An Electronic Life History Calendar in a Web Survey

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1. Abstract

In surveys that collect data of experiences over multiple years of respondents' lives, respondents are often offered cues to help with the recall process. A life history calendar is one such tool that many organizations have used over time, including the National Survey of Family Growth (NSFG). Using the existing paper Life History Calendar as a starting point, RTI developed an electronic life history calendar and integrated it with a Blaise 5 instrument so that web respondents have the option to view and report significant events in a calendar format. When subsequently asked to place other events in time, respondents could refer to the calendar for context and easier recall. The electronic calendar can be displayed on demand at any time—or in specific sections, if so configured—either in full-screen mode or along with the Blaise question. Its responsive design allows for a display on any screen infAppendix

 portrait or landscape orientation.

In iterative collaboration with our client, the National Center for Health Statistics (NCHS), we heavily customized an off-the-shelf chart and automatically populated the calendar with responses in real time. Events were put into temporal context with year, month, respondent age, and previously entered responses to help orient the user. The Blaise instrument was designed to easily collect information for effortless processing by the calendar application. In this presentation, we describe the architecture of the calendar and its implementation with the Blaise 5 Web instrument.

2. Background

Life History Calendars (LHC) improve recall for events of interest by linking to landmark events in a respondent's life (Belli et al., 2001). Historically, they have been used in in-person, interviewer-administered surveys. With the move to web and mixed-mode data collections, surveys like the NSFG that utilize LHCs needed an alternative for the web administration.

NCHS began conducting the NSFG 50 years ago. The survey collects data on reproductive and general health. Since 1995, it has used in-person CAPI data collection with instruments programmed in various versions of Blaise. In January 2022, it moved to a mixed-mode design, including a self-administered web instrument designed to work in browsers and on mobile devices.

3. Technical Description

3.1 LHC Implementation

The NSFG instrument collects detailed information on events, such as pregnancy outcomes, sexual activity, and contraceptive use, by month over the past four years. Figure 1 shows the *paper* LHC used in face-to-face interviews for 2022.

Figure 1. NSFG Paper Life History Calendar

Years and months appear across the top and question categories along the left side, forming a grid in which respondents can mark life events. The calendar covers the current year and three previous years. A column toward the left labelled "before 2019" is for recording relevant events that took place prior to the reference period of interest.

Figure 2 is an example of our *electronic* version incorporated into the NSFG Blaise 5 questionnaire.

Figure 2. NSFG Electronic Life History Calendar Embedded with Blaise Questionnaire

Everything below the central scroll bar is programmed in Blaise, while above the bar is custom. A design decision was made to have the calendar be *above* the question and scrollable, so that the calendar content is large enough to read but does not take all the screen space. The electronic calendar is not a data entry tool, but rather a graphical representation of responses that are entered into the Blaise survey instrument and that correspond to the questions presented on each screen with the calendar view. Every part of the screen is also available in Spanish—buttons, labels, month abbreviations, etc.

A tutorial, shown in Figure 3, is presented to respondents to help them understand how they can control and use the calendar. It has many elements designed to replicate the paper version, and some enhancements that are only possible with an electronic version. Of note, at the upper right is one control to hide/show the calendar and another to display it in full screen (i.e., without any Blaise content). Along the top are the "guide rows" with years and months, similar to the paper version. The respondent's age is shown and updates according to their date of birth. The "Before" column is also present as in the paper version. The years displayed adjust according to the current year.

For visibility, a design decision was made to display only a portion of the calendar by default. Scroll bars allow viewing more months and question categories.

As shown in Step 5, calendar items have hover text for further content. The calendar events stay visible for the remainder of the questionnaire, including if the respondent backs up.

