



# Design of a survey of sexual behaviour and attitudes in the British population

## Scoping review

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## Definitions and acronyms

Probability sampling	A method of sampling individuals whereby every member of a defined population has a known chance of being selected to take part. In Britain this is commonly address-based sampling from a complete list of addresses (the Postcode Address File). Depending on the survey, there may also be further selection of households and eligible individuals within addresses.
CAPI	Computer-assisted Personal Interviewing (face-to-face computerised questionnaire, with questions administered and data entered by trained field interviewers)
CASI	Computer-assisted Self Interviewing (self-completion computerised questionnaire)
PAPI	Paper self-completion booklet
Boost sample	In addition to the core sample representing the population overall, boost samples can be recruited to increase the analytical power for analyses of particular population groups of interest. These often use similar sampling and recruitment methods but only individuals belonging to the population of interest are eligible to take part.

# Executive summary

This report presents the findings from a scoping review, carried out to inform the design of updated collection of representative survey data on sexual attitudes and lifestyles in Britain (Natsal-4), whether via a dedicated survey or using existing research infrastructure.

## Background

To date, the primary source of representative data on sexual lifestyles of the British population has been the National Surveys of Sexual Attitudes and Lifestyles (Natsal). This series of repeat cross-sectional surveys have become a vital resource to inform policy, practice, and public discussion of sexuality and sexual health. Natsal-1 (1990-1991), Natsal-2 (1999-2001) and Natsal-3 (2010-2012) used address-based probability sampling with selection of one individual per household for an interviewer-administered (CAPI/CASI) interview. This method is considered the 'gold standard' for studies aiming to be representative of the population. However, survey methodologists are exploring alternative methods of obtaining high-quality representative data in more cost-effective ways, in light of declining response rates to probability sample face-to-face surveys, increasing fieldwork costs, and pressure to cut survey budgets. To consider the optimal design to collect updated data on sexual attitudes and lifestyles, this review assessed methods used to date by other major UK population surveys and by population surveys of sexual health internationally. The review distinguishes between sampling methods, and recruitment/data collection mode (e.g. face-to-face, web, telephone) as each have distinct implications for data quality and cost.

## Sampling methods

### *Sampling frame*

Many sexual health studies have used convenience sampling to recruit population groups of particular interest, for example sexual health clinic attendees and men attending gay-orientated venues. However, these have major selection biases and are not representative of the general population. Some research has also used online volunteer-based internet panel samples, however the estimates generated using this sampling method are highly variable and are generally considered to be poor quality, e.g. unknown response rates and selection/response biases. In contrast, the unique contribution of Natsal is the ability to provide robust and detailed insight into sexual health that is broadly representative of the general population. This needs to include those who do not access services or who would not usually volunteer to take part in a sex survey, including those who are not sexually active. Probability-based sampling methods are critical to achieving this, therefore this review excluded convenience sampling methods (e.g. snowball sampling, volunteer-based online surveys).

### *Sampling individuals*

There are a number of practical, statistical, ethical, and data quality drawbacks to administering a survey with a substantial CASI section on a sensitive topic to multiple household members. These include increased length of time in household unless multiple devices are available, reduction in precision as a result of clustering within households, risk of increased reporting bias, and increased risk of creating conflict

within a household (see section 1.3.2). Preference is therefore given to design options which enable selection of only one individual per household to participate.

## Recruitment and data collection mode

The method of in-person recruitment and interviewing by trained field interviewers used by Natsal-1-2-3 is the approach taken by the majority of major social surveys in the UK and population surveys of sexual health worldwide. We identified 6 alternative design options, and reviewed these as well as the Natsal-1-2-3 approach with consideration to the cost, data quality, and ability to deliver the required data:

- 1) A dedicated probability sample survey with individual selection, recruitment and interviewing by trained fieldworkers (used in Natsal-1-2-3);
- 2) Invite participants from an existing probability sample survey to participate in a follow-up interview about sexual health;
- 3) Add a module of sexual health questions to an existing health-related probability sample survey;
- 4) A web panel survey, based on an existing probability sample (one such panel exists in Britain, where participants in a probability sample face-to-face survey have been invited to take part in an ongoing online panel with telephone follow-up of non-responders);
- 5) A telephone survey, with participants recruited via random-digit dialling of telephone numbers (landline and mobile);
- 6) A 'web-first' mixed-mode survey, where a sample of addresses are sent postal invitations to participate in a web survey (non-responding addresses are followed up, either with a paper questionnaire sent by post, or a visit from a trained fieldworker);
- 7) A probability sample survey with individual selection and recruitment by a trained fieldworker, who then leaves instructions for that individual to complete a web survey.

Full details of each option can be found in section 2, with an overview of the assessment in table 2.1. In summary: Option 2 was ruled out because it offered minimal cost savings and had several major drawbacks, including the risk of additional non-response bias, and the need to follow up several years of sample to achieve the required sample size. Option 4 offered such a limited sample size that it would not be possible to deliver the key outputs required by Natsal. Option 5 has been shown to have major limitations in terms of sample frame and response. Options 3, 4, and 7 would need a considerably reduced questionnaire which could only deliver limited data, precluding the ability to look at sexual health holistically, to consider its multifactorial drivers, or to include newly prioritised, in addition to existing 'core', questions. All of these alternative options would also make analysis of change over time difficult to interpret due to the changes in methodology.

Some UK repeat cross-sectional surveys and longitudinal studies have moved to mixed-mode designs including online components. These generally use address-based probability sampling and invite participants by letter to participate in a web survey initially, with postal or face-to-face data collection options offered either alongside, or in subsequent reminder letters. A postal data collection option offers far greater potential for cost-savings than face-to-face, but has major drawbacks in terms of response bias, higher item non-response, lower data quality, and limited questionnaire length/complexity. The extent of cost-savings for a web plus face-to-face mixed-mode

design versus a face-to-face only design are unclear, and are likely to vary between surveys.

Major surveys which have transitioned to mixed-mode data collection have generally done so after a period of parallel runs with the 'traditional' method in order to quantify effects of response/selection biases and mode effects on the resulting estimates and the time-series. These experiments have identified several major issues which no survey has yet overcome:

- 1) Response rates are lower, leading to concerns about the increased risk of (unmeasured) response bias. This is especially true where the alternative mode is a paper questionnaire, but has also been found with face-to-face follow-up.
- 2) There is evidence of measurable response bias: web survey participants tend to be regular internet users and more socio-economically advantaged. The latter bias is only slightly improved by the offer of an alternative mode.
- 3) Participants often do not follow instructions for selecting one individual per household. In two separate experiments, one in four web interviews was completed by the 'wrong' household member, increasing the risk of selection bias.
- 4) Large differences in estimates compared with traditional method resulted in "breaking" the time series.

