A Web-Based Event History Calendar Approach for Measuring Contraceptive Use Behavior

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Acknowledgements

The authors thank Alexa Zmich, Deji Suolang, and Paul Schulz for assistance with programming and data management; Gregg Peterson, Colette Keyser, and the Blaise group at Statistics Netherlands for their high-quality development work; and Andrew Hupp for his careful management of the data collection. The authors gratefully acknowledge use of the services and facilities of the Population Studies Center at the University of Michigan, funded by NICHD Center Grant P2CHD041028.

Funding

Financial support for this research was provided by NIH Grant R01HD095920.

Abstract

Event history calendars (EHCs) are frequently used in social measurement to capture important information about the time ordering of events in people’s lives, and enable inference about the relationships of the events with other outcomes of interest. To date, EHCs have primarily been designed for face-to-face or telephone survey interviewing, and few calendar tools have been developed for more private, self-administered modes of data collection. Web surveys offer benefits in terms of both self-administration, which can reduce social desirability bias, and timeliness. We developed and tested a web application enabling the calendar-based measurement of contraceptive method use histories. These measures provide valuable information for researchers studying family planning and fertility behaviors. This study describes the development of the web application, and presents a comparison of data collected from online panels using the application with data from a benchmark face-to-face survey collecting similar measures (the National Survey of Family Growth).

Introduction

Event history calendars (EHCs) or life history calendars (LHCs) have a long history of use in social research, beginning with the pioneering work of Freedman and colleagues (Freedman et al. 1988). Belli, Stafford and Alwin (2009) and Glasner, van der Vaart and Dijkstra (2015) provide reviews. Evidence of their efficacy relative to standard survey questions for improving recall of autobiographic events is well-established (see Belli, Shay, and Stafford 2001). EHCs are used in a number of large-scale surveys (e.g., the Panel Study of Income Dynamics, the National Survey of Family Growth) covering a variety of substantive domains. EHCs are mostly used in interviewer-administered surveys, and particularly in face-to-face surveys where the EHC can serve as a visual cue for respondents. EHCs have also been successfully adapted for telephone administration (e.g., Belli et al. 2007) and for paper-and-pencil self-administration (e.g., Kendig et al. 2014; Morselli, Le Goff, and Gauthier 2019).

The calendar approach is particularly powerful when the questions investigated require empirical evidence of the time-order of events. Calendar-based tools actively engage respondents in both recall and the time ordering of the events they are attempting to recall (Freedman et al. 1988). This approach is powerful across a wide range of substantive domains, including the associations between training and employment, education and marriage, income change and migration, or exposure to trauma and mental disorder.

For some substantive topics, the potential sensitivity of the subject matter motivates innovation in the use of more private modes of implementing the EHC approach. There is strong evidence that modes affording more privacy, such as audio computer-assisted self-interviewing (ACASI), web, or text messaging, produce higher reporting of potentially sensitive topics; examples include topics related to sex or sexuality, substance use, or exposure to personal trauma and mental disorder (West, Ghimire, and Axinn 2015). These topics also demand measurement of the time-order of events. For example, in the study of trauma and mental disorder, it is crucial to know if disorder symptoms began before the exposure to a trauma or if the traumatic exposure occurred before the onset of symptoms.

There are few EHC/LHC tools designed for more private, self-administered modes of data collection like ACASI or web surveys. We aimed to address this gap by designing and testing a web-based EHC approach for the measurement of contraceptive use behavior. Measurement of contraceptive use behavior requires the measurement of sexual activity as well as specific contraceptive method choices. The time ordering of these events is critical to understanding processes creating both transmission of sexually transmitted infections (STIs) and unintended pregnancies. Our approach is modeled on the U.S. National Survey of Family Growth (NSFG) – an important gold standard for the measurement of contraceptive use and non-use, contraceptive method choice, and contraceptive method efficacy. By modeling our approach on the NSFG, we are able to compare the performance of this new web-based EHC approach to the NSFG approach.