Figure 3. Respondent Instructions
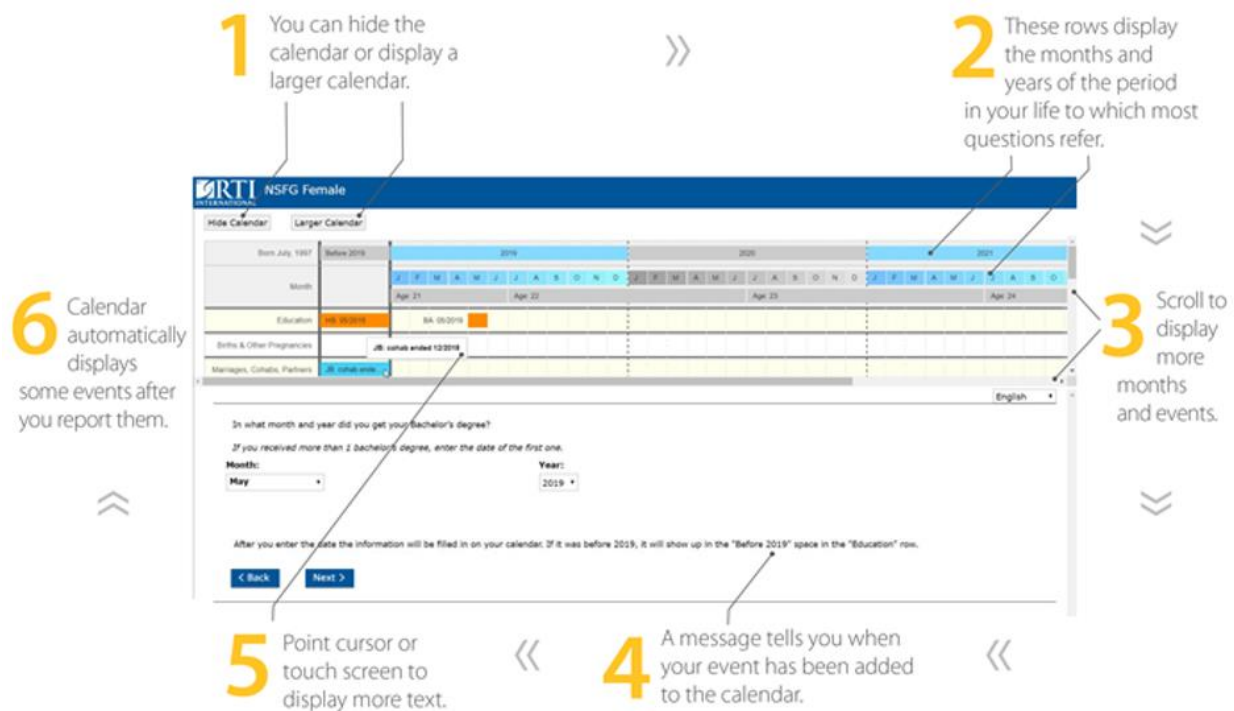
3.2   LHC Architecture

The Blaise 5 site is a Single Page Application. We added custom elements and scripts to that page to house and control the calendar. The LHC itself is hosted in a separate website on the same server, which includes the chart. This is partly because Blaise 5 and the LHC have different reload requirements. For example, changing languages requires us to reload the chart, but Blaise updates itself without reloading

the Blaise page. It also maintains a separation of concerns—of the user interface controls and monitoring versus the chart functionality.

Figure 4 represents the structure. At the top of the diagram is the questionnaire. Above the center line are changes we made to the webpage that Blaise generates. We create a placeholder (upper right) where the calendar can be inserted, along with the custom buttons. The UI script (at center left) monitors the Blaise page for changes to the item, page, case ID, language selection, and so on. It then requests updated data from the calendar application (lower left).

Below the line is the separate calendar application. It gets data from the Blaise database and transforms it, adds data for "guide" rows (such as years and months), and performs several UI customizations, including grid line weights, styles, and colors.

The Calendar Page (lower right) is primarily a container for the chart, but it also receives messages and writes logs to a paradata file when the buttons are used.