Work by survey methodologists is ongoing to attempt to address these issues and to gather evidence on other knowledge gaps about the optimal design for mixed-mode surveys, including whether mode options should be offered simultaneously or sequentially, the best incentive strategy, and acceptable web survey length. It is not known whether or when the major limitations will be overcome, nor has any study assessed the extent to which these issues may be different for surveys of sensitive topics like Natsal. Given the unresolved problems with this approach, a move to a mixed-mode design without further evidence on optimal design is not recommended.

## Proposed design

Given the disadvantages and uncertainty around cost-savings of many of the options considered, the proposed design for an updated survey remains an address-based probability sample with interviewer-led recruitment and interview. This approach is considered the best available option for achieving a representative sample, and offers a number of advantages including: retaining the time series aspect of Natsal, allowing reliable individual selection, enabling collection of detailed data to address multiple research questions that can benefit the wider scientific community, a tried-and-tested platform for the enhancement of the survey data with biological and routine data, and providing a population-based sampling frame for future research in this area.

# 1 Background

## 1.1 The National Surveys of Sexual Attitudes and Lifestyles (Natsal)

The National Surveys of Sexual Attitudes and Lifestyles (Natsal) are large probability sample surveys, representative of the British population. Together, Natsal-1 (1990-1991), Natsal-2 (1999-2001) and Natsal-3 (2010-2012) have interviewed over 45,000 men and women, spanning those born through much of the 20th Century. The major contribution of Natsal is the ability to provide robust and detailed insight into the sexual health of the general population, including those who do not access services or who would not usually volunteer to take part in a sex survey. This information has been crucial in understanding transmission dynamics for STIs, patterns of service use and non-use, how young people learn about sex, and the prevalence and risk factors for unplanned pregnancy, sexual function problems, and non-volitional sex, among many other topics.

All three Natsal surveys have used address-based probability sampling, with selection of one person per household to take part. Selection of individuals within households, and recruitment to the survey was carried out by trained field interviewers who then conducted the survey interview, typically in the participant's home. Natsal-1 used paper-based interviewing, including a paper self-completion booklet for the most sensitive questions, whereas Natsal-2 and -3 used computerised interviewing (CAPI) with a computerised self-completion (CASI) for the most sensitive questions. Although each survey has included new questions to respond to emerging areas of inquiry, core questions have been kept the same, resulting in a time series of comparable data across the three surveys. Some population groups of particular interest have been 'boosted' (oversampled) to give greater analytical power for sub-group analyses: London residents (Natsal-2), ethnic minority groups (Natsal-2), and young people (Natsal-3). Natsal-2 and -3 also collected biological samples e.g. urine to measure the prevalence of, and risk factors for, sexually transmitted infections, providing unique information on the epidemiology of these infections within the population.

## 1.2 This scoping review

This scoping review was conducted to identify the optimum method currently available for the collection of updated data on sexual behaviour, attitudes, and lifestyles among the general population in Britain (Natsal-4), whether via a dedicated survey or using existing research infrastructure. The need for these data is becoming increasingly urgent in light of recent cuts to sexual health services and changes in how these services are commissioned[1]. Expanded data are also needed on topics not covered by the previous Natsal surveys, for example the role of digital media (including pornography) in how people learn about sex, meet partners, maintain relationships, and access information, advice, and healthcare.

Although probability sample surveys with selection and recruitment of participants by trained field interviewers is considered to be the current 'gold standard' for collecting general population data, declining response rates, increasing fieldwork costs, and pressure to cut survey budgets are increasingly leading major social surveys to look into alternative means of obtaining high-quality representative data in more cost-

effective ways. This review examines the design of other major population surveys in Britain and of population surveys of sexual behaviour/attitudes internationally, and assesses the appropriateness of these methods for Natsal-4.

The review distinguishes between sampling methods (e.g. sampling frame) and recruitment/data collection mode (e.g. face-to-face, web, telephone) as each have distinct implications for data quality and cost.

## 1.3 Terms of reference and sampling methods considered out-of-scope

### 1.3.1 Sample frame and methods

Sexual health studies have tended to use convenience sampling to recruit population groups of particular interest, for example sexual health clinic attendees and men attending gay-orientated venues (e.g. [2–5]). In addition, excellent routine surveillance data on diagnoses of STIs, along with basic demographic and behavioural characteristics are collected within sexual health services (e.g. [6]). These methods are suitable for some purposes, e.g. collecting detailed data on sub-populations, development of interventions, understanding experience of services, and measure development. However, these methods are not designed to capture representative data on the general population in Britain, which requires a population survey. Some research has used online volunteer-based internet panel samples, however the estimates generated using this sampling method are highly variable and are generally considered to be poor quality [7,8], e.g. unknown response rates and selection/response biases. Probability-based sampling methods are crucial to achieving data that reliably represents the wider British population, and so this review excluded non-probability sampling methods (e.g. snowball sampling, volunteer-based online surveys).

### 1.3.2 Sampling of individuals versus households

When administering a survey with a substantial self-completion element like Natsal, there are practical reasons for selecting one person per household for interview: to reduce the length of time in the household, and because of the drawbacks of simultaneous administration of computerised self-completion modules<sup>1</sup>. There are also statistical reasons to do so: interviewing multiple household members results in clustering within households, which may reduce the precision of estimates for a given sample size if (as is likely) there is more correlation in the measures of interest between members of the same household than across different households. Given the sensitive subject matters that Natsal addresses, there are several further ethical and data quality concerns to interviewing multiple members of a household, e.g. potential

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<sup>1</sup> Administering several CASI self-completion modules on the interviewer's laptop/tablet would add substantially to the length of time in the household, plus break up the interview as other household members wait their turn. This could be overcome by making the CASI element a web survey and asking participants to log on via their own devices, however this is likely to lead to higher non-response to the CASI modules. Many household surveys, such as the Health Survey for England (HSE) use paper self-completion booklets, however these have well-documented limitations for complex questionnaires like Natsal. For example, our previous work found much higher levels of item-non response to paper-based self-completion than CASI (~10% in HSE 2010 vs 1-3% in Natsal[17]), and paper questionnaires limit the scope for complex question routing[8].

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effects on reporting bias (knowing that another member of the household is answering the same questions may make it 'feel' less private), respondent discomfort or embarrassment, and the risk of creating conflict within a household following the interview, given the particularly sensitive nature of some questions including those on non-volitional sex. Although there may be scientific benefits of studying multiple household members – for example to collect data from both members of cohabiting couples, these practical, statistical, data quality, and ethical concerns outweigh such benefits for Natsal. Design options which allow selection of one individual per household to participate are therefore strongly preferred.

