



The accuracy of reported sensitive sexual behaviour in Britain: exploring the extent of change 1990–2000

A J Copas, K Wellings, B Erens, C H Mercer, S McManus, K A Fenton, C Korovessis, W Macdowall, K Nanchahal and A M Johnson

Sex. Transm. Inf. 2002;78;26-30
doi:10.1136/sti.78.1.26

Updated information and services can be found at:
<http://sti.bmjournals.com/cgi/content/full/78/1/26>

These include:

References

This article cites 11 articles, 3 of which can be accessed free at:
<http://sti.bmjournals.com/cgi/content/full/78/1/26#BIBL>

6 online articles that cite this article can be accessed at:
<http://sti.bmjournals.com/cgi/content/full/78/1/26#otherarticles>

Rapid responses

You can respond to this article at:
<http://sti.bmjournals.com/cgi/eletter-submit/78/1/26>

Email alerting service

Receive free email alerts when new articles cite this article - sign up in the box at the top right corner of the article

Topic collections

Articles on similar topics can be found in the following collections

[Other Epidemiology](#) (1512 articles)
[Sexually Transmitted Infections](#) (1156 articles)

Notes

To order reprints of this article go to:
<http://www.bmjournals.com/cgi/reprintform>

To subscribe to *Sexually Transmitted Infections* go to:
<http://www.bmjournals.com/subscriptions/>

ORIGINAL ARTICLE

The accuracy of reported sensitive sexual behaviour in Britain: exploring the extent of change 1990–2000

A J Copas, K Wellings, B Erens, C H Mercer, S McManus, K A Fenton, C Korovessis, W Macdowall, K Nanchahal, A M Johnson

Sex Transm Inf 2002;**78**:26–30

See end of article for authors' affiliations

Correspondence to:
Dr Andrew Copas, Centre for Infectious Disease Epidemiology, Department of Sexually Transmitted Diseases, Royal Free and University College London Medical School, Mortimer Market Centre, Off Capper Street, London WC1E 6AU, UK; acopas@gum.ucl.ac.uk

Accepted for publication
20 December 2001

Objectives: The 1990–1 British national probability sample survey of sexual attitudes and lifestyles (Natsal 1990) was repeated in 1999–2001 (Natsal 2000) to update population estimates of risk behaviours, and assess change over time. We examine whether changes in prevalence estimates may partly result from changes in measurement accuracy.

Methods: Taking Natsal 2000 (11 161 respondents) and Natsal 1990 (13 765 respondents aged 16–44) we compared the response rate, sample representativeness, reporting of abortion last year (relative to official statistics), and selected attitudes. Among the common birth cohort eligible for both surveys (aged 16–34 Natsal 1990, 26–44 Natsal 2000), we compared reporting of experiences before 1990.

Results: The response rate (66.8% Natsal 1990, 65.4% Natsal 2000) and completeness of reporting abortion were unchanged (84% Natsal 1990, 86% Natsal 2000). Attitudes were significantly changed in Natsal 2000 relative to Natsal 1990—for example, increased tolerance of male homosexual sex, OR (95% CI) 2.10 (1.93–2.29) men and 2.95 (2.74 to 3.18) women. In the common birth cohort reporting of heterosexual intercourse before 16 (OR 1.15 (1.02 to 1.29) men, 1.49 (1.31 to 1.69) women), and homosexual experience (OR 1.80 (1.46 to 2.21) men, 2.00 (1.61 to 2.48) women) were significantly increased.

Conclusions: The results are consistent with improved reporting accuracy for some sensitive behaviours in Natsal 2000, in line with greater social tolerance and improved survey methodology. However, the evidence is not conclusive, and may not be generalisable to all such behaviours. The increase found in the reported prevalence of STI risk behaviours between Natsal 1990 and Natsal 2000 is likely to be somewhat overstated.

Since the first British National Survey of Sexual Attitudes and Lifestyles (Natsal 1990, Natsal-I) was conducted, in 1990–1, the results^{1,2} have had wide policy application, informing projections of the HIV epidemic and guiding preventive interventions aimed at reducing unplanned conception and sexually transmitted infection (STI).^{3–5} The survey was repeated (Natsal 2000, Natsal-II) in 1999–2001^{6–8} to update our knowledge of sexual lifestyles in the United Kingdom and to provide estimates of change over time. Given the recent increases in the incidence of STIs in Britain⁴ and the relatively high prevalence of teenage motherhood, the new data are again of considerable scientific and policy relevance.