Background

A key feature of EHCs is a matrix of visual cues to help respondents recall the timing of key events. These typically include both a standard set of cues, such as column headings marked with time periods (e.g., years), and a variable set of cues, usually composed of respondents’ reports of other life events (Axinn, Pearce, and Ghimire 1999). Together, these visual cues help respondents recall the timing of events and the sequencing of related events. The time frames covered by EHCs range from the lifetime to years or even days. The EHC in the Survey of Ageing Health and Retirement in Europe (SHARELIFE; see https://tinyurl.com/y99m8pnx) covers the lifetime, while the NSFG EHC covers up to four years of sexual activity, contraceptive use, and related variables in monthly intervals (see https://tinyurl.com/y8crcxw5). By way of contrast, the relationship history calendar developed by Luke, Clark, and Zulu (2011) covered a 10-year period of sexual and life-event histories in monthly increments (see also Black et al. 2018).

Although EHCs have been computerized for interviewers using computer-assisted interviewing (CAI) methods, there has been relatively little work on adapting EHCs for web-based self-administration. Calderwood (2012) reports on the development and testing of a life history calendar for the age 55 sweep of the British National Child Development Study (NCDS), a mixed-mode survey conducted using web and telephone modes in 2013. Relationship and employment history were collected in a monthly EHC going back to the last sweep in 2008 (i.e., 5 years). Details on the survey implementation can be found at https://tinyurl.com/ycz3yqnd. Details on the success of the implementation of the EHC in 2013 are not yet reported.

Glasner, van der Vaart, and Dijkstra (2015) experimented with four different versions of an LHC in the LISS online probability panel in the Netherlands. The experiment varied the use of landmark events and visual feedback (using an LHC) in a 2×2 design (overall n=1,451). The version where landmark events were first asked had higher breakoff rates (18.8% with no feedback, 25.3% with visual feedback) than the versions without landmark events (7% on average). The version with visual feedback (i.e., the LHC) showed evidence of enhanced data quality (i.e., more events) relative to a conventional online questionnaire, but at a cost of longer surveys.

Some studies have focused on sexual behaviors. Morselli and colleagues (2016) used a test-retest design to compare the LHC approach to asking standard questions about sexual behaviors and substance use. A total of 138 college students in Switzerland participated in the first wave, and 58 participated in the second wave. Given the small sample sizes, few significant differences were detected. Bay-Cheng (2017) described a pilot study of a digital Sexual Life History Calendar (d/SLHC), reporting no differences in sexual behavior and outcomes compared to online survey responses, although those completing the d/SLHC reported higher levels of self-esteem. Finally, a recent paper by Wieczorek et al. (2020) describes a tool to develop online EHCs, but provides no data on the effectiveness of the method. There is thus limited empirical evidence to date on how well web-based event history calendars work.

The Objectives of Measuring Contraceptive Use Behavior

Measurement of the dynamics of contraceptive method use across time has multiple objectives. One is to detect periods of time in which individuals are sexually active but not using a contraceptive method. These events greatly increase the risks of contracting STIs or experiencing unintended pregnancies. Although male condoms are the most effective method of avoiding STIs, sterilization and long-acting reversible contraceptives (LARC), such as implants or intrauterine devices (IUDs), are the most effective methods of avoiding unintended pregnancies (Kowal et al. 2018). As a result these topics require measurement of the type of contraception used.

A second objective is the study of contraceptive method choice. Many different types of contraceptive methods are currently available, but each has different strengths and weaknesses. Individuals who use contraceptives often change the method they use and sometimes use multiple methods at the same time. These behaviors have important consequences: periods of switching methods are known to have higher risk of pregnancy, and simultaneous use of multiple methods produces lower risk of pregnancy (Bajos et al. 2006; Pazol, Kramer, and Hogue 2010). Because some methods are coitally-specific, these changes can take place rapidly, as often as each time an individual has sex.

A third objective is the evaluation of contraceptive method efficacy. Though all methods are designed to prevent pregnancy, efficacy varies across methods (Sundaram et al. 2017; Simmons et al. 2018). Different than the manufacturer’s theoretical efficacy for a specific method, *use efficacy* measures the actual rate at which contraceptive methods fail during use. Measurements of use efficacy require matching in-time measures of sexual behavior, contraceptive use, and the type of contraceptive used.