## 2 Review of design options

### 2.1 Introduction

The design options considered in this scoping review were selected as they have been used in the previous Natsal surveys, and/or are currently used in large-scale population surveys or population sex surveys internationally. A summary of international population sex surveys can be found in appendix A, whereas relevant UK surveys are cited throughout the main body of the report.

These options are:

1. A dedicated probability sample + interviewer-led interview (method used on previous Natsal surveys)
2. Follow-up participants from an existing probability sample survey
3. Add detailed sexual health module to existing health-related probability sample survey
4. Probability-based web/telephone panel
5. Random digit dialling telephone survey
6. 'Web-first' mixed-mode survey
7. Interviewer recruitment + web survey.

Table 2.1 sets out an overview of these design options and their ability to meet the following requirements of data collection based on the available evidence:

- Substantially cheaper delivery of data compared with the method used in Natsal-1-2-3 (probability sample survey with interviewer-led recruitment and interviewing).
- Represent the general population (minimise sampling and response bias).
- Adequate sample size to meet data users' needs ('sufficient power').
- Detailed questionnaire, including both existing core questions and new topics.
- Possibility to boost population groups of interest, particularly young people and ethnic minority groups.
- Collection of biological samples (e.g. urine to measure STIs).
- Consent to linkage to routine data sources (e.g. general practice data).
- Continuity of time series data, i.e. an ability to interpret a change in estimates over time as reflecting real change in the population.

Further detail for each option is provided in sections 2.2-2.8.

**Table 2:1 Overview of design options considered and whether they meet data collection requirements based on available evidence**

Option	Cheaper delivery of data	Minimise sampling and response bias	Sufficient power	Detailed questionnaire data including new topics	Youth / ethnic boost samples	Biological samples	Data linkage	Maintain time series
1: Probability sample + interviewer-led interview (method used on previous Natsal surveys)	n/a	✓	✓	✓	✓	✓	✓	✓
2: Follow-up existing probability sample survey	✗	✗	(✓) Need to follow up several years	✓	(✗) Depends on survey sample size	✓	✓	✗
3: Add detailed sexual health module to existing survey	✓	✓	(✓) Need to include for several years	(✗) Amount of detail depends on survey/ sponsors	(✗) Would need separate funding	(✓) Depending on survey	(✓) Subject to agreement from survey team	(✓) For limited set of questions, depending on mode
4: Probability-based web/telephone panel	✓	✗	✗	✗	✗	NK(✓)	NK(✗)	✗
5: Random digit dialling + telephone interview	✓	✗	✓	NK(✓)	NK	NK(✓)	NK(✗)	✗
6: 'Web-first' mixed-mode survey	NK	✗	✓	(✓) For some but not all participants	NK(✗)	NK(✓)	NK(✓)	✗
7. Interviewer recruitment + web survey	NK(✓)	NK(✗)	✓	✗	✓	NK(✓)	NK(✓)	✗

**Notes:**

(✓) indicates that this is possible, depending on the specific design chosen.

'NK' indicates insufficient evidence from available from other surveys;

'NK(✓)' indicates insufficient evidence, but likely to be able to deliver or partially deliver;

'NK(✗)' indicates insufficient evidence, but unlikely to deliver.

## 2.2 Probability sample in-person survey (method used for Natsal-1-2-3)

Table 2:2 Probability sample in-person survey (method used for Natsal-1-2-3)	
Sample design	Probability sample (address-based).
Recruitment mode	Interviewer visit to address.
Interview mode	CAPI and CASI.
How it would work	<p>As per previous Natsal surveys:</p> <ul style="list-style-type: none"> <li>• In-person address-based recruitment by interviewers with random selection of 1 participant per household.</li> <li>• Detailed CAPI and CASI interview, biological samples, consent to data linkage, consent to recontact about follow-on studies.</li> <li>• Unproductive addresses (after at least 6 contact attempts). reissued to a second interviewer at a later date to maximise response rates.</li> <li>• Doorstep screening for young people / people from specific ethnic groups at boost sample addresses.</li> </ul>
What data can be delivered	<ul style="list-style-type: none"> <li>• Sample broadly representative of the general British population[1].</li> <li>• Detailed questionnaire data covering a wide range of sexual health topics, using CASI for most sensitive questions to mitigate interviewer effects on reporting.</li> <li>• Maintain time series by using consistent methods.</li> <li>• Youth and ethnic group boost samples.</li> <li>• Biological samples.</li> <li>• Data linkage.</li> <li>• Quality control measures (piloting with interviewer feedback; interviewer supervision; 10% call-back to verify interviews).</li> </ul>
Drawbacks	<ul style="list-style-type: none"> <li>• High fieldwork costs.</li> <li>• Declining response rates across population surveys, making it difficult to maintain this quality metric and more resource-intensive to achieve each interview.</li> <li>• Despite being best available sampling method, likely to be some unmeasurable response biases.</li> </ul>
Cost implications	No cost savings on core survey design vs previous Natsal studies.

**SUMMARY:** Best method currently available for achieving high-quality representative data, but limited cost-saving opportunities, and challenging to maintain acceptable response rates.

## 2.3 Follow up sample from an existing probability sample survey

Sample design	Probability sample (address-based).
Recruitment mode	Either interviewer visit to address or invite to participate by letter/telephone/email.
Interview mode	CAPI/CASI, web.
How it would work	Approach those who have taken part in a relevant (i.e. health-related) survey, and who expressed willingness to participate in further research. Potential surveys include Health Survey for England (HSE), Scottish Health Survey (SHeS). These people could be invited to take part in either another in-person interview, or a web survey.
What data can be delivered	<ul style="list-style-type: none"> <li>• Detailed questionnaire (if in-person).</li> <li>• Biological samples.</li> <li>• Data linkage possible.</li> <li>• Quality control as per current method (table 2.2) if in-person.</li> </ul>
Drawbacks	<ul style="list-style-type: none"> <li>• Response rates likely to be substantially lower than current method (section 2.2) as non-response to initial survey is combined with 2nd stage non-response to follow-up interview. Individual-level response rate for HSE 2015 was 57%. 86% of individuals agreed to be contacted about future studies. Assuming a maximum of 60% would take part in an in-person follow-up or 25% in a web-based follow-up, this would give approximate (max) response rates of 34% and 14% respectively. Non-response bias could be partially mitigated by including a short sexual behaviour module for all participants in the original survey to provide additional data for 2nd stage non-response weighting.</li> <li>• Small sample size available once non-response has been accounted for – may take several years of survey waves to get required sample size (either prospectively, or going back to old survey years in which case response rates may be lower).</li> <li>• Only a small reduction in fieldwork costs (see below).</li> <li>• Relies on survey sponsor agreement to access the sample (and add questions to the original survey if needed).</li> <li>• Youth and ethnic group Boost samples not possible unless already planned for those studies.</li> <li>• Health Survey in Wales ceased in 2015 therefore an alternative suitable survey would need to be identified in Wales.</li> </ul>
Cost implications	<ul style="list-style-type: none"> <li>• Limited reductions in cost due to the need for in-person recruitment to achieve the higher response rate estimate of 34%, the need to follow up several years of sample, and the fact that sample are less geographically clustered than in option 2.2, thus increasing interviewers' travel time.</li> <li>• Costs could be reduced further if interviewed all members of household rather than selecting one individual (see discussion about this in section 1.3.2).</li> <li>• Costs could also be reduced by making follow-up contact by telephone rather than in person, but this compromises response rates and cost savings likely to be low.</li> <li>• Additional costs of adding a module of questions to the initial survey, which would enhance non-response weighting.</li> </ul>

**SUMMARY:** Substantial compromises on response rates and the possibility of additional response bias, for little reduction in costs.