Figure 4. Application Structure
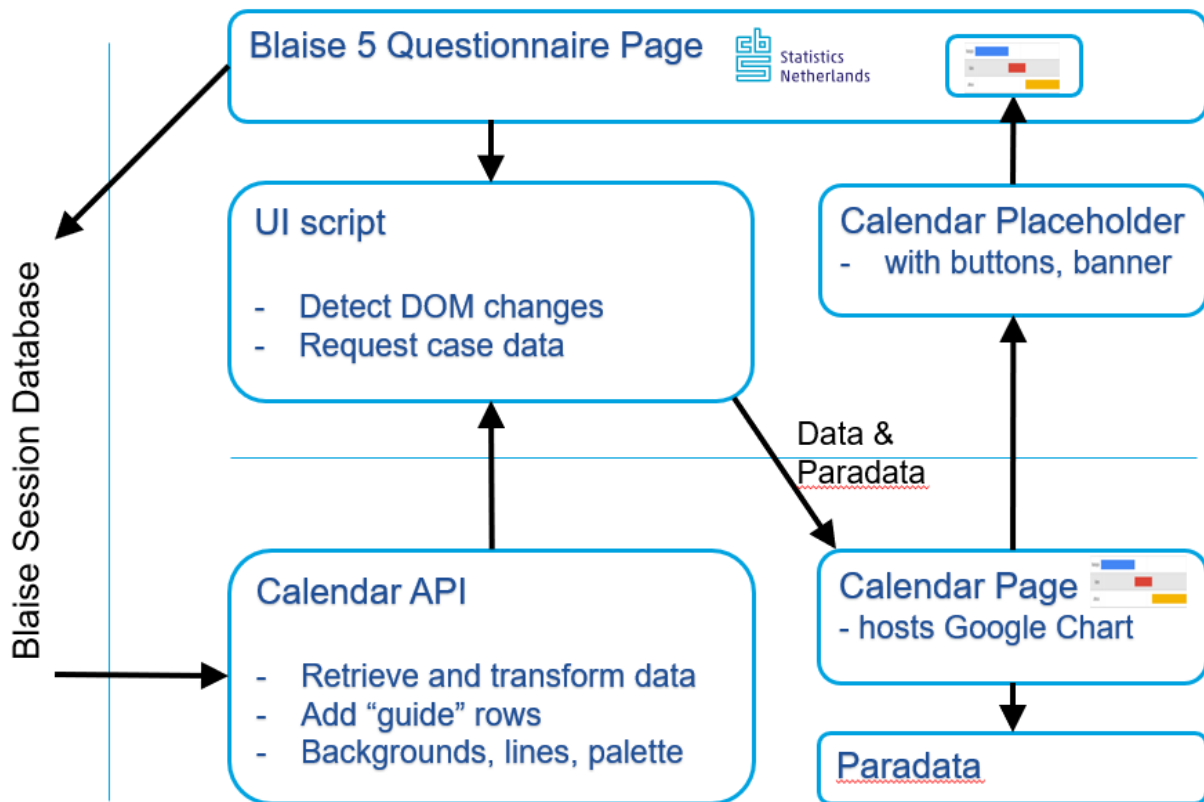
3.3   Blaise Interaction—Data & Design

A few factors are important to the interaction of the LHC with the Blaise instrument. First, it is essential to use the Blaise session database. Only the session database has the latest values as they are being entered.

Second, Blaise offers API calls to request values by item, such as with GetBlaiseItem(). For comparatively large numbers of items, such as the use of specific contraceptives by month over a period of years, we found this to be too slow. Instead, we access an entire block of items in one call to GetField() and loop through them if the structure is known. For that reason, having a reliable data structure is critical. The items displayed in the calendar are spread throughout the questionnaire, and questionnaires change over time. Since we want a stable interface between Blaise and the calendar, we created a Blaise block named "LHC" (Figure 5) that has copies of the values the calendar will need to access. Any time one of those items is answered, its value is copied to the LHC block as part of the Blaise programming. This way, they are in a reliable location in the database.