To provide the measures of contraceptive behavior needed to support these three objectives, an ideal tool would measure contraceptive use continuously, monitoring change in use as specific in time as each sexual event, for enough duration per person to assess variability in patterns of use, including non-use, method choice, and consistency of use of specific methods. The Relationship Dynamics and Social Life (RDSL) study used a weekly electronic diary to monitor sex, contraceptive use and contraceptive method choice (Barber, Kusunoki, and Gatny 2011).

Although the RDSL design is quite powerful, it is difficult to scale it up to represent large populations. The RDSL measurements provide the means to identify key design constraints that can be relaxed. Particularly important, RDSL interviews indicated that most key episodes of contraceptive non-use and method choice change can be assessed with measures less precise than weekly (Barber et al. 2016). Also important, the RDSL results indicate that respondents are able to report these important events accurately across many months in a single interview (Axinn et al. 2015). Together, these insights from the intensive RDSL study support the design of a new tool for larger-scale and broader-scope measurement of contraceptive behavior.

Building on these important lessons, we constructed a new online EHC tool for measurement of contraceptive behavior that can be scaled to larger samples, broader age ranges, and studies with greater accompanying content. The tool builds on the important EHC property of visual enhancement of autobiographical recall to measure contraceptive behavior across a 24-month recall period. Importantly, the “events” that subjects are initially asked to recall are not major life events, but rather sexual activity in specific months. Sexual activity can be a memorable event, but it's also a strong timing cue and a parallel memory cue that is an excellent match to our measurement objective (contraceptive behavior), which can help with recall of contraceptive behaviors across the entire two-year period. Adding major life events like a marriage or birth to the calendar could facilitate recall, but only for people who experienced them during the two-year period. Months where sexual activity was reported are retained to visually assist respondents with recall of specific contraceptive use behaviors in those months.

The constant evolution of software for web surveys allows us to integrate a more visually-enhanced calendar of sexual activity, contraceptive use, and contraceptive method choice into the self-administered web survey mode, providing respondents with maximum confidentiality for reporting on these private topics. By mimicking NSFG measures of sex, contraception and contraceptive method choice, we can directly compare the measures obtained using this cost-efficient, self-administered EHC tool to measures obtained from the NSFG’s face-to-face EHC approach.

Methods

Development of the Contraceptive Use History Instrument

We worked with the Blaise group at Statistics Netherlands (CBS) to develop a web instrument using the Blaise 5 software (version 5.6.5.2055; https://www.blaise.com). CBS built a small prototype for the EHC calendar that we specified to measure sexual activity and contraceptive use in the past 24 months. The prototype was then used by programmers at the University of Michigan (U-M) to develop the full web application as a self-completion survey instrument. The web application was written following responsive design principles, such that it could be easily adapted for larger-screen tablets and PCs, in addition to smaller mobile devices (smartphones). U-M staff tested the usability of the application through two design iterations, and programmed the application so that the code could easily be incorporated into larger survey instruments. CBS provided ongoing email support to U-M programmers during development and testing. The Blaise code and ancillary files implementing the application described here are available at <https://github.com/bradytwest/WHS>, and the code can be modified for other studies by readers who have purchased an annual Blaise license.

The web application initially asks participants for their date of birth, their gender, their Hispanic ethnicity, and their race. Respondents are then asked if they had ever had sex at any time in their lives. Individuals indicating that they had ever had sex are then provided with a list of 21 contraceptive methods (with definitions for each method) and asked to select all methods that they had ever used in their lifetime.

At this point, the EHC functionality of the application provides participants with a visual matrix showing the past 24 months before the month of the survey, and participants are asked to click (or tap) on months in which they were sexually active. Doing so highlights the months that were selected in green. For each of the methods that participants indicated ever using in their lifetime, the EHC application then presents the same matrix of 24 prior months, with months of sexual activity highlighted in green, and asks participants to click / tap the months in which they were actively using that particular method [see Figures 1 (PC) and 2 (smartphone)]. This was repeated for each of the methods indicated by the participant. Participants were then provided with a summary list of months of sexual activity and contraceptive methods used, and allowed to either confirm the information or go back and make changes if desired. Participants could indicate months where they were using a particular contraceptive but were not sexually active (e.g., Figure 1).