## 2.4 Add a sexual health module to another probability sample survey

Sample design	Probability sample (address-based).
Recruitment mode	Interviewer visit to address.
Interview mode	CASI/paper self-completion.
Example of how it could work	Add a module to a relevant survey (e.g. HSE/SHeS), potentially introducing a CASI module on these surveys instead of a paper self-completion booklet. This approach was taken for the New Zealand Health Survey (NZHS) 2014-15, which included an extensive sexual health module (see appendix).
What data can be delivered	<ul style="list-style-type: none"> <li>• Sample broadly representative of the British population.</li> <li>• Reasonably detailed data on sexual behaviour in conjunction with demographics /other health data.</li> <li>• Biological samples.</li> <li>• Data linkage.</li> <li>• Quality control measures as per table 2.2.</li> </ul>
Drawbacks / risks	<ul style="list-style-type: none"> <li>• Sample size is limited (see section 2.2) for the available surveys in any given year so would need to add a detailed module on several years of the survey to have sufficient power for analysis.</li> <li>• Collecting data from all members of the household would increase sample size in each year, but has ethical and practical drawbacks (see section 1.3.2).</li> <li>• Self-completion modules on these surveys are currently paper booklets, which have known drawbacks (see footnote 1, page 6). Feasibility of introducing a CASI module would need to be explored and would depend on whether sexual health data is being collected from all household members, or only one individual per household.</li> <li>• Youth and ethnic group boost samples not possible (unless already planned).</li> <li>• Requires agreement from survey sponsors – other question topics may have to be cut in those years.</li> <li>• Limited to a maximum of ~15 minutes of sexual health questions<sup>2</sup>.</li> <li>• Health Survey in Wales ceased in 2015 therefore an alternative suitable survey would need to be identified in Wales.</li> </ul>
Cost implications	Greatly reduced cost by use of existing survey infrastructure.

**SUMMARY:** An option for reducing survey costs while retaining a high-quality sample but several years of fieldwork needed and much reduced survey content. Feasibility depends on willingness of survey sponsors to dedicate questionnaire space to sexual health over several years. Likely to be more appropriate for collecting small amounts of sexual health data in the years between dedicated sexual health surveys.

<sup>2</sup> A brief sexual health module was added to HSE in 2010 and 2012. However, without contextual data about other aspects of sexual health or detailed behavioural/partnership data it is not possible to examine sexual health holistically or answer research questions beyond prevalence of a few key variables. A more extensive module could provide very valuable information, however the maximum feasible length for a module is likely to be 15 minutes (due to existing core modules), therefore the amount of data would be much more limited than that collected in Natsal 1-2-3.

## 2.5 Probability-based web/telephone panel

Sample design	Probability sample (address-based) who have already participated in an in-person interview invited to enter an ongoing research panel.
Recruitment mode	Recruited to the panel by the interviewer at the end of initial survey interview. Panelists subsequently recruited to participate in monthly questionnaires by email, with telephone follow-up of panel members who do not respond online.
Interview mode	Web/telephone.
How it would work	Add a module of questions to the existing NatCen probability panel, which recruits panel members following participation in the British Social Attitudes survey (an in-person probability sample survey)[2]. Panel participants are invited to participate in regular short web surveys (+ telephone follow-up of those who do not respond to web).
What data can be delivered	<ul style="list-style-type: none"> <li>• Approximately 15-30 mins of questions<sup>3</sup>.</li> <li>• Only ~2000 individuals maximum currently in the panel.</li> <li>• Potential to request self-collected biological sample via post, but this would need development work to test feasibility and acceptability.</li> <li>• Rapid method of data collection enables inclusion of questions in response to emerging issues.</li> <li>• Multiple data collection points from the same participants may provide some scope for longitudinal analysis.</li> </ul>
Drawbacks / risks	<ul style="list-style-type: none"> <li>• Low response rates (effective response rate of ~15%) – work investigating response bias is ongoing.</li> <li>• Limited sample size – lack of power, particularly to look at population sub-groups.</li> <li>• Limited questionnaire length, therefore loses the ability to look at sexual health holistically or answer multiple research questions.</li> <li>• Loss of time-series data (change in sample design &amp; mode effects).</li> <li>• Age range is 18+ thus no data on 16-17 year olds, who are an important group for sexual health research.</li> <li>• Youth and ethnic group boost samples not possible.</li> </ul>
Cost implications	Low cost.

**SUMMARY:** Not a satisfactory alternative to a detailed survey due to small sample size and limited number of questions, but could be used to provide rapid supplementary data on key topics that affect the majority of the general population in between dedicated surveys.

<sup>3</sup> Guidance on the maximum recommended questionnaire length for web surveys varies. Dillman (2015), who has led a lot of the methodological research in this field proposed 20-30 minutes is acceptable[4]. In an experiment on the European Social Survey, the median interview length was 52 minutes (with some people needing to complete in multiple sessions) and although some break off was observed (see section 3.3), this was perhaps lower than would be expected for such a lengthy online questionnaire. However, this was a one-off web survey rather than an ongoing panel survey for which a long interview may jeopardise participation in future interviews. In addition, the increasing choice of smart phones as a means of completing web surveys may mean that participants are less likely to take part in lengthy web interviews[10]. Acceptable interview length may also vary according to how engaging and how intrusive the survey questions are.