Considerable interest is expected in how sexual behaviour has changed over the past decade. While change in early sexual experience, such as heterosexual intercourse before 16 can be assessed by comparing reporting across age groups in Natsal 2000 alone,⁸ in general the assessment of change requires a comparison of reporting in the two surveys. All surveys are subject to possible bias which is not removed by the standard weighting procedures^{9–11}; hence, the need to explore the extent to which differences in estimates between Natsal 1990 and 2000 result from a change in bias and the extent to which they may signal real changes in patterns of sexual lifestyle. This research problem has long been recognised.¹²

There are several potential sources of bias in surveys, as described in detail elsewhere.¹⁰ The sample interviewed may not be representative of the population of interest either because of exclusions from the sampling frame or because of non-participation. In addition, when interviewed, some participants may decline to answer or may misreport personal information owing to difficulties of recall, misunderstanding, or systematically choosing not to divulge certain sensitive

behaviour—for example, homosexual contact. Bias may depend on the time between the event of interest and interview through either difficulties of recall, a tendency to modify selective recollections according to the value system currently held, or a tendency to censor recent sensitive events.¹³ Many of these sources of bias are influenced by perceptions of survey confidentiality and of social acceptance governed by current social norms.

This paper explores the extent to which changes in the reporting of sensitive behaviours between Natsal 1990 and Natsal 2000 may be attributable to changes other than real change in population behaviour, of which three are readily identifiable. Firstly, the method of data collection for the most

Key messages

- The National Survey of Sexual Attitudes first carried out in 1990–1 (Natsal 1990) was repeated in 1999–2001 (Natsal 2000).
- The results of a comparison of reporting in Natsal 1990 and Natsal 2000 with external data and with each other are consistent with improved reporting accuracy for some sensitive behaviours.
- Such an improvement may reflect changing social attitudes, improved survey methodology, and greater privacy of interviewing.
- It is difficult to generalise our findings to all behaviours, but the increases in the prevalence of reported STI risk behaviours between 1990 and 2000 are likely to be a result of real changes in population behaviour but also in part a greater willingness to report.

sensitive behaviours changed from pen and paper self completion (PAPI) in Natsal 1990 to computer assisted self interview (CASI) in Natsal 2000. Other authors found that CASI leads to higher reporting of sensitive behaviours than PAPI in certain populations—for example, a survey of US men aged 15–19.¹⁴ However, a pilot study for Natsal 2000, in which respondents were randomised to either PAPI or CASI, suggested little impact in general on the reporting of sensitive behaviours, though it did not exclude an impact for particular behaviours or on particular population subgroups.¹⁵ Secondly, demographic changes in Britain over the period led to an increase in the proportion of single person households. This resulted in more respondents being interviewed without others present, leading to greater confidentiality. Perhaps most importantly, there may have been a change in social attitudes over the past decade towards greater acceptance of sexual diversity. This is apparent in our own results and those of others. The proportion of participants reporting the attitude that homosexual relations are “not wrong at all” in the British Social Attitudes Survey, for example, doubled between 1989 and 1999.^{16 17}

In this paper we consider possible sources of bias, their possible effects in Natsal 1990 and 2000, and the evidence for any change over time. In our discussion we consider the implications and limitations of our findings.

METHODS

Survey methods

Natsal 1990 was carried out in 1990–1 and the methods have been described in detail elsewhere.¹⁸ Natsal 2000 was carried out in 1999–2001.⁷ In both surveys a multistage probability sample of addresses was drawn from the postcode address file for Britain, and hence an appreciable change in the effect of sampling frame exclusions on bias is unlikely. In Natsal 2000 London addresses were oversampled.⁷ One member of the household was randomly selected for interview, without replacement. In Natsal 1990 those aged 16–59 were eligible for interview, while in Natsal 2000 this range was reduced to 16–44. In both surveys similar information was collected by the interviewer in a face to face interview, but the more sensitive information was collected through a self completion method (PAPI in Natsal 1990 and CASI in Natsal 2000). Those with minimal sexual experience were not offered the self completion section.⁷ The questions in Natsal 2000 were substantially the same as those in Natsal 1990, but additional questions were also included to reflect changing policy and epidemiological interests. A total of 13 765 interviews were collected in Natsal 1990 among those aged 16–44 and 11 161 in Natsal 2000.

