those who do not. Overall 25–35% of people refuse to engage in telephone or face-to-face interviews designed wholly or primarily to investigate sexual behaviours, orientation and attitudes. Non-participation in mail sex surveys tends to be greater, with non-return rates of approximately 40% being common.

Very little research has been designed specifically to determine the direction and magnitude of participation bias in sex research. To date, all large sample studies have been cross-sectional, random population surveys and analysis of non-response usually is limited to comparison of demographic characteristics of responders with census data and with data from random surveys not related to sexual issues. In general, it is found that non-responders are more likely to be male, older, live in cities and have lower educational attainment than responders, while marital status, employment status and ethnicity appear not to be consistently related to non-response. This pattern is similar to many community health surveys and, if differences between the...
sample and population are known, statistical weighting techniques can be applied to minimize biases.11,13

However, this solution is far from adequate. Many unmeasured variables (such as personality, sexual attitudes, sexual orientation and experiences) may influence willingness to participate in sex surveys and these could be largely or partly independent of demographic characteristics. Participation reflects, to some degree, a psychological predisposition to disclose personal information.14 It may be that the primary psychological (and psychosexual) determinants of non-response remain hidden in most large cross-sectional sex surveys and, therefore, that neither the direction or magnitude of participation bias is properly understood.

Non-participation may result in underestimation15 or overestimation1,3 of the actual levels of sexual behaviour and diversity in the community. A third possibility is that responders do not differ substantially from non-responders, which is suggested by an observation that ‘difficult to reach’ people who eventually responded in a sex survey did not differ appreciably from early responders.8 Several studies have noted that the average non-response rate is no greater for sex research than for other studies of sensitive issues,16,17 which may suggest that the sexual nature of the questionnaire does not especially bias the responses. However, there appears to be no a priori reason to assume that equivalence among surveys in the magnitude of non-response indicates equivalence in the direction or magnitude of bias. In health surveys, for example, the direction of bias can vary depending upon whether the study involves screening for health problems or self-report of health risk behaviours.12

A clearer understanding of participation bias in sexuality research would be gained if it were possible to separate general reluctance to participate in ‘health and lifestyle’ surveys and specific reluctance to participate in sex research. In this study we asked 9112 adult twins in a longitudinal research register, who previously had participated in mail health surveys, whether they were willing to volunteer for a postal survey of sexual behaviours and attitudes. One year after the sex survey, a significant proportion of this group volunteered for a telephone interview regarding sensitive personal issues, particularly mental health problems. This paper examines the psychological, behavioural and social characteristics of people who explicitly consented or refused to volunteer for the sex survey.

METHOD
Subjects and Recruitment Procedure
Subjects were drawn from the Australian National Health and Medical Research Council Twin Register (ATR). The ATR is a volunteer register begun in 1978 and has about 25,000 twin pairs of all zygosity types and all ages enrolled and in various stages of active contact. Subjects for this study were recruited from two phases of a large twin-family study of alcohol use and abuse.18

The twins were resident in all eight states and territories of Australia. There is a disproportionate number of young females and people with higher than average levels of education.19,20 In relation to psychological factors, comparisons with normative data from the 1980s indicated that subjects were generally representative of the Australian population in terms of personality and depression21 and alcohol consumption.22 Diversity within the sample in terms of religious affiliations, income and social attitudes has been documented elsewhere.23–25

Recruitment for the sex survey occurred in two phases. Two cohorts of twins (I and II) were ascertainment from two databases comprised entirely of people who previously had participated in at least one postal survey of ‘health and lifestyles’ between 1988 and 1990.

Cohort I (young cohort). This cohort (n = 5144) were aged 17–25 inclusive when they returned a postal Health and Lifestyle Questionnaire (HLQ) in 1990. As the last item of the HLQ, twins were asked the following question: ‘We have applied for funding to carry out an anonymous study of sexual behaviour and attitudes. Would you be willing to receive a questionnaire with explicit questions on these topics? [ ] Yes [ ] No’. All subjects who said ‘Yes’ were mailed the sex questionnaire approximately 12 months later. This delay with mailing to cohort I was caused by unanticipated funding constraints.