Figure 5. Blaise Block Defined for Calendar Interaction

The Blaise Resource Database was adjusted to work smoothly with the LHC. As mentioned, the script monitors the Blaise page for changes. This is done via a footer that is invisible to the respondent. A visible version is shown in Figure 6. The script reads the footer to get the case ID, page and item IDs, and so on as they change. It also contains a directive of whether to display the entire calendar container (which, for example, should not be visible on the screen before the calendar is introduced to the respondent), including the show/hide and full-screen buttons.

Figure 6. Blaise Footer (Normally Invisible)

3.4   Collecting and Displaying Many Data Points across Years

One section in the instrument collects data for up to 48 months: every month in the past three years and up to the interview month in the current year. A set of more than 20 questions is asked about contraceptive use in the respondent's life. To facilitate this task, the respondent is presented with a grid where she clicks the box for the month(s) with sexual activities, and a checkmark appears in the box. Then, for each selected contraceptive method, the respondent is asked to mark the months when it was used (Figure 7).

A Blaise special procedure was developed to define columns and rows in the grid for the question. A hard check is triggered in that procedure if any inconsistency is detected between the selected month(s) and the previously reported sexual activity. An additional check may be executed if the respondent was pregnant in the selected month(s). The LHC is updated with the collected information and the respondent can see all birth control methods in one place, each on its own row, with letters designating the methods used during the given month (e.g., "P" for pill, "C" for condom).

The Blaise procedure assigns row names for each specific year, replacing the standard row titles and column numbers that are normally assigned. The procedure is also responsible for assigning data to fields in the LHC. With supporting modifications to the Resource Database, the procedure selectively hides checkboxes depending on the current date and respondent age; that is, for future months in the row for the current year (as in the top row of the table in Figure 7), as well as for past months when the respondent has already indicated she was not using contraceptives.

Figure 7. Condensed Interface for Collecting and Displaying Many Data Items

4. Electronic Calendar Evaluation

To better understand the use of a self-administered electronic LHC, and the life history calendar in general, we embedded debriefing questions at the end of the NSFG female instrument asked of both web and in-person interviewed respondents. Because mode of data collection is confounded with calendar mode, this design did not allow for the direct comparison of estimates between web and face-to-face (electronic vs. paper), but it presents an initial feasibility test that allows us to better assess the proportion of web respondents who utilized the calendar, where it was used, and its ease of use.

To supplement the respondent debriefing questions, we examined paradata, such as screen size and actions taken by respondents (e.g., minimize or enlarge the calendar, hide or show the calendar).

4.1 Paradata on Calendar Use

During the first year of data collection, we collected paradata on the usage of the show/hide and full-screen buttons. In Figure 8, some respondent actions are outlined for visibility. We can look at the "show" and "full-screen" buttons together as ways to view the calendar. As outlined in blue, the overall number of respondents who ever used the show or full-screen buttons or ever used the hide button were about the same. About half used both options (green outline). About 25% showed the calendar and never hid it, while about 25% hid it and never showed it.