<<INSERT FIGURE 1 HERE>>

<< INSERT FIGURE 2 HERE >>

The application concluded with two simple questions about participant burden. The first question asks participants how strongly they agree with the statement “This survey was easy to complete.” Response options include Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. An open-ended question then asks if there was anything that would make the survey easier to complete; few respondents answered this question, so we do not consider it further. After extensive internal testing of the functionality of this application, we proceeded with our pilot data collection. Interested readers can view the web application at <https://www.mivideo.it.umich.edu/media/t/1_xfqh3edr>.

The Women’s Health Study

For our pilot data collection, we worked with Cloud Research ([www.cloudresearch.com](http://www.cloudresearch.com)) to recruit a target sample of 1,500 females who had ever had sexual intercourse with a man, aiming to achieve balanced sample sizes across six groups defined by age (18-30, 31-49) and race/ethnicity (non-Hispanic white, non-Hispanic black, and Hispanic). Our goal was not to make inference about any type of target population, but rather to test the feasibility of using the web application to collect reasonable information on contraceptive use from women in each of these subgroups. We fully acknowledge that the online panelists recruited by Cloud Research are a non-probability sample of volunteers.

Cloud Research recruited participants for this survey (referred to as the “Women’s Health Study”, or WHS) by sending an invitation to online panelists who were women in one of the six subgroups defined above (see the supplemental materials for the invitation text). They were then provided with a web link leading to the survey, and compensated for their participation according to the panel that they were recruited from (Cloud Research leverages several online panels). Non-eligible respondents were simply thanked for their time and participation if they indicated being male, being younger than 18 or older than 49, or never having had sex.

The WHS data collection occurred between November 8, 2019 and February 11, 2020. Invitations to complete the survey were sent to a total of 4,860 individuals, and of these, 1,611 started the survey (a recruitment rate of 33.1%). Of the 1,611 individuals starting the survey, 90 (5.6%) were deemed ineligible. In total, 1,521 eligible females between the ages of 18 and 49 who had ever had sex completed the web survey during this time period. No eligible females who started dropped out; devices used included a smartphone (80.5%), PC (19%), or tablet (only 8 respondents).

NSFG Overview

Briefly, the NSFG collects family and fertility data from a national probability sample of persons between the ages of 15 and 49 living in the United States. More information about the NSFG can be found at its website (<https://www.cdc.gov/nchs/nsfg/>). In the NSFG, contraceptive method use histories are collected dating back to the month of January for the third year prior to the year of the interview (i.e., up to 48 months) via face-to-face interviewing. Respondents are provided with a paper calendar (see the supplemental materials) on which they can record any activities for each month before the interviewer enters this into the computer. We determined measures of contraceptive use behaviors that could be computed in the same way using both the WHS and NSFG data, focusing on the past 24 months only.

While the purpose of the NSFG is to enable national inference about parameters describing family planning and fertility behaviors (e.g., what proportion of sexually active teenagers is using condoms), our focus is not on generation of national parameter estimates. We instead draw simple random samples of NSFG respondents with socio-demographic features and recent sexual activity histories similar to those of the WHS respondents, for purposes of comparing the responses provided on these common measures. We analyzed data from the 2015-2017 public-use NSFG data, which is currently the most recent publicly-available NSFG data.

Measures of Interest

In addition to race/ethnicity and age, we computed the following measures of interest using both the WHS and NSFG data:

* Had sex in the past 24 months
* Number of months sexually active in the past 24 months
* Count of unique methods used (out of 21; see list below) in the past 24 months
* Classes of methods used (out of 4) in the past 24 months:
	1. IUD/coil/loop, hormonal implant, injectable, or male/female sterilization;
	2. Birth control pills, contraceptive patch, contraceptive ring, or emergency contraception;
	3. Male/female condoms; and
	4. Withdrawal, diaphragm, cervical cap, sponge, spermicides (including suppository/insert, foam, or jelly/cream), fertility awareness-based methods (including calendar rhythm or safe period), or other methods.