When subjects received the sex questionnaire, they were asked to complete a consent form with their name, date of birth, and signature, and to return this separately in a small stamped envelope to indicate whether or not they had consented to complete the sex questionnaire. Approximately 2 weeks after initial mailing of the sex questionnaire, all twins were sent a reminder letter. Consent forms were logged as they were returned and subsequently all twins who had not returned a consent form were followed up once by telephone. Because we received many queries from twins asking whether they should complete the questionnaire if their co-twin had decided not to participate, we sent a further letter urging such ‘singles’ to co-operate.

Cohort II (older cohort). A second cohort of 3968 twins had taken part in similar HLQ studies in 1988 or 1989 and were aged between 27 and 52 years in 1992. They were first approached by letter, which asked whether or not they were willing to receive the sexual behaviour questionnaire. These were mailed to consenting subjects.
within one month of return of the consent letters. Those who did not respond within 6 weeks were followed up with a single telephone call.

At the end of the sex survey period, a different and substantially unrelated research project began. During 1992–1993, all subjects in cohort II only were approached by telephone about their willingness to participate in a semi-structured telephone interview. The interviews averaged approximately 40 min. and the questions primarily were designed to assess mental health problems using criteria from the Diagnostic and Statistical Manual (DSM-III-R). The interview also contained several questions about sexual experiences.

Response Rates for the Sexual Behaviour and Attitudes Survey

It should be emphasized that the sex questionnaires were returned anonymously. Linkage of twin pairs was achieved by private agreement between co-twins on a 10-digit common code number. The present analysis considers the twins as individuals. The final explicit consent rate for the survey was 52.0% of all people who were initially approached (4735 returned the consent letter from 9112). Slightly more people returned the questionnaires (n = 4903) than consent forms. Of the 168 people who returned the questionnaire but not the consent form, we can assume that all had previously said they were willing to receive the questionnaire.

In summary, the three groups of subjects who were identified included;

(i) Subjects who explicitly refused to participate (n = 2497, 27.4%). This group includes 6.4% (n = 583) of all subjects who were willing to receive a sex questionnaire but who returned a consent form which stated that they would not participate;

(ii) Subjects who initially agreed to receive the sex questionnaire, were sent a questionnaire but who did not return a consent form (n = 1710, 18.8%). The high proportion of ‘missing’ responses may mainly be due to funding constraints, which delayed mail-outs of questionnaires to cohort I by up to one year and minimized the amount of follow-up of non-returns in both research cohorts (one letter and one attempt to make telephone contact);

(iii) Subjects who consented both to receive and return the questionnaire (n = 4735, 52.0%).

Response Rates for the Telephone Interview in 1992–1993

Of the 3968 subjects in cohort II who had been approached for the sex survey, 3674 (92.6%) agreed approximately one year later to complete a telephone interview regarding mental health. In that separately funded project, survey recruitment included exhaustive attempts to contact all potential subjects. In effect, we set a goal of not less than 10 unsuccessful telephone calls or letters for each person. Those who were difficult to find were traced with the help of national databases of phone numbers and electoral enrolments. This achieved very high levels of co-operation, including 83.6% of the people in cohort II who explicitly refused to do the sex survey, 94.4% of those in cohort II who were ‘lost’ to the sex survey and 97.4% of those in cohort II who had explicitly consented to do the sex survey.

Participation data for the three primary phases of this study are summarized in Figure 1.

Materials

This analysis focused on five domains of personal information.

Demographics. Age was calculated for all subjects by subtracting date of birth from the date at the median point of the final consent form return period. Data on education level, marital status, church attendance, voting preference, occupation, smoking and alcohol consumption were collected via postal survey in 1988–1990. Data on ethnicity and urban/rural location were not sufficient for analysis; ethnicity information has been collected only for a small minority of participants in this registry and, unfortunately, residential location was not recorded on the returned consent forms and could not reliably be inferred from earlier surveys, especially for passive refusals.

Personality. Approximately 85% of subjects had previously completed the Eysenck Personality Questionnaire, which includes measures of Neuroticism (i.e. excessive worrying, emotional lability), Extraversion (i.e. outgoing, exploratory, confident), Psychoticism (i.e. ‘tough-mindedness’) and Lie (i.e. social conformity). A similar proportion had completed the Tri-Dimensional Personality Questionnaire, which assesses the extent to which a person has a Novelty-Seeking personality (i.e. exploratory, curious, impulsive), is Harm Avoidant (i.e. cautious, shy, inhibited) and Reward Dependent (i.e. eager to help, industrious, warmly sympathetic).