## 2.6 Random Digit Dialling (RDD) telephone survey

Sample design	Random dialling of telephone numbers (dual landline & mobile phone sampling frame).
Recruitment mode	Telephone. For landlines, individual selection would be performed in initial telephone screen & phone number for selected individual requested. Selected individual called for interview. For mobiles the owner of the phone is the respondent (no selection needed)
Interview mode	Telephone interview.
How it would work	RDD + telephone interview has been used by sex surveys in France and Australia (see appendix). Although not used on either survey, options for creating a telephone self-completion could be explored (e.g. using interactive voice recognition (IVR) software, or asking participants to complete a separate web survey).
What data can be delivered	<ul style="list-style-type: none"> <li>• Best practice guidance: up to 20-25 mins of questions (although French survey interview was ~50 minutes).</li> <li>• Possibility of biological samples (via post).</li> <li>• Quality control checks.</li> </ul>
Drawbacks/risks	<ul style="list-style-type: none"> <li>• Low response rates e.g. 28% in Sport England's Active People Survey[3]. RDD is very rarely used in Britain<sup>4</sup>. Although previously one of the major survey methods used in the USA, even there many surveys are moving away from RDD due to increasing difficulties in obtaining telephone interviews[4].</li> <li>• No existing complete telephone number sample frame.</li> <li>• Likely to experience high level of proxy refusals / difficulty getting phone number for selected individual for landline sample.</li> <li>• Risk of interview break-off and item non-response given sensitive topic &amp; cold-calling nature of recruitment.</li> <li>• Uncertain feasibility of requesting consent to data linkage.</li> <li>• Uncertain feasibility of screening for ethnicity by phone.</li> </ul>
Cost implications	Less costly than a face-to-face only option, although limited information on which to estimate costs in UK context.

**SUMMARY:** Not a satisfactory alternative design due to uncertain quality of the sampling frame and low response rates.

<sup>4</sup> The Active People Survey cited here was one of the only major British surveys to use this method, but this moved to web-first (with paper and telephone options available on request) in 2015[40].

## 2.7 ‘Web-first’ mixed-mode

See section 3 for more detail on available evidence on web-first mixed-mode in the UK and discussion of the evidence gaps.

Sample design	Probability sample (address-based).
Recruitment mode	Initial recruitment via letter. Potential for face-to-face recruitment of non-responders depending on option chosen.
Interview mode	Web survey + CAPI/CASI OR: Web survey + PAPI.
How it would work	Web survey invitation letter sent to all addresses with instructions for selecting one eligible individual to take part and a link for that person to complete the survey online. Unproductive addresses (either all or a sub-sample) followed up with an interviewer visit and CAPI/CASI interview, OR unproductive addresses followed up by sending a postal questionnaire (PAPI).
What data can be delivered	<ul style="list-style-type: none"> <li>• Best practice guidance: 15-20 minute questionnaire for web responders (see footnote 3, page 6).</li> <li>• Detailed data for those followed up for in-person interview (and potentially for web participants, depending on web survey length).</li> <li>• Potential for biological samples, although response rates likely to be lower for web participants.</li> <li>• Quality control measures for CAPI/CASI interviews as in section 2.2. Some web survey data quality algorithms can be used, e.g. to check for obviously fraudulent interviews[5].</li> </ul>
Drawbacks	<ul style="list-style-type: none"> <li>• Low response rate to web offer (likely range 15-25%) and non-response bias has been documented [5,6] (see section 3).</li> <li>• Proxy refusals likely to be higher as household member who opens the letter may choose not to participate on behalf of all in household (may be particularly problematic for a sensitive topic).</li> <li>• Postal (PAPI) follow-up of non-responders far more cost-effective than in-person follow-up. However, non-response biases have been documented (see section 3) and there are known limitations of using paper questionnaires (see footnote 1, page 6). Unclear based on current evidence whether face-to-face follow-up would minimise non-response biases.</li> <li>• Evidence that individual selection without an interviewer present does not work, leading to potential selection biases[5,6] (see section 3).</li> <li>• Loss of time series data (see section 3 for further discussion)</li> <li>• Less data on web (or paper) responders. A longer web interview could be trialled, although may result in a high rate of interview break-off (see footnote 3, page 14).</li> <li>• Uncertainty about feasibility of biological samples and data linkage for web responders.</li> </ul>
Cost implications	<ul style="list-style-type: none"> <li>• Potential to reduce fieldwork costs by saving interviewer visits although would need to test uptake of web-first option for a sensitive topic. See section 3.4 for further discussion.</li> <li>• Additional development work needed to establish optimum mixed-mode design and gather evidence on biases.</li> <li>• Additional design, programming, &amp; data processing costs of having multiple modes[7].</li> </ul>

**SUMMARY:** Many issues with data quality have been identified and remained unresolved, including problems with individual selection, increased response bias compared with face-to-face only surveys, and disruption in time trends for survey

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estimates. In-person follow-up likely to be needed (due to poor response and data quality for postal follow-up) but cost savings would be substantially lower with this option. Mixed-mode not yet been tested with a survey on a sensitive topic therefore there is a lack of evidence about biases and mode effects, and the resulting impact on key estimates and cost-savings.

## 2.8 In-person recruitment followed by web interview

Sample design	Probability sample (address-based).
Recruitment mode	Interviewer visit to address.
Interview mode	Web survey.
How it would work	<ul style="list-style-type: none"> <li>Recruitment in-person (face-to-face doorstep screening &amp; individual selection) but interviewer leaves information pack about a web survey for the selected individual. Face-to-face interview (or paper booklet) offered as an alternative option.</li> <li>A similar approach was taken on the British Gambling Prevalence Survey (BGPS) 2007 where interviewers left paper self-completion booklets but there was also the option to fill in a web survey (only 7% chose this option). For those choosing the paper option, interviewers returned to collect the booklet rather than relying on participants to post it.</li> </ul>
What data can be delivered	<ul style="list-style-type: none"> <li>15-20 minute questionnaire (for web) (see footnote 3, page 14).</li> <li>Robust individual selection.</li> <li>Higher response rates than some other options reviewed due to interviewer-led recruitment (BGPS 2007 response rate 52%<sup>5</sup>).</li> <li>Potential for biological samples by post for web responders.</li> <li>Some web survey data quality algorithms can be used, e.g. to check for obviously fraudulent interviews[5].</li> </ul>
Drawbacks	<ul style="list-style-type: none"> <li>Limited number of questions for web responders (limited usefulness).</li> <li>Lower response rates than current method – many people agree to participate but do not, thus requiring considerable fieldwork resource and expense to follow up non-responders.</li> <li>Higher proxy refusals likely, which may introduce bias.</li> <li>Cannot confirm who is completing the web survey. Possibility of ineligible household members (e.g. out of age range) completing the survey where incentive is conditional on participation.</li> <li>Loss of time series due to changes in sampling and data collection modes.</li> <li>Data quality problems with paper option. BGPS 2010 survey moved away from this approach to a face-to-face survey in part due to the limitations of paper questionnaires[8].</li> </ul>
Cost implications	<ul style="list-style-type: none"> <li>Potential to reduce costs by reducing interviewer time, although less cost-saving than some other options due to large amount of resources required recruiting and following-up participants.</li> <li>Some additional compensation for field interviewers may be needed to maintain morale and motivation given this approach would be less well paid relative to other surveys and the work itself would be less rewarding.</li> </ul>

**SUMMARY:** Some potential cost savings, but unlikely to be sufficient to justify the compromise in response rates, interview detail, and time series. This is not a commonly-used approach due to these drawbacks.