Methods were included in the more effective pregnancy-prevention class when multiple methods were reported (e.g., months with condom and birth control pills were grouped with the second class of methods used).

* Indicators of using unique methods at any time in the past 12 months
* No contraceptive use in a given month

These measures were computed in both the WHS and NSFG based on the EHC data.

Data Analysis

We first determined the number of WHS respondents in the 18 subgroups defined by age (18-30, 31-49), race/ethnicity (non-Hispanic white, non-Hispanic black, and Hispanic), any sexual activity in the past 24 months (yes/no), and for those sexually active, whether the count of months of sexual activity in the past 24 months was either higher or lower than/equal to the median based on the NSFG data (23; 49.9% of sexually active NSFG respondents indicated 24 months of sexual activity). Importantly, age and race/ethnicity were the only two socio-demographic measures collected in the WHS prior to the EHC measurement for respondents who indicated lifetime sexual activity. We then selected simple random samples of female NSFG respondents in each of the 18 subgroups. If possible, the sample sizes in each NSFG subgroup were equal to the number of respondents from each subgroup in the WHS. In two of the 18 subgroups, the number of NSFG respondents was less than the number of WHS respondents (by 12 and 31, respectively). In these cases, all NSFG respondents from each subgroup were included, and additional cases were sampled from a similar NSFG subgroup to ensure that the overall sample size matched the overall WHS sample size. The purpose of this approach was to compare response distributions on our measures of contraceptive behavior between subgroups with very similar features based on socio-demographics and recent sexual activity. Importantly, this was not a randomized experiment, so the comparisons that we report here may have been affected by other confounding factors that we were unable to match on, possibly related to the sample composition or the survey mode.

For the matched samples, we first computed mean reported counts of methods used (out of 21) and classes of methods used (out of 4). Next, for 18-49 year-old respondents who were sexually active in at least one of the past 24 months, we computed the percentages of respondents who used 1) particular types of contraceptives, 2) no contraceptives, and 3) multiple contraceptives. Next, for 18-30 year-olds who were sexually active in at least 12 of the past 24 months, we looked at the range of percentages not using contraception in a *given* month, the mean proportion of the past 24 months with no methods used (computed for each respondent), and the percentages reporting 1) use of multiple methods in the past 24 months, 2) use of multiple *classes* of methods in the past 24 months, and 3) any months of sexual activity with no contraception. These ages produce the highest rates of contraceptive use changes, sex without contraception, and unintended pregnancies, making them particularly important for the study of monthly dynamics of contraceptive use behaviors. Finally, we examined descriptive statistics for response times depending on the device used, along with the percentage agreeing that the WHS survey was easy to complete.

To estimate the sampling variability of our estimates, we: 1) computed bootstrap standard errors for the WHS estimates based on 1,000 replicate samples of the same size selected with replacement, and 2) estimated standard errors for the NSFG estimates by drawing 1,000 independent simple random samples of the same size, and computing the standard deviation of the 1,000 estimates that resulted. Given the estimates and their standard errors for both the WHS and the NSFG, we then tested the null hypothesis that the two independent studies produced similar response distributions for a given item by computing a test statistic as the difference in the estimates divided by the square root of the sum of the variances of the estimates. We referred this test statistic to a standard normal distribution to compute a two-tailed *p*-value for testing the null hypothesis.

Results

Sample Characteristics

The WHS received completed surveys from 1,521 females. Five respondents did not provide race/ethnicity information, and were dropped from subsequent analyses, resulting in a sample size of 1,516. The average age of the women responding was 25.8, and respondent ages ranged from 18 to 49, as expected. The race/ethnicity distribution was 31.0% Hispanic, 30.2% non-Hispanic Black, and 38.8% non-Hispanic other. The mean reported counts of methods used (out of 21) and *classes* of methods used (out of 4) per person in the past 24 months were significantly higher (*p* < 0.01) in the WHS sample (1.8/1.4) when compared to the nearly-matched NSFG sample (1.5/1.3) of size 1,516. The WHS sample also had a lower mean number of months of sexual activity in the past 24 months (9.7, versus 12.9 in the NSFG). Recall that 49.9% of sexually active NSFG respondents reported 24 months of sexual activity, compared to only 26.7% of WHS respondents.