Mental health. Of those in cohort II, 93% (n = 3674) completed a structured psychiatric diagnostic interview by telephone in 1992–1993. This is a subset of the 5995 twins aged between 27 and 90 years who were interviewed during that time. Diagnoses of Major
Depressive Disorder, Alcohol Dependence and Childhood Conduct Disorder were derived from DSM-III-R diagnostic criteria which are embedded in an Australian version of the Semi-Structured Assessment for the Genetic of Alcoholism (SSAGA31). This project is described in detail elsewhere.18,27,32 Participants were also asked about their family history of depression and alcohol abuse, although this was not verified by interviews with relatives or other means.

Age at first intercourse and adverse sex-related events. Participants in the telephone interview (cohort II only) were asked to provide the age at which they first had sexual intercourse and were asked a single question about whether they had ever been forced to have sex, including intercourse, before the age of 18 years.27,28 In the 1988–1990 postal surveys, women only were asked whether they had ever, at any time in their lives, been raped or physically assaulted and whether they had ever had difficulties with their marriage, pregnancies or fertility.

Attitudes. Attitudes were measured to a limited degree. Six items which assessed subjects’ agreement with sexual issues (legalized abortion, legalized prostitution, casual sex, birth control, condom vending machines and

---

**Figure 1 Willingness to participate in a sex survey: data collection stages**

Note: percentages for each type of response were calculated with the denominator = 9112.

a HLQ, Health and Lifestyle Questionnaire.
b SQ, Sexual Behaviour and Attitudes Questionnaire.
c Older subjects only (aged above 27 years) were asked to participate; response rate = 93%.
Data analysis

Data files from the 1988–1990 HLQ surveys and the 1992–1993 telephone interviews were merged with the sex survey consent data. All analyses were conducted using SAS V6.09 using the CATMOD and GLM procedures. More than 85% of all twins in the original health and lifestyle postal surveys participated with their co-twin and, therefore, the data were non-independent. Because non-independence of twin-pair data leads to an underestimation of sampling variance of estimates, the Type I error rate may be inflated if twins are treated as independent subjects in analyses. A conservative adjustment for possible bias was achieved by recalculating all variance estimates (standard errors and confidence intervals) by approximating the number of independent observations as the original sample size divided by two. In practice, this was achieved by multiplying the original variance of estimates by the square root of 2, then re-calculating the significance of odds ratios and F and t tests as appropriate.

Results

Demographic characteristics

Demographic data are shown in Table 1. In relation to age, sex and sample cohort, it is clear that the majority of people who initially agreed but did not return a consent form were younger, more likely to be male and primarily from cohort I, while the people who explicitly refused did not differ to a large degree in terms of age, sex or cohort from those who explicitly consented to return the questionnaire. Analyses of contrasts between groups have been adjusted for age, sex and sample cohort and their two-way interactions.

Logistic regression analyses summarized in Table 1 indicate that there were some small, though statistically significant, demographic differences between respondent groups. The most consistent differences were between groups A (explicit refusal) and C (explicit consent). Those who explicitly consented were more likely...
than refusers to have a university education, to be married or to have a professional occupation and less likely to attend church at least once a week or to vote for a conservative political party (in Australia, these are the National and Liberal parties).

The use of tobacco and alcohol was also associated with participation. Consenters were more likely to have been current smokers and more likely to be regular (at least weekly) drinkers than were refusers (when surveyed in 1988–1990). Self-reported age at first alcohol consumption with friends was slightly lower for group C (Mean = 16.5 yrs; SD = 3.12) and group B (Mean = 16.5 yrs, SD = 3.19) than it was for refusers (Mean = 16.8 yrs, SD = 3.08) and this association was significant (F = 5.55; d.f. = 2,7834; P = 0.004). However, self-reported age at first smoking was not significantly different between the three respondent groups, after adjustment for non-independence of twin data. Subjects who agreed to participate initially but were lost (group B) were somewhat less likely to attend church on a weekly basis than people who explicitly refused and they were more likely to smoke and drink regularly than those who explicitly agreed to participate.

**Personality**

Personality scale data were available for most subjects from the 1988–1990 mailed questionnaires and these are summarized in Table 2. For individual measures, the differences in group means were small, though many of the comparisons between groups were statistically significant.