Methods of exploring bias and its change between surveys

To measure the representativeness of the sample of participants we compared the response rates in the two surveys, and the extent to which the demographic structure of the participants (after weighting for differential selection probabilities, but not non-response) matched the contemporary population, as indicated by population estimates for mid-1991¹⁹ and mid-1999.^{20 21}

As an external consistency check, we compared the reporting of abortion in the previous year with contemporary official statistics from 1990^{22 23} and 1999 (provided by the Office for National Statistics).

We analysed data from the 19 year common birth cohort, those eligible for both surveys, aged 16–34 in Natsal 1990 (3857 male and 5161 female respondents) and 26–44 in Natsal 2000 (3392 male and 4747 female respondents). We compared the reporting of events occurring before 1990 between the samples interviewed in Natsal 1990 and Natsal 2000. We would expect little difference if there is no change in bias. To

establish that the experience occurred before 1990, age at first occurrence is required, which can be compared with age at interview. Events reported in Natsal 1990 are taken to have occurred before 1990, and reporting in Natsal 2000 of an event at age 10 or more years less than current age is taken to have occurred before 1990. Heterosexual intercourse before 16 and homosexual experience were included, and less sensitive experiences—for example, not living with both parents until 16, were included for comparison. These experiences were selected to cover the full range of objective questions available relating to specific ages. We looked for evidence of variation in the change in any bias according to sex by testing its interaction with survey. This method assumes either a broadly closed population over time—that is, minimal emigration and immigration, or that immigrants and emigrants have comparable sexual behaviour.

For each survey we determined the extent to which reporting of homosexual experience varied between the self completion and face to face components of the interview.

We compared the reporting of homosexual genital contact before 20 (heterosexual intercourse before 16 has been examined elsewhere⁸), across age groups in Natsal 2000. This analysis was performed not to address the change in bias between surveys directly, but to assess whether evidence from Natsal 2000 alone can demonstrate substantial change in behaviour over the past decade.

We compared the reporting of attitudes to sex before marriage, unfaithfulness, casual sex, and male homosexual sex. Odds ratios greater than 1 presented for the reporting in Natsal 2000 relative to Natsal 1990 indicate increased tolerance.

We compared the proportions of respondents reporting other people present in the home, and other people within earshot, in the two surveys. This could be an important factor determining willingness to report, although both surveys were designed so that participants were not required to give verbal answers to any sensitive questions.

Statistical methods

Our initial comparison of the demographic structure of the participants with population estimates was performed using data weighted only for differential selection probabilities, as defined by household size and region. For all other analysis, the data were weighted to account for the differential selection probabilities and then also post-stratified to British population estimates of the age, sex, and region distribution from mid-1991 and mid-1999 as described elsewhere.⁷ Post-stratification is particularly intended to reduce any bias from non-participation. All analysis was performed using the survey analysis software of STATA 6, which accounts for the clustering, weighting, and stratification of the data. We used the odds ratio (OR) for Natsal 2000 relative to Natsal 1990 as the measure of change in reporting of behaviours. For ordinal outcomes (for example, attitudes), these are calculated under the assumption of proportional odds. The adjusted ORs presented are calculated using logistic regression.