Contraceptive Use Behaviors

Table 1 focuses on past-year contraceptive use among 18-49 year-olds who reported sexual activity in at least one of the prior 24 months. In terms of the relative frequency of use of each of the methods, the ordering of the percentages is generally consistent between the two surveys. For example, condoms represent the most popular contraceptive method based on either data source, and no one in either sample reported using a cervical cap. In addition, the pill is the second most popular contraceptive used in both samples. We did find significantly higher reporting of condom use, pill use, no contraceptive use, and use of multiple methods in the WHS.

<<INSERT TABLE 1 HERE>>

Table 2 focuses on contraceptive use behaviors among the two nearly-matched samples of 354 18-30 year-olds who reported sexual activity in at least half of the prior 24 months. We see similar results based on the two samples for the percentage of respondents not using contraception in each month and the mean proportions of the past 24 months when no methods were used (rows 1 and 2). There was significantly higher reporting of use of multiple methods in the WHS, both in terms of individual methods and the four general classes of methods (rows 3 and 4). Finally, we found similar percentages of persons reporting any months of sexual activity with no contraception in the WHS data (row 5).

<<INSERT TABLE 2 HERE>>

Overall, our comparisons of the contraceptive use measures between the WHS and the NSFG suggest that the collection of largely the same information recorded in the NSFG for these socio-demographic subgroups is feasible using the web application described here.

Respondent Burden in the WHS

We found that 95.5% of respondents to the final question about ease of use agreed (with 76% strongly agreeing) that the survey was easy to complete. The distribution of agreement responses did not vary by race/ethnicity or age. Table 3 presents descriptive summaries of response times for the WHS. The survey took 3.6 minutes to complete on average, with little variance depending on the device used; NSFG respondents spend 6.6 minutes on average completing the calendar during the in-person interviews. These results collectively suggest that the WHS respondents found the web application very easy to use and minimally burdensome.

<< INSERT TABLE 3 HERE >>

Discussion

This study demonstrates that the collection of contraceptive method use histories via easy-to-use online versions of EHCs is feasible using available web survey technology, and generates data on contraceptive method use history similar to that captured using a paper calendar in a gold-standard national face-to-face survey on fertility behaviors (the NSFG). We found that respondents in the self-administered EHC were significantly more likely to report use of multiple different contraceptive methods and sex without contraception than in the NSFG. Given that respondents in the interviewer-administered NSFG were significantly more likely to report sexual activity, the higher reporting of multiple contraceptive methods in the self-administered EHC is striking. This finding means that it is unlikely the self-administered EHC obtains an under-report of contraceptive method use.

The results of this study have important implications for future practice related to collecting data from survey respondents on sensitive behaviors in general, and reproductive health behaviors specifically. Although the NSFG currently collects contraceptive method use histories via an interviewer asking a respondent questions about their histories, future studies like this could provide respondents with a laptop or tablet device with the EHC web application installed, and allow them to self-administer the questions about method use histories. The results reported here suggest that it is easy for respondents to self-administer these types of questions, and the self-administration may correct some of the socially-desirable reporting that occurs in face-to-face interviewing. This is similar to the use of ACASI for sensitive reproductive health issues like abortion, already in place in the NSFG. The ability to collect these data online also has important implications for the timeliness of the data collection, in that data processing and preparation of data files would become a much quicker enterprise.

This study is certainly not without limitations. While web-based EHCs offer advantages, they do not fully prevent retrospective bias or memory loss and can only be completed by participants capable of using the internet. Although the online panels are defined by volunteers and not selected using probability sampling, our goal was *not* to make population inference, but rather to assess the feasibility of measuring contraceptive behaviors online. It may well be that the opt-in online respondents are not truly representative of the NSFG population in terms of other factors that were not measured here, such as education, relationship status, and socio-economic status (Callegaro et al. 2014). We did not collect these measures in the WHS, and therefore could only analyze matched samples based on age, race/ethnicity, and recent sexual activity. In addition, the face-to-face interviewing used in the NSFG may have introduced interviewer effects on the calendar responses (e.g., less reporting of potentially sensitive behaviors), ultimately affecting the comparisons reported here. To disentangle these effects of sample composition and mode of administration, future research could consider an experiment with a probability sample of individuals who are randomly assigned to either the self-administered EHC, a self-administered module without a calendar, or an interviewer-administered EHC.