Scores on the three sub-scales of the Tri-Dimensional Personality Questionnaire indicate that consenters were significantly more novelty-seeking, more reward dependent and less harm avoidant than people who refused, while groups B and C did not differ on these measures. Trends in the four Eysenck Personality Questionnaire factors were less clear-cut: group B differed from A on three measures (greater extraversion, more tough-mindedness, less social conformity). Two of the four contrasts between B and C were also significant while no contrasts between A and C were significant.

**Mental Health**

Diagnostic data from the structured psychiatric telephone interview completed with subjects in cohort II are shown in Table 3. Contrasts revealed that differences between groups B and C were very small and mostly not significant. In comparison to people who refused, those who returned consent forms had significantly higher lifetime rates of major depressive disorder, alcohol dependence and childhood conduct disorder. These effects were quite large, with OR of approximately 2 or greater for alcohol dependence and conduct disorder. People who consented were also more likely than refusers to report a family history of depression.
Sexual Behaviour and Adverse Sex-Related Experiences

Information on age at first sexual intercourse was collected from participants in the telephone interviews (i.e. cohort II, aged 27–52 years). Given considerable positive skew in reported age at first intercourse, data were log-transformed. People who explicitly consented to participate in the mailed sex survey reported an earlier age at first sexual intercourse (Mean = 19.48 yrs, SD = 5.10) than did people who were lost (Mean = 19.69, SD = 5.12) or who refused to participate (Mean = 20.12 yrs, SD = 5.11) and this was statistically significant (F = 5.18, d.f. = 2, 3510; P = 0.006).

A small proportion of these adult subjects had not yet had sex. The percentages of people in groups A, B and C who said in the telephone interview that they were virgins were 3.3% (n = 33), 0.7% (n = 2) and 1.8% (n = 42) respectively, indicating a trend for virgins to be more likely to refuse to participate; 43% of the virgins (33/77) explicitly refused, compared to a base refusal rate of approximately 27%. Further, people who refused to participate in the sex survey appeared more likely to refuse to answer a question about age at first intercourse in the later telephone interview; of the 69 people who declined over the telephone to nominate an age at first intercourse, 53 (76.8%) had also explicitly refused to participate in the postal sex survey. Although it is impossible to know the age at sexual behaviour onset for persistent refusers, this may not significantly bias the estimates, given that 94.7% of people in the older cohort who refused to complete the sex survey did answer the question about age at first intercourse in the subsequent telephone interview.

Data on adverse sex-related events are shown in Table 4. Although relatively few subjects reported sexual abuse involving intercourse before age 18, there was a significant association with sex survey participation, with responders being approximately two and half times more likely to report early sexual abuse than people who refused the sex survey. The remainder of the data in Table 4 was gathered from women who completed the 1988–1990 HLQ survey. The lifetime prevalence of rape was elevated among responders and those in group B, in comparison to refusers. Women who refused to do the sex survey were less likely than women in the other two groups to report marital difficulties and failure of a pregnancy, while reports of physical assault and fertility problems appear not to be significantly associated with non-response.
Sex-Related Attitudes

Data on sex-related attitudes were collected from 84.7% of the full sample in the 1988–1990 mail HLQ surveys, as part of a larger attitude scale. Subjects were simply asked whether they agreed, disagreed or were uncertain regarding each issue. The percentages of each group who agreed with each of six items are shown in Table 5. People who consented to participate in the sex survey were significantly more likely than refusers to agree with each issue, although the effects sizes were generally small. The most robust associations were observed for attitudes toward condom vending machines, gay rights and legalized prostitution. Except for agreement with birth control, subjects in group B were significantly different from A, while no contrasts between groups B and C were significant.

DISCUSSION

This study offers several insights into participation bias in sex research. First, it questions the belief, based on gross comparisons of participation rates in sex surveys and other social survey research, that willingness to participate in sexual behaviour studies is not especially different from willingness to volunteer for other types of social and health surveys.16,17 We have found considerable reluctance to volunteer for sex research among people who otherwise were willing to participate in mail and telephone surveys of health and social issues, many of which were personally sensitive. In all 27% explicitly refused either to receive a proffered questionnaire on their sexual attitudes and behaviours or, once the questionnaire had been posted, they explicitly refused to complete and return it.