RESULTS

The participation rates (after adjusting for the oversampling of London in Natsal 2000, and with other standard adjustments⁷) were similar at 66.8% in Natsal 1990 and 65.4% in Natsal 2000. However, these rates are not strictly comparable since the age ranges eligible were 16–59 in Natsal 1990 but 16–44 in Natsal 2000. Since people over 45 were found less likely to participate in Natsal 1990⁷ it may be that the fall in participation rate between surveys would have been somewhat larger had the age range remained constant. Table 1 shows that in Natsal 1990 men were under-represented, and in Natsal 2000 this under-representation is somewhat greater. Among men the under-representation of London is somewhat increased,

Table 1 Demographic structure of the participants in Natsal 1990 (aged 16–44) and Natsal 2000, weighted for differential selection, compared with population estimates supplied by the Office for National Statistics

	Natsal 1990 (%)	Mid 1991 census figures (%)	Difference Natsal, census (95% CI)	Natsal 2000 (%)	Mid 1999 population estimates (%)	Difference Natsal, population estimates (95% CI)
Men	44.5	50.7	-6.2 (-7.0 to -5.4)	43.5	51.0	-7.5 (-8.3 to -6.7)
Age (years)						
16–19	13.4	12.6	0.9 (0.2 to 1.6)	13.6	12.2	1.4 (0.6 to 2.3)
20–24	18.7	18.5	0.2 (-0.8 to 1.2)	14.3	14.5	-0.2 (-1.2 to 0.9)
25–29	18.3	19.6	-1.3 (-2.3 to -0.4)	15.6	17.7	-2.0 (-2.8 to -1.2)
30–34	16.5	17.3	-0.8 (-1.6 to 0.1)	19.6	19.8	-0.2 (-1.1 to 0.7)
35–39	16.1	15.3	0.8 (0.0 to 1.7)	18.7	19.4	-0.7 (-1.6 to 0.1)
40–44	17.0	16.8	0.3 (-0.6 to 1.2)	18.2	16.4	1.7 (0.9 to 2.6)
Region						
London	11.8	13.4	-1.6 (-2.4 to -0.8)	11.8	14.6	-2.7 (-3.3 to -2.2)
Unweighted base	6000			4762		
Women	55.5	49.5	6.2 (5.4 to 7.0)	56.5	49.0	7.5 (6.7 to 8.3)
Age (years)						
16–19	12.8	12.2	0.6 (-0.2 to 1.3)	11.0	12.0	-1.0 (-1.6 to -0.4)
20–24	16.3	18.2	-1.9 (-2.8 to -1.0)	13.4	14.4	-1.0 (-1.8 to -0.1)
25–29	19.8	19.4	0.4 (-0.6 to 1.4)	17.1	17.4	-0.3 (-1.1 to 0.5)
30–34	17.6	17.4	0.2 (-0.7 to 1.0)	20.7	19.8	1.0 (0.1 to 1.8)
35–39	16.5	15.6	0.9 (0.1 to 1.8)	20.0	19.5	0.5 (-0.3 to 1.4)
40–44	17.0	17.2	-0.2 (-1.0 to 0.7)	17.8	16.9	0.9 (0.0 to 1.7)
Region						
London	11.3	13.7	-2.4 (-3.2 to -1.7)	11.6	14.4	-2.8 (-3.3 to -2.3)
Unweighted base	7765			6399		

among women the under-representation of those aged less than 30 is somewhat increased. Among eligible participants who accepted the self completion component of the interview the non-response rates for the questions within were generally very low using PAPI (Natsal 1990) but even lower using CASI (Natsal 2000) owing in part to the automatic routing of questions, as found previously¹⁵ (data not shown).

In Natsal 1990, the reported abortion rate among the 7384 female respondents aged 16–44 was 12.9/1000. This is 84% (95% CI 66 to 107) of the rate from official statistics. In Natsal 2000 the reported rate based on 6173 respondents was 13.5/1000. This is 86% (67 to 111) of the official rate, and hence the completeness of reporting seems largely unchanged, providing no evidence for a change in bias. For each survey the completeness of reporting was also calculated by age group (16–19, 20–24, 25–29, 30–34, 35–39, and 40–44), data not shown. For neither survey was the reporting for any age group significantly different from the official rate, and in neither survey was there evidence of a trend in completeness across age groups.

Table 2 shows the prevalence of reported behaviours in each survey for the common birth cohort and the corresponding ORs. The reporting of both homosexual experience and heterosexual intercourse before 16 are significantly higher in Natsal 2000 for women with ORs (95% CI) of 2.00 (1.61 to 2.48) and 1.49 (1.31 to 1.69), respectively. The reporting is also significantly higher for men, but less than for women, with ORs of 1.80 (1.46 to 2.21) and 1.15 (1.02 to 1.29), respectively. The increase in reporting of heterosexual intercourse before 16 is significantly less for men than for women. The reporting of the other experiences, which are generally somewhat less sensitive, is broadly unchanged with the exception of significantly higher reporting in Natsal 2000 of not discussing sexual matters with either parent when aged 14.