The timing of the NSFG and WHS data collections may have affected these comparisons as well. Patterns of contraceptive use may have changed between administrations of the NSFG (2015-2017) and the WHS (2019-2020). For example, Plan B was approved for over-the-counter use in 2013, and it possible that it gained more acceptance by the time the WHS was fielded. In addition, participants from a volunteer panel are more trained to complete online surveys, and thus may encounter fewer difficulties with a sophisticated EHC as compared to the general population. Some WHS participants may have been “professional respondents” who found the survey simple and completed it quickly.

Despite these limitations, the online EHC tested in this study shows promise and could be evaluated further in larger-scale web survey data collections and clinical studies.

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**Figure 1. Example of selecting months where birth control pills were used.**

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**Figure 2. Appearance of the application on a smartphone.**

**Table 1. Past-year contraceptive use for 18-49 year-old respondents who were sexually active in at least one of the past 24 months (estimated standard errors in parentheses).**

|  |  |  |  |
| --- | --- | --- | --- |
| **In the past year, did the respondent use (a/n):** | **WHS (n=1,125)** | **NSFG (n=1,168)** | ***p*-value** |
| condom? | 51.2% (1.5) | 40.2% (1.0) | < 0.001 |
| birth control pill? | 37.7% (1.4) | 21.6% (0.9) | < 0.001 |
| diaphragm? | 0.7% (0.3) | 0.0% (0.0) | -- |
| IUD? | 8.1% (0.8) | 13.4% (0.7) | < 0.001 |
| hormonal implant? | 3.2% (0.5) | 5.4% (0.4) | < 0.001 |
| Depo-Provera injectable? | 6.3% (0.7) | 6.5% (0.5) | 0.485 |
| cervical cap? | 0.0% (0.0) | 0.0% (0.0) | -- |
| emergency contraceptive pill? | 7.7% (0.8) | 5.7% (0.4) | 0.025 |
| contraceptive patch?  | 1.8% (0.4) | 0.9% (0.2) | 0.044 |
| contraceptive ring? | 1.9% (0.4) | 2.6% (0.3) | 0.162 |
| no contraceptives? | 16.3% (1.1) | 11.3% (0.7) | < 0.001 |
| multiple contraceptive methods? | 53.0% (1.5) | 36.8% (1.0) | < 0.001 |

**Table 2.** **Contraceptive use for 18-30 year-olds who were sexually active in at least 12 of the past 24 months (estimated standard errors in parentheses).**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Values** | **WHS (n=354)** | **NSFG (n=354)** | ***p*-value** |
| % Not using contraception in a given month  | Range Across Past 24 Months | 12.2%-20.1% | 16.1%-22.0% | -- |
| Proportion of past 24 Months with No Method Used | Mean | 0.20 (0.02) | 0.22 (0.01) | 0.371 |
| Used Multiple Methods in Past 24 Months | Yes | 81.6% (2.1) | 59.0% (1.7) | < 0.001 |
| Used Multiple Classes of Methods in Past 24 Months | Yes | 81.1% (2.2) | 56.8% (1.7) | < 0.001 |
| Any months of sexual activity with no contraception | Yes | 46.6% (2.7) | 43.8% (1.6) | 0.372 |

**Table 3.** **Descriptive statistics for WHS response times (in minutes) by device used.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Device Used** | **n** | **Mean** | **Median** | **SD** | **Range** |
| Overall (all devices)  | 1516 | 3.59 | 2.89 | 4.28 | 0.22-71.60 |
| PC | 281 | 3.30 | 2.72 | 3.57 | 0.22-36.19 |
| Smartphone | 1189 | 3.67 | 2.93 | 4.49 | 0.31-71.60 |
| Tablet | 8 | 3.68 | 3.64 | 1.25 | 1.77-5.21 |
| Unknown | 38 | 3.31 | 3.19 | 1.91 | 0.46-7.54 |