Second, linkage of consent information to the longitudinal data set enabled a global characterization of people who volunteered. In comparison to people who refused, consenters had less conservative sexual attitudes, more novelty-seeking and less harm-avoidant personalities, less regular church attendance, less conservative political preferences, were more likely to smoke tobacco and drink alcohol regularly, had an earlier onset of sexual behaviour, more adverse sexual experiences and poorer mental health. These findings replicate and extend some trends in small studies of students.3,33

Although this study included few actual measures of sexual behaviour, it has shown that a cluster of factors known to be associated with sexual experience, such as frequent alcohol use, smoking, liberal sexual attitudes and novelty-seeking personality6,34–37 were less prevalent among people who refused to participate. It appears reasonable, therefore, to conclude that the liberalism of sexual attitudes and the prevalence of some sexual experiences are overestimated in mail sex surveys.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participation category</th>
<th>Contrasts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a Explicit refusal</td>
<td>b Agreement, but subsequent loss (i.e. consented twice)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c Responders</td>
</tr>
<tr>
<td>Sexual abuse before age 18 (%)</td>
<td>2.7</td>
<td>3.9</td>
</tr>
<tr>
<td>Base Nb</td>
<td>988</td>
<td>284</td>
</tr>
<tr>
<td>Rape (ever, %)</td>
<td>4.2</td>
<td>8.5</td>
</tr>
<tr>
<td>Base Nb</td>
<td>1318</td>
<td>576</td>
</tr>
<tr>
<td>Physical assault (ever, %)</td>
<td>5.1</td>
<td>9.8</td>
</tr>
<tr>
<td>Base Nc</td>
<td>1319</td>
<td>574</td>
</tr>
<tr>
<td>Marriage difficulties (ever, %)</td>
<td>11.1</td>
<td>15.1</td>
</tr>
<tr>
<td>Base Nc</td>
<td>1321</td>
<td>576</td>
</tr>
<tr>
<td>Loss of a pregnancy (ever, %)</td>
<td>13.0</td>
<td>12.4</td>
</tr>
<tr>
<td>Base Nc</td>
<td>1319</td>
<td>573</td>
</tr>
<tr>
<td>Fertility problems (ever, %)</td>
<td>6.2</td>
<td>3.7</td>
</tr>
<tr>
<td>Base Nc</td>
<td>1314</td>
<td>571</td>
</tr>
</tbody>
</table>

a Logistic regression models included adjustment for age, sex, cohort and two-way interactions, where appropriate. Confidence intervals were adjusted to correct the artificially low variance estimates in correlated twin data.


c Data collected from women only (in both cohorts). Logistic regressions include adjustment for age, sex, subject cohort and two-way interactions.
However, the modest effect sizes found here indicate that this bias may not seriously compromise the validity of population estimates. Furthermore, it is possible that this overestimation of sexual experience due to voluntarism counteracts, to some extent, the often observed tendency for respondents in sex surveys to minimize or underreport the frequency and diversity of sexual behaviour.\textsuperscript{1,2,38}

A central question is whether these patterns might be extrapolated to the general population, since all of the participants in this study were known volunteers. Of course, the precise nature of biases among people who persistently refuse to engage in research is largely unknowable, except in relation to a few demographic characteristics. We are confident, however, that this study is more generalizable than most previous work on this issue; participants were part of a large, socially diverse national sample and it has been demonstrated previously that they are similar to the general population on a number of psychological dimensions, including personality, emotional state and frequency of alcohol consumption.\textsuperscript{21,22}

A methodological weakness of this study was that nearly one in five of the people initially approached agreed to receive the sex questionnaire but were subsequently lost. Some of this attrition would be due to passive refusal. It is also likely that loss occurred because of a delay of up to one year between initial agreement and the follow-up mailing of the questionnaire to the younger twin cohort. Funding constraints limited recontact attempts for the majority of subjects to one reminder letter and one telephone call. It is interesting, however, that people who initially agreed to participate but were subsequently lost were more similar to people who explicitly consented than to people who explicitly refused, especially in terms of attitudes, sex-related adverse events and demographic characteristics. It may be that the majority of those lost to the survey were true potential responders and further contact efforts would have increased the response rate while not substantially altering the psychological and social profile of respondents.\textsuperscript{8}

The data have implications for theories of survey non-participation. Although much is known about the demographic characteristics of people who explicitly refuse to do surveys of sensitive issues, demographic factors do not, of themselves, explain the refusal. Rather, it is likely that a psychological predisposition toward disclosure of personal information is related to social background to some degree.\textsuperscript{14} In population sex surveys, people with novelty-seeking, uninhibited personalities and liberal sexual attitudes and behaviours