<sup>5</sup> Response rates likely to be lower now, given the general pattern of decline in population survey response rates.

## 3 Evidence on web-first mixed-mode surveys from major UK surveys

### 3.1 Summary of available evidence

Almost 90% of the population now have access to the internet[9] and day-to-day services are increasingly offered online, thus there is an (untested) assumption that survey participants may expect to be able to take part online rather than in a face-to-face interview[10]. However, concerns have been raised about the 'digital divide'[e.g. 19,20] – where the shift online increases inequalities by leaving out some members of society (often those already disadvantaged and socially excluded), whether in terms of access to services or inclusion in research.

Online research methods are usually quicker and cheaper than face-to-face methods, with potential for larger achieved sample sizes, thus probability sample based online data collection is an attractive alternative to the traditional face-to-face survey. As there is currently no sample frame including email addresses in the UK, 'address-based online surveying' or 'web-first' is the most promising available method for obtaining a new cross-sectional probability-based online sample. This method involves sending postal invitations to a stratified random sample of addresses with instructions for participation in a web survey[13]. To address issues of low response rates to this approach, and concerns about inclusion of 'offline' individuals, an alternative interview method (paper/telephone/face-to-face) is usually offered on request, or pro-actively offered at a later stage.

Two major probability sample surveys have conducted high quality experiments into the consequences of moving data collection from face-to-face to a 'web-first' model: the Community Life Survey (summarised in section 3.2) and the European Social Survey (section 3.3). Sport England transitioned their Active Lives Survey from telephone interviewing (sampled using random digit dialling) to online data collection (using address-based sampling) – these results have not been described in detail here because the original sampling and data-collection design were not address-based/face-to-face. Further work is also in progress and awaiting results:

- The Office for National Statistics is currently undertaking a programme of development and testing of online data collection for the Labour Force Survey, as well as work to transition the 2021 Census to online data collection.
- The new cross-EU Fundamental Rights Survey is currently conducting an experiment into web-first methods including offering face-to-face as an alternative mode.

Additional methodological work has been carried out in other contexts, for example outside the UK, or within existing longitudinal cohort studies. Some of these studies have been cited where relevant in section 2.

## 3.2 Case study: Community Life Survey (CLS)

The CLS is an annual repeat cross-sectional survey run by UK Government's Cabinet Office to track trends and developments in areas that encourage social action and empower communities. In 2012-2015, the CLS implemented a series of parallel experiments with address-based online surveying (described below) alongside the ongoing probability sample (address-based) face-to-face survey. Details of these experiments and results have been reported[5], and are summarised below.

### 3.2.1 Experimental design

- Probability sample (address-based) postal invitation to participate in a web survey, with paper booklet option offered on request.
- Experimented with different options for sending reminders
- Selection of one household per address not deemed possible – this is thought to affect only ~1% of addresses (but more in some areas such as London).
- Tried both selecting one adult per household (using next/last birthday method) and up to 4 adults per household
- Experimented with different incentive options

### 3.2.2 Key findings

- Response rates substantially lower (28% vs 60% face-to-face) thus risk of non-response bias is greater. Compared with face-to-face, web sample more likely to be everyday internet users, high earners, owner-occupiers, native English speakers, and more highly educated.
- Including paper booklet in second reminder rather than only on request increased response rates (22% to 35%) and increased representation of non-internet users, but did not reduce other sample biases listed above and added costs. *CLS Recommendation: send to a sub-sample in 2<sup>nd</sup> reminder. This approach resulted in 28% response rate.*
- £5 unconditional incentive sent with initial letter led to higher response but not cost-effective. *CLS Recommendation: promised £10 incentive conditional on participation.*
- Random individual selection did not work (as has previously been documented with postal surveys). With this option, in 1 in 4 households overall the wrong household member took part, which increases the risk of selection bias. Permitting up to 4 adults per household led to some individuals filling in the survey for more adults than listed (4% of households), and some survey quality indicators suggested possible fraudulent survey completion in households with four adults, although this was in a small minority of households. *CLS Recommendation: allow all adults at each address to take part (up to 4) given serious problems with individual selection.*
- No evidence of substantially poorer data quality of online data compared with face-to-face using metrics such as time taken to complete and measures to detect short-cutting tactics ('satisficing'). However, higher levels of drop-outs part way through (11% vs 1%) and reduced willingness to be recontacted for further research (43% vs 83%).

- Key estimates were substantially different in web/postal vs face-to-face: around two-thirds of the estimates were significantly different, and around 20% of these differences were substantial – at least 5 percentage points difference. Weighting to correct for demographic profile only partially improved this. Further experimental work suggested that this was largely due to data collection mode (web vs face-to-face) rather than additional sample bias. The parallel experiments permit some allowance for these affects when assessing the time series of estimates.
- Detailed information on cost savings not published, costs of web + paper reported as ‘substantially lower’ than face-to-face.

### 3.2.3 Design from 2016 onwards

Web + paper: Address-based invitation for all adults (up to 4) to participate in web survey with paper booklet option offered on request (21% response rate).

## 3.3 Case study: European Social Survey (ESS)

The European Social Survey is a repeat cross-sectional survey covering 36 European countries, taking place every 2 years. In 2012, the ESS conducted a parallel experiment with sequential mixed mode alongside the face-to-face main survey, including in the UK[6,14].

### 3.3.1 Experimental design

- Probability sample (address-based) postal invitation to participate in a web survey.
- Letter included a £5 voucher unconditional incentive (i.e. could be redeemed regardless of participation)
- Selection of one individual per household was carried out. Half of the sample were instructed to use the first/last birthday method (as for CLS). For the other half of the sample, whoever opened the letter was asked to complete a short online survey about the household (household roster). At the end of this, the survey selected one individual per household to participate in the individual interview.
- An additional conditional incentive was posted to those who participated in the web survey. Two values were tested: £15 and £35.
- After a reminder process, a sub-sample were followed up face-to-face. These were only offered £5 conditional incentive for participating in the face-to-face interview.
- The web interview length was similar to the face-to-face interview (median 52 minutes)

### 3.3.2 Key findings

- Response rate to the web phase was 21%, rising to 39% with face-to-face follow-up. This compared with 55% in the main face-to-face ESS survey.
- Those who participated in the web survey were younger and more socio-economically advantaged (better educated, more likely to be in work, and higher income). Once the face-to-face follow-up sample was combined with the web sample these differences reduced but were not eliminated.