Figure 8. Calendar Use—Showing and Hiding
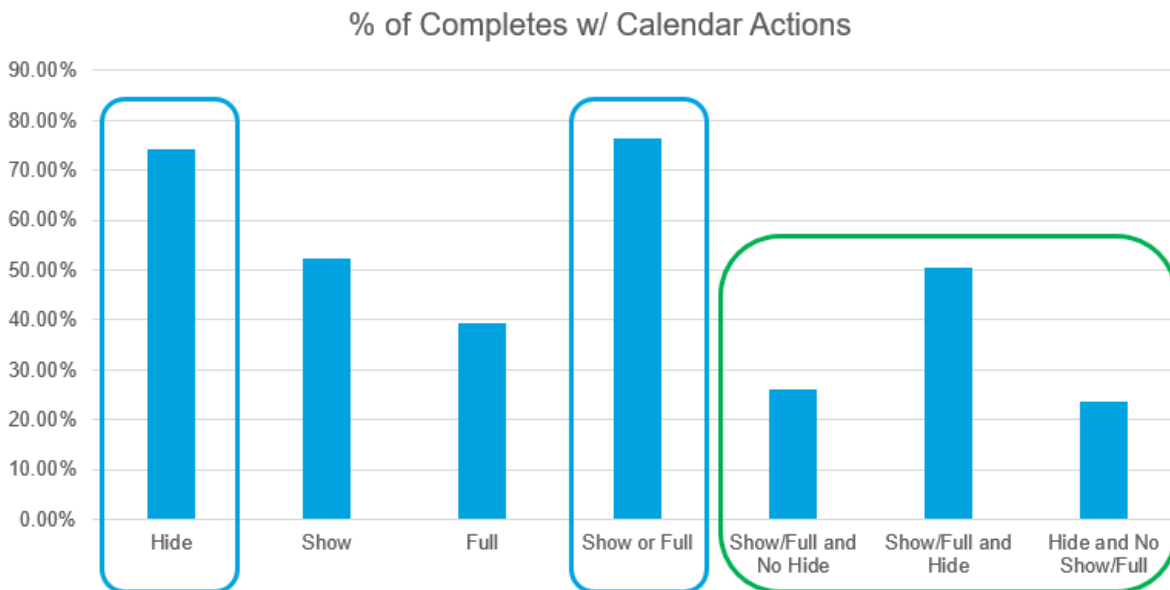
Figure 9 examines differences between screen sizes. Respondents using smaller screens were, predictably, more likely to hide the calendar and less likely to use the full-screen option. Here, small is defined as having a screen width of less than or equal to 600 pixels.

Figure 9. Calendar Use and Screen Size Comparison
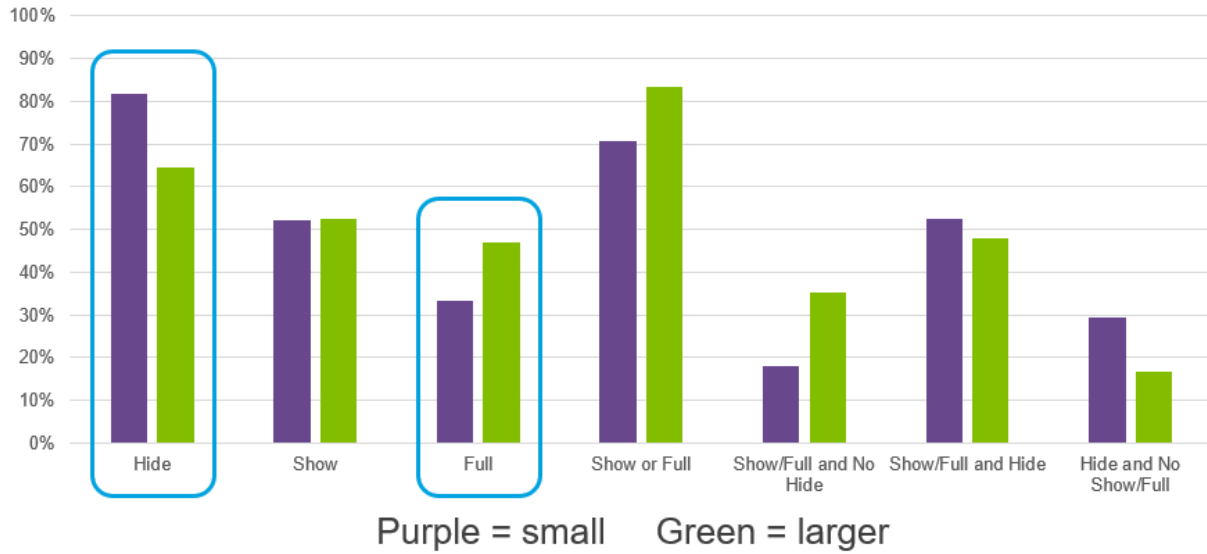
4.2   Self-Reported Frequency of LHC Use

We asked respondents about the kinds of questions in which they found the calendar useful. Some results are presented in Figure 10.