In Natsal 1990, among male respondents 5.3% (95% CI 4.7 to 5.9) reported homosexual experience in the face to face component of the interview, compared to 6.0% (5.4 to 6.7) in the self completion component, a ratio of 1.14. Among women the figures were 2.8% (2.5 to 3.3) and 3.7% (3.3 to 4.2), a ratio of 1.30. In Natsal 2000 among men the figures were 6.7% (6.0

Table 2 The reporting of behaviours in each survey by those aged 16–34 in Natsal 1990 and those 26–44 in Natsal 2000, and odds ratios (OR) for reporting in Natsal 2000 relative to Natsal 1990, adjusting for year of birth

Behaviour	Men		Women		OR (95% CI)	
	Natsal 1990 (%)	Natsal 2000 (%)	Natsal 1990 (%)	Natsal 2000 (%)	Men	Women
Heterosexual intercourse before 16	24.7	27.5	12.9	18.2	1.15 (1.02 to 1.29)	1.49 (1.31 to 1.69)
Homosexual experience* before 1990	5.0	8.5	3.5	6.7	1.80 (1.46 to 2.21)	2.00 (1.61 to 2.48)
Didn't live with both parents till 16†	16.0	18.8	19.0	20.0	1.21 (0.97 to 1.50)	1.04 (0.86 to 1.26)
Child before 20‡	3.4	4.1	13.5	14.1	1.20 (0.88 to 1.63)	1.05 (0.91 to 1.21)
Lived with someone before 20‡	11.3	11.6	28.0	27.8	1.03 (0.84 to 1.24)	0.99 (0.88 to 1.12)
Started menstruating before age 12	NA	NA	17.2	17.7	NA	1.04 (0.92 to 1.17)
No contraception at first sex§	28.9	28.9	24.8	26.1	1.02 (0.90 to 1.15)	1.08 (0.97 to 1.20)
Partner more willing at first sex§†	4.5	6.0	24.6	23.5	1.34 (0.91 to 1.96)	0.94 (0.79 to 1.13)
Recently met partner at first sex§†	20.0	19.8	7.0	8.6	0.98 (0.78 to 1.23)	1.23 (0.93 to 1.63)
Did not discuss sex with parents when 14†	67.5	76.9	56.4	60.4	1.62 (1.35 to 1.95)	1.19 (1.03 to 1.38)
Last school attended single sex	15.9	17.1	17.8	18.8	1.13 (0.98 to 1.30)	1.10 (0.97 to 1.24)

Statistically significant odds ratios for change between 1990 and 2000 are in bold.

*Refers to any kind of sexual experience or contact with someone of the same sex.

†This question only asked of a randomly selected one quarter of respondents in Natsal 1990.

‡Comparison restricted to respondents aged 20–34 in Natsal 1990 and 30–44 in Natsal 2000.

§Comparison restricted to respondents who first had sex before 1990.

Table 3 The change in reported attitudes on selected sensitive topics between surveys