- Large numbers of people did not comply with the instructions for individual selection – the wrong individual completed the interview in 1 in 4 households in total, and there were large amounts of missing data on household members leading to uncertainty about the accuracy of selection in other households.
- This design resulted in substantial cost savings (~60%), but had a much lower response rate than the main face-to-face survey. The authors concluded that if the face-to-face follow-up response rate could be improved to bring up the overall response rate to be comparable with the face-to-face main survey, the cost savings would still be in the region of 25%
- The higher conditional incentive had little impact on response to the web survey (21.5% for £35 vs 19.6% for £15).
- Approximately 5% of web-responders broke off the interview early, and a further 2% completed most of the interview but did not get to the end.

### 3.3.3 Design from 2014 onwards

ESS has retained face-to-face data collection by field interviewers.

## 3.4 Evidence gaps: web-first mixed mode

At a recent cross-sector seminar on web-first surveys in the UK, experts in this field raised a number of unanswered questions about the impact of moving to this methodology on data quality, as well as regarding the best way to administer mixed-mode surveys in practice[10]. These include:

- Whether it is possible to select one person per household for interview with these methods.
- How to increase web response given the many steps involved from opening the postal invitation to logging onto a device and completing the survey.
- The best method of offering alternative data collection modes (e.g. whether to give participants a choice of mode, or offer sequentially, whether to offer the alternative mode to all or a sub-sample of non-respondents).
- How to differentiate the effects of changing mode and changing sampling method on key estimates, and how either of these may vary across different kinds of questions / topics.
- Optimal questionnaire design for a survey that will be administered across multiple modes to ensure comparability of estimates.
- The validity of combining data from different modes.
- The optimal design of any parallel studies including existing and new methods and the potential for these to help interpretation of time series.
- Whether it is possible to transition from face-to-face to address-based online surveying while maintaining the ability to look at change over time.

Only one cross-sectional study in the UK (ESS) has attempted the web + face-to-face and more evidence is needed about the extent to which this approach could reduce non-response bias while still making cost-savings, including whether targeted face-to-face follow-up (e.g. focussing at areas with high proportions of traditionally under-represented groups) could further decrease non-response bias.

In addition, it is not known whether the effect of changing sample design and data collection mode would be different on a survey which is overtly on a sensitive topic, like Natsal. Although the CLS concluded large differences in key estimates were primarily due to the change in data collection mode, rather than non-response biases, experimental evidence from Natsal-3 suggests mode effects could be less extreme for Natsal, as a large proportion of key data is collected via the CASI, which is a similar mode to a web survey[15]. However, the web survey element of this mode effects experiment was conducted among those who had previously taken part in a Natsal CAPI/CASI interview, and our previous work has found that rapport with the interviewers on Natsal plays an important role in eliciting accurate data for sensitive questions[16], therefore the extent of mode effects in a 'fresh' sample is unknown. Furthermore, the sampling method change may result in different, and potentially greater, effects for Natsal than the CLS due to the sensitive subject matter, given the expectation of higher levels of proxy refusals, and the potential impact of changing the first stage of recruitment to opt-in. Further evidence would be needed to assess whether this is the case, and the extent to which face-to-face follow-up mitigates any increases in non-response bias. For a study like Natsal, which occurs infrequently, such evidence could be gathered via parallel experiments trialling mixed-mode alongside the previously-used methodology, however to do this to a high standard would require considerable additional resource.

Finally, the cost implications of moving to a mixed-mode web plus face-to-face design are not well established. The ESS estimate of 25% cost savings (compared with face-to-face only) assumes high response rates are achievable. Information from Understanding Society (a longitudinal study) on cost savings for a web plus face-to-face sequential design found cost savings of 19-30% (depending on uptake of the web option) but this reduced to 8-15% once additional incentive costs had been factored in[7]. Cost savings for a cross-sectional survey using this method are likely to be lower due to lower uptake of the web option (letter cannot be addressed to a named individual, therefore will often not be opened; lower buy-in from participants who are being contacted cold; prohibitive costs of unconditional incentives which are known to increase response rates).

## 4 Recommended design following this review

After consideration of the quality and cost of all options set out in section 2 of this report, the recommendation of this review is that the preferred option for Natsal-4 is a new dedicated survey, using methods consistent with the previous Natsal surveys: address-based probability sampling with in-person interviewer visits to perform random selection of one individual per household for a CAPI and CASI interview. In addition to the benefits to individual selection and response rates (and potentially response bias) of in-person recruitment by field interviewers, face-to-face interviews enable a longer interview, with explanation of biological sampling and data linkage, enabling collection of rich and detailed data that can benefit the scientific and policy community, rather than answering a limited number of focussed research questions.

Although some UK repeat cross-sectional surveys and longitudinal studies have moved to mixed-methods designs including online components, this has generally been done following a period of parallel run experiments allowing comparison with the previously-used method in order to quantify changes to sampling biases and mode effects. A number of outstanding questions remain about the effect on estimates and survey quality following the experiments conducted to date (see section 3). Given the known limitations of paper questionnaires as a means of administering complex questionnaires such as Natsal[8,17,18] this option would still require in-person follow-up for participants who do not participate online / remotely, therefore cost savings are likely to be modest, but nonetheless may be possible. Given the (limited) available evidence from other surveys that have made this transition outlined in section 3, and the potential for different effects of sampling method and data collection mode on data quality for surveys of sensitive topics like Natsal, further methodological work would be needed to investigate the feasibility and impact on non-response bias and survey estimates before a mixed-mode approach could be considered.

## Appendix A. Review of methods used by other population sex surveys internationally

Table 4:1 Review of methods used by other population sex surveys internationally

Country & Survey title	Sampling method	Sample size	Response rates	mode	Interview length	Notes
Australia: Australian Study of Health and Relationships (2001-2; 2012-13)[19]	- Dual frame Random Digit Dialling (RDD) (landline and mobile phone) - random selection of 1 individual per household for landlines	20,094 (2012-13 survey)	25-29%	Telephone	- 19 minutes (mean), range 10-60 minutes. - Asked a shortened version of the questionnaire if only had 1 (opposite-sex) partner in past year/not had sex in past year/never had sex	Cost of face-to-face surveys in Australia prohibitive due to size of country

Table 4:1 Review of methods used by other population sex surveys internationally

Country & Survey title	Sampling method	Sample size	Response rates	mode	Interview length	Notes
France: Contexte de la Sexualité en France (CSF) (1970; 1992; 2005-06) [20]	- Dual frame RDD (telephone directory sample & sample of cell phone users) - random selection of 1 individual per household for landlines	12,364 (2005-06 survey)	74% of those selected (i.e. of those where contact was made & agreed to selection process). Actual response not reported but assumed to be similar to Australian study	Telephone	~50 minutes, detailed questionnaire	Included home-based self-sampling for chlamydia testing among a sub-sample aged 18-44y (self-taken vaginal swab for women, urine for men). 76% of those eligible agreed to receive a home testing kit. A series of reminder telephone calls and letters was used to increase completion rates (from 29% before reminders to 68%). The final response rate was 52%. [21]
Japan: National Fertility Survey (every 5 years; latest 2015) [22]	Follow-up of a general probability sample survey with a paper self-completion questionnaire. Survey sampled all married women aged under 50 years and all unmarried men and women aged 18-49 years. Participants were recruited in-person by survey staff who left the questionnaire and then returned later to collect it.	15,350	76.5% (single people), 87.8% (married people)	PAPI	Approximately 10-25 minutes [personal communication with research team]	Primary focus on relationships and family formation.