Figure 10. Calendar Use by Section
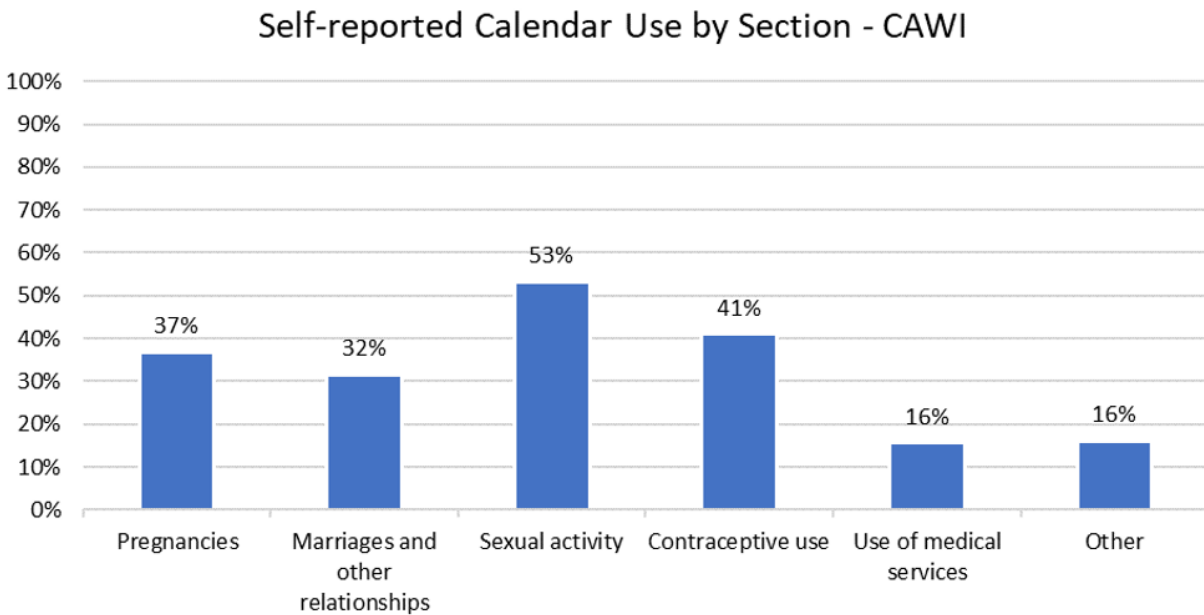
More than half reported using it in the section on sexual activity. About 40% used the LHC for questions about contraceptive use, followed by pregnancy and relationship sections in the 30% range.

We also asked about the consistency of using the calendar (Figure 11). About a third of respondents (orange slice) started using it, and then stopped. But about a quarter (blue) used it throughout the survey and about another quarter (gray) didn't use it at first, then began using it later.

Figure 11. Calendar Use

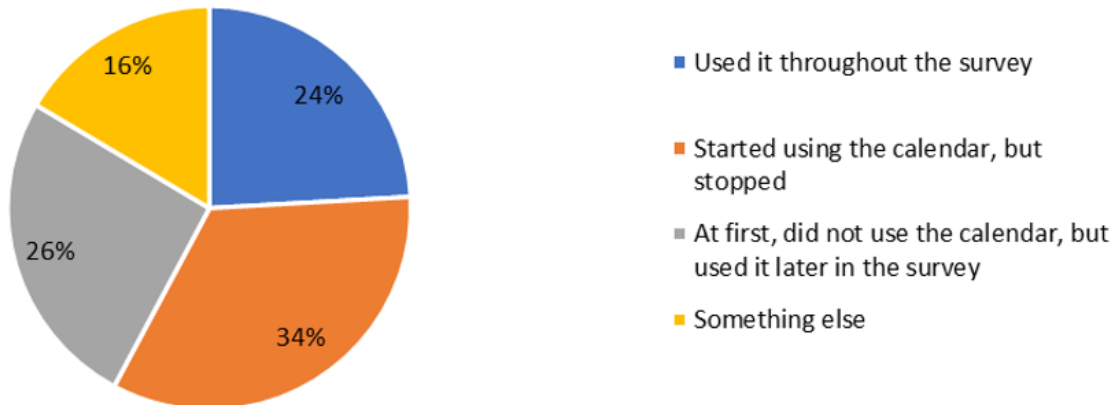## Self-estimate of How much Used/Looked at Calendar - CAWI