<table>
<thead>
<tr>
<th>Variable</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>OR</th>
<th>CI</th>
<th>OR</th>
<th>CI</th>
<th>OR</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you agree with?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casual sex (%)</td>
<td>22.5</td>
<td>35.9</td>
<td>29.6</td>
<td>1.35</td>
<td>1.05–1.70</td>
<td>1.43</td>
<td>1.18–1.71</td>
<td>1.05</td>
<td>0.85–1.31</td>
</tr>
<tr>
<td>Gay rights (%)</td>
<td>27.1</td>
<td>35.9</td>
<td>39.5</td>
<td>1.61</td>
<td>1.61–2.00</td>
<td>1.75</td>
<td>1.48–2.06</td>
<td>1.09</td>
<td>0.89–1.32</td>
</tr>
<tr>
<td>Birth control (%)</td>
<td>91.2</td>
<td>91.6</td>
<td>93.7</td>
<td>1.33</td>
<td>1.33–1.57</td>
<td>1.47</td>
<td>1.47–1.57</td>
<td>1.10</td>
<td>1.10–1.10</td>
</tr>
<tr>
<td>Legalized abortions (%)</td>
<td>60.8</td>
<td>67.9</td>
<td>69.1</td>
<td>1.37</td>
<td>1.37–1.59</td>
<td>1.44</td>
<td>1.44–1.57</td>
<td>1.05</td>
<td>1.05–1.05</td>
</tr>
<tr>
<td>Condom vending machines (%)</td>
<td>77.5</td>
<td>88.9</td>
<td>87.7</td>
<td>1.37</td>
<td>1.37–1.60</td>
<td>1.44</td>
<td>1.44–1.60</td>
<td>1.05</td>
<td>1.05–1.05</td>
</tr>
<tr>
<td>Legalized prostitution (%)</td>
<td>45.6</td>
<td>52.9</td>
<td>56.4</td>
<td>1.48</td>
<td>1.48–1.83</td>
<td>1.60</td>
<td>1.60–1.83</td>
<td>1.08</td>
<td>1.08–1.08</td>
</tr>
<tr>
<td>Base N\textsuperscript{b}</td>
<td>2008</td>
<td>1196</td>
<td>4371</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{a} Logistic regression models included adjustment for age, sex, cohort and two-way interactions. Confidence intervals were adjusted to correct the artificially low variance estimates in correlated twin data.

\textsuperscript{b} Base Ns did not differ appreciably between questions, with a maximum deviation of 0.59\% from the numbers shown.
who smoke and drink alcohol frequently may perceive little personal threat from sex surveys and hence may be more willing to volunteer. There is some evidence that perceived threat from personal disclosures varies inversely with sexual knowledge and experience and this is consistent with the patterns observed here.

It is possible that these predisposing psychological factors have the opposite effect upon participation in other types of research. For example, smokers, heavy drinkers and people with mental health problems may be more, rather than less, difficult to recruit in general community health surveys. Willingness to disclose sexual matters may be, to some extent, independent of an overall willingness to disclose on other topics. The implication is that the direction of bias in sex surveys might not be extrapolated from trends in surveys of other sensitive topics.

In summary, the patterns observed here suggest that community surveys overestimate the degree of sexual liberalism, activity and adversity in the population. While the apparent bias in this study was consistent across various measures of behaviour and attitudes, the magnitude was small. Further research should examine the extent to which participation bias influences estimates of different classes of sexual behaviour, since the direction and magnitude of bias might not be equivalent for common and rare behaviours. There is also a need for further study of the relationship between dimensions of sexuality and willingness to disclose personal information in social surveys.

ACKNOWLEDGEMENTS

The sex research component was funded by a First Award to JMB from the US National Institute of Mental Health (USA) and a small Commonwealth AIDS Research Grant (Australia) to NGM and MPD. Data from other phases in this longitudinal study were collected in projects supported by NIAAA grants AA07535 and AA07728 (USA) and by grants from the National Health and Medical Research Council (Australia). The authors thank Dr Steve Dinwiddie for his scientific contribution to the Phase III data collection. Joanne Caldewell, Ann Eldridge, Robert Lake, Sue Mason, Theresa Pangan, John Pearson, David Purdie and Olivia Zheng provided valuable technical assistance.

REFERENCES


(Revised version received January 1997)