% reporting	Men		Women		OR for reporting tolerance of the behaviour in Natsal 2000 relative to Natsal 1990, adjusted for age (95% CI)*	
	Natsal 1990	Natsal 2000	Natsal 1990	Natsal 2000	Men	Women
Sex before marriage:						
rarely wrong, or not wrong at all	84.4	85.2	79.3	84.4	0.97 (0.88 to 1.08)	1.28 (1.17 to 1.40)
sometimes, mostly, always wrong	14.6	13.8	19.1	14.4		
don't know, "it depends"	1.0	1.1	1.7	1.2		
Unfaithfulness in marriage:						
rarely wrong, or not wrong at all	3.7	2.6	2.2	1.2	0.72 (0.66 to 0.78)	0.72 (0.67 to 0.78)
sometimes, mostly, always wrong	94.3	95.6	96.2	97.6		
don't know, "it depends"	2.1	1.8	1.6	1.2		
Unfaithfulness in cohabitation:						
rarely wrong, or not wrong at all	10.9	6.6	5.7	2.8	0.69 (0.64 to 0.74)	0.65 (0.61 to 0.70)
sometimes, mostly, always wrong	86.3	91.7	92.4	96.0		
don't know, "it depends"	2.8	1.8	1.9	1.3		
"One night stands":						
rarely wrong, or not wrong at all	26.7	37.2	8.1	18.7	1.88 (1.74 to 2.03)	2.91 (2.70 to 3.13)
sometimes, mostly, always wrong	70.5	58.8	90.0	77.1		
don't know, "it depends"	2.9	4.0	2.0	4.2		
Male homosexual sex:						
rarely wrong, or not wrong at all	25.3	42.1	32.6	59.1	2.10 (1.93 to 2.29)	2.95 (2.74 to 3.18)
sometimes, mostly, always wrong	70.9	54.1	60.4	35.6		
don't know, "it depends"	3.8	3.8	7.0	5.3		

Statistically significant odds ratios for change between 1990 and 2000 are in bold.

*Excluding the don't know/"it depends" category, and using all five remaining levels of opinion under an assumption of proportional odds.

to 7.5) and 8.4% (7.6 to 9.2), giving a ratio of 1.24, and among women the figures were 7.0% (6.4 to 7.8) and 9.7% (8.9 to 10.5) giving a ratio of 1.38. Hence, among men and women the reporting of homosexual experience in self completion relative to face to face was somewhat higher in Natsal 2000 (when CASI was used) than Natsal 1990 (when PAPI was used).

The reported prevalence of homosexual genital contact before 20 among men in Natsal 2000 in the age groups 20–24, 25–29, 30–34, 35–39, and 40–44 were 3.6% (2.3 to 5.5), 3.1% (2.1 to 4.5), 5.6% (4.2 to 7.4), 5.2% (3.9 to 6.9), and 4.6% (3.3 to 6.3), respectively. Among women the figures were 3.9% (2.7 to 5.6), 2.6% (1.7 to 3.8), 2.2% (1.5 to 3.2), 2.3% (1.6 to 3.4), and 2.6% (1.8 to 3.8). For neither sex was there a significant trend in the prevalence across age. As reported elsewhere,⁸ reporting of heterosexual intercourse before 16 in Natsal 2000 is greater among younger women, but not among men. This suggests that this behaviour has increased among the population of women over recent years (although the results could in principle reflect a reduced willingness to report the behaviour among older respondents).

Table 3 shows marked changes in reported attitudes between Natsal 1990 and 2000. There are substantial increases in the reported tolerance of male homosexuality OR 2.10 (1.93 to 2.29) among men and 2.95 (2.74 to 3.18) among women, and of "one night stands" and, in addition, the reported tolerance of sex before marriage is increased among women. Testing of interaction terms (data not shown) indicates that the increase in reported tolerance is significantly smaller for men. The reported tolerance of unfaithfulness in marriage or cohabitation is significantly decreased in Natsal 2000, though tolerance was already very low in Natsal 1990.

The proportion of interviews where someone else was in the home but not within earshot, was slightly higher in Natsal 2000 than in Natsal 1990, at 30.6% (29.6 to 31.6) compared with 26.2% (25.3 to 27.1). However, the proportion of interviews where someone else was within earshot was much lower at 28.0% (27.0 to 29.0) compared to 45.1% (44.1 to 46.1).

CONCLUSIONS

The comparison of data from Natsal 1990 and 2000 demonstrates significant increases in the reported prevalence

of several sexual behaviours among those aged 16–44.^{6,7} Such increases may reflect real increases in the population prevalence, but they might reflect in part a change in bias. In this paper we have attempted to assess whether there has been an appreciable change in bias and, if so, whether it has led to higher or lower reporting of sensitive behaviour, so that inference about real changes over time in population behaviour can be made from the surveys.