Table 4:1 Review of methods used by other population sex surveys internationally

Country & Survey title	Sampling method	Sample size	Response rates	mode	Interview length	Notes
New Zealand Health Survey (2014-15)[23]	<ul style="list-style-type: none"> <li>-Probability sample (address-based)</li> <li>- oversampling of areas with high proportion of ethnic minority residents</li> <li>- one adult per household aged 15+ years (only those aged 16-74 years were eligible to do the Sexual and Reproductive Health module)</li> </ul>	13,497 (aged 15+ participating in the survey overall)	79% (87% of these completed the sexual and reproductive health module)	In-person interview (CAPI for the adult health survey & audio-CASI for the sexual and reproductive health module)	37 minutes for the Adult Health Survey, 18 minutes for the Sexual and Reproductive Health module [personal communication with research team]	<p>General health survey but included an extensive sexual &amp; reproductive health module in 2014-15.</p> <p>Interviewers reported that S&amp;RH self-completion module was too long for respondents. Research team advised that they would shorten the S&amp;RH module to under 15 minutes if they were to run it again.</p>
Norway, Sweden, Denmark HPV Survey in Women (2011-12)[24]	<ul style="list-style-type: none"> <li>- Study population: women aged 18-45 years</li> <li>- Sampled from national population registers (which included information on gender and age, to enable selection of only eligible participants)</li> <li>- Invited by letter. If didn't respond were contacted by telephone</li> </ul>	47,895	61%	Initially offered postal (paper) questionnaire or web survey. If didn't respond after 1 reminder letter were telephoned and completed survey over the phone	Not reported	Approx 65% participated via paper questionnaire, 18% via online survey, and 17% via phone.

Table 4:1 Review of methods used by other population sex surveys internationally

Country & Survey title	Sampling method	Sample size	Response rates	mode	Interview length	Notes
Health Survey Northern Ireland (2011-12, 2015-16)[25,26]	Probability sample (address-based). All adults aged 16y+ eligible for interview.	3,915 with 2,075 completing the sexual health module	60% for survey overall, with 60% of those eligible completing the sexual health CASI module	CASI & CASI. A paper booklet was also offered.	9 minutes (sexual health module) [personal communication with research team]	General health survey with sexual health self-completion module Sexual Health module asked of those aged 16-55y (2011-12) and 16-74y (2015-16).
Slovenian National Survey of Sexual Lifestyles (1999-2001)[27,28]	Probability sample, using population register which included demographic details	1,752	67%	In-person (interviewer-administered & paper self-completion)	Mean interview duration: 72 minutes (median 70 minutes) [personal communication with research team]	Used paper questionnaire for both interviewer-administered and self-completion elements.  A second survey was carried out in 2016-17, which again used probability sampling and in-person interviewing (this time using CAPI and CASI), including urine sampling to test for chlamydia [personal communication with research team].
South African National HIV Prevalence, Incidence and behaviour Survey (2012)[29]	- Probability sample, using aerial photography to create sample frame. - All eligible HH members interviewed	11,079	85% (HH level response) 89.5% participation rate within HHs	In-person (paper based questionnaire administered by trained fieldworkers)	Not reported	Included dried blood spots to test for HIV
Spanish National Sexual Health Survey (2008-09)[30]	- Probability sample (address-based) - one individual selected per HH (random sampling)	1,939	Not reported	In-person (CAPI & paper self-completion)	Average: 31 minutes	

Table 4:1 Review of methods used by other population sex surveys internationally

Country & Survey title	Sampling method	Sample size	Response rates	mode	Interview length	Notes
USA National Survey of Family Growth (commissioned in 4-year waves; most recent in field 2015-2019)[31–33]	<ul style="list-style-type: none"> <li>- probability sample (address-based) with in-person recruitment</li> <li>- one individual per household (random selection)</li> <li>- Oversampled areas ('census blocks') with higher proportion of black &amp; hispanic households, screened for ethnicity at some addresses (boost), over sampled young people by changing the probability of selection within households</li> </ul>	Approx. 5,000 per year	73%	In-person (CAPI & audio-CASI)	70 minute average interview	
USA National Survey of Sexual Health and Behavior (2009, 2012, 2015) [34–36]	'knowledge networks', a probability-based panel run by GfK, initially recruited via RDD & address-based sampling, then followed up online for various omnibus surveys	Approx. 2,000 - 6,000 depending on wave.	44% (of invited panel participants) for 2015 survey	web survey	Median 17 minutes for 2015 survey [personal communication with research team]	
USA Sexual Exploration in America Study (2015)[37]	GfK Knowledge networks (see above)	2,021	47% (of invited panel participants)	Web survey	Median 18 minutes [personal communication with research team]	
USA General Social Survey (1972-present; biennial)[38]	<ul style="list-style-type: none"> <li>-probability sample, using NORC's sample frame of US addresses.</li> <li>- one individual per household (random selection)</li> </ul>	Approx 1,000 – 3,000 depending on year.	~70%	CAPI (plus some telephone interviews where it is not possible to arrange face-to-face interview)	Not reported	General survey, includes some questions on sexual behaviour, attitudes to sexual health/lifestyles, sex education, abortion (in some years)

Table 4:1 Review of methods used by other population sex surveys internationally

Country & Survey title	Sampling method	Sample size	Response rates	mode	Interview length	Notes
USA National Health and Nutrition Examination Survey (NHANES) (1998-present, annual)[39]	-Probability sampling (address-based) - one individual per household (random selection)	Approx 7,000 per year	~67%	In-person (CAPI & audio-CASI) at home plus mobile medical centre assessment	Length of sexual behaviours module not reported (~35 questions)	2017/18 survey included questions on sexual behaviours Includes biological samples tested for STIs, HIV & viral hepatitis

## Appendix B. References

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