The observed increase in tolerance towards sexual diversity reflecting changed social norms, the higher proportion of interviews conducted without other people within earshot, and the use of CASI interviewing in Natsal 2000 would be expected to have led to more candid responses. These changes may also have led to greater participation in the survey among those with sensitive sexual experience. Both these changes in bias are consistent with the results of the analysis of the common birth cohort, those eligible for both surveys. The reporting of homosexual experience before 1990 is almost twice as high in Natsal 2000 as Natsal 1990, and the reporting of heterosexual intercourse before 16 is also significantly higher. For the other (generally less sensitive) experiences, with only one exception there is no evidence of a change in reporting between surveys. The finding that in Natsal 2000 the reporting of homosexual experience in the self completion relative to the face to face component was higher than in Natsal 1990 is consistent with a small increase in the candour of reporting because of CASI. The comparison of the demographic structure of the two samples, after weighting for differential selection probabilities, with contemporary population estimates demonstrated small changes. Finally, the comparison of prevalence estimates for recent abortion with contemporary statistics provided no evidence of an appreciable change in bias. So while not every method suggests the same conclusion, the evidence taken together is consistent with a change in bias, leading to higher reporting of sensitive behaviours in Natsal 2000. We cannot deduce that the sample of participants is more representative in Natsal 2000, but the evidence suggests that reporting in Natsal 2000 is more candid. This finding is clearly encouraging, and since also CASI interviewing leads to higher internal consistency and lower question non-response,¹⁵ we are hopeful that data from Natsal 2000

have not only updated population estimates but improved their accuracy.

Clearly our work has limitations. Only a few behaviours can be considered in each of our methods, and for the common cohort analysis these cannot relate to recent experience. Only abortion statistics are available for reliable consistency checks external to the surveys. It is unclear how our findings can be generalised to other experiences. The interpretation of the results from the common birth cohort analysis is also not straightforward. The higher reporting observed in Natsal 2000 for sensitive behaviours may be in part because when interviewed, those respondents from Natsal 2000 were 10 years older than those in Natsal 1990 and so a longer period of time had elapsed since the events reported. Difficulties of recall are unlikely to have led to such large differences in reporting, because these are personally significant events, and the results for the less sensitive events show no evidence of systematic problems. However, willingness to report the events may have increased with the time elapsed, as the event became less morally charged.

To make inference concerning change in population behaviour from the surveys, for some behaviours data from external sources—for example, abortion statistics, can be used to aid interpretation. The change in early experience can be established using data from Natsal 2000 alone. For other sensitive behaviours where change must be established by a comparison of data from the two surveys, the likelihood of a change in bias must be considered. Any change in bias could be highly variable across behaviours—for example, being large for early homosexual experience but minimal for recent abortion, and might vary by sex. Thus, increases in the reported prevalence over time, and greater increases for women, may overestimate the real change in population behaviour. However, looking at Natsal 2000 data alone there is evidence of real increases in the prevalence of early heterosexual intercourse among women (though little evidence of a change in early homosexual experience for either sex). The comparison of reported attitudes between the surveys and other sources suggests greater tolerance of sexual diversity which arguably itself provides evidence of population behaviour change. Furthermore, external data such as the recent increase in STI incidence,⁴ suggest that the increases in the reporting of various sensitive behaviours associated with STI risk between surveys⁷ in part reflect changing population behaviour, and cannot be explained as merely the result of changing bias.

CONTRIBUTORS

AC was the lead writer of this paper; AC and CM performed the statistical analysis; CM prepared the dataset for analysis with contributions from CK and AC; AJ, KW, BE, and KF were the principal investigators and designed and managed Natsal 2000, with contributions from AC, SM, and CK; WM, KN, and all the authors contributed towards the ideas for analysis, interpretation of the results, and writing of the paper.

Authors' affiliations

A J Copas, C H Mercer, K A Fenton, A M Johnson, Centre for Infectious Disease Epidemiology, Department of Primary care and Population Sciences and Department of Sexually Transmitted Diseases, Royal Free and University College Medical School, Mortimer Market Centre, off Capper Street, London WC1E 6AU, UK
B Erens, S McManus, C Korovessis, National Centre for Social Research, 35 Northampton Square, London EC1V 0AX, UK
K Wellings, W Macdowall, K Nanchahal, Health Promotion Research Unit, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK
K A Fenton, HIV/STI Division, PHLS Communicable Disease Surveillance Centre, 61 Colindale Avenue, London NW9 5EQ, UK

REFERENCES

- 1 **Johnson AM**, Wadsworth J, Wellings K, *et al*. Sexual lifestyles and HIV risk. *Nature* 1992;**360**:410–12.
- 2 **Johnson AM**, Wadsworth J, Wellings K, *et al*. *Sexual attitudes and lifestyles*. Oxford: Blackwell, 1994.
- 3 **Health Education Authority**. *Promoting the health of teenage and lone mothers Setting a research agenda*. London: Health Education Authority, 1999.
- 4 **Nicoll A**, Hughes G, Donnelly M, *et al*. Assessing the impact of national anti-HIV sexual health campaigns: trends in the transmission of HIV and other sexually transmitted infections in England. *Sex Transm Inf* 2001;**77**:242–7.
- 5 **Social Exclusion Unit**. *Teenage pregnancy*. London: Stationery Office, 1999.
- 6 **Fenton KA**, Korovessis C, Johnson AM, *et al*. Sexual behaviour in Britain: sexually transmitted infections and prevalent genital Chlamydia trachomatis infection. *Lancet* 2001;**358**:1851–4.
- 7 **Johnson AM**, Mercer C H, Erens B, *et al*. Sexual behaviour in Britain: partnerships, practices and risk behaviour. *Lancet* 2001;**358**:1835–42.
- 8 **Wellings K**, Nanchahal K, Macdowall W, *et al*. Sexual behaviour in Britain: early heterosexual experience. *Lancet* 2001;**358**:1843–50.
- 9 **Copas AJ**, Johnson AM, Wadsworth J. Assessing participation bias in a sexual behaviour survey: implications for measuring HIV risk. *AIDS* 1997;**11**:783–90.
- 10 **Fenton KA**, Johnson AM, McManus S, *et al*. Measuring sexual behaviour: methodological challenges in survey research. *Sex Transm Inf* 2001;**77**:84–92.
- 11 **Wadsworth J**, Johnson AM, Wellings K, *et al*. What's in a mean?—An examination of the inconsistency between men and women in reporting sexual partnerships. *J Roy Statist Soc A* 1996;**159**:111–23.
- 12 **Lee RM**. *Doing research on sensitive topics*. London: Sage, 1993.
- 13 **Kinsey AC**, Pomeroy WB, Martin CE. *Sexual behaviour in the human male*. Philadelphia and London: WB Saunders, 1948.
- 14 **Turner CF**, Ku L, Rogers SM, *et al*. Adolescent sexual behaviour, drug use and violence: increased reporting with computer survey technology. *Science* 1998;**280**:867–73.
- 15 **Johnson AM**, Copas AJ, Erens B, *et al*. Effect of computer-assisted self interviews on reporting of sexual HIV risk behaviours in a general population sample: a methodological experiment. *AIDS* 2001;**15**:111–15.
- 16 **Brook L**, Hedges S, Jowell R, *et al*. *British social attitudes cumulative sourcebook*. Aldershot: Gower, 1992.
- 17 **Park A**. The generation game. In: Jowell R, Curtice J, Park A, Thomson K, Jarvis L, Bromley C, Stratford N, eds. *British social attitudes*. London: Sage, 2000.
- 18 **Wadsworth J**, Field J, Johnson AM, *et al*. Methodology of the National Survey of Sexual Attitudes and Lifestyles. *J Roy Statist Soc A* 1993;**156**:407–21.
- 19 **Office of Population Censuses and Surveys**. *1991 Census. Age, sex, and marital status*. London: HMSO, 1993.
- 20 **Office for National Statistics**. *Population estimates 1999. MMWR* 2000.
- 21 **Registrar General for Scotland**. *Mid-1999 population estimates*. Edinburgh: General Registrar Office for Scotland, 2000.
- 22 **Office of Population Censuses and Surveys**. *Abortion statistics. Legal abortions carried out under the 1967 Abortion Act in England and Wales, 1990*. London: HMSO, 1991.
- 23 **Scottish Health Service**. *Scottish health statistics*. Edinburgh: ISD Publications, 1991.