- Used it throughout the survey
- Started using the calendar, but stopped
- At first, did not use the calendar, but used it later in the survey
- Something else

(Pie chart values: 24%, 34%, 26%, 16%)

Finally, we asked about the ease of use. Results are shown in Figure 12. Just 3% found it extremely difficult. While 17% found it somewhat difficult, 79% said it was either easy or somewhat easy to use.

Figure 12. Ease of Calendar Use

Self-reported Ease of Calendar Use - CAWI

- Calendar was easy to use
- Calendar was somewhat easy to use
- Calendar was somewhat difficult to use
- Calendar was extremely difficult to use

(Pie chart values: 43%, 36%, 17%, 3%)
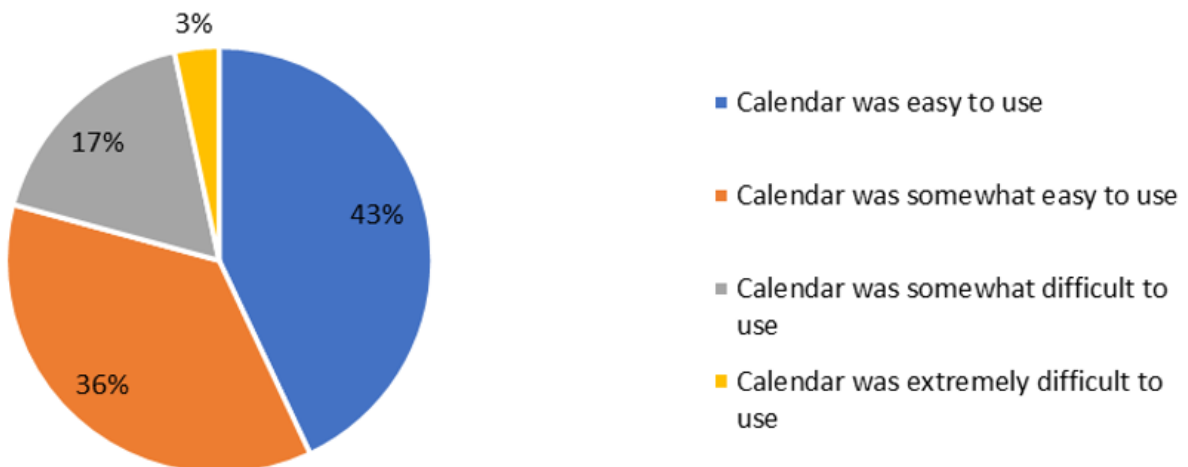
5. Conclusion

Blaise integration was successful, with customizations for usability and performance. We used the GetField() Blaise API with indexing on larger blocks of data for improved performance. Custom data structures storing copies of calendar data allowed us to align and freeze the programmatic interface between the Blaise and calendar APIs.

Customizations to the Blaise instrument and environment enabled better user interface design and improved integration with the calendar. Enhancements to the Blaise Resource Database control the visibility of columns in grid data entry. Special Blaise procedures control the display of data entry elements and assign data to specific fields.

While respondents sitting in person with an interviewer reported using the LHC significantly more than CAWI respondents (34% reported not using the calendar in year one vs. 78% on the web), the LHC allowed us to continue providing respondents with this memory aid during that period, as well as for the ongoing data collection in which nearly 75% of interviews are completed on the web.

Those who reported using the electronic calendar mostly utilized it in the sections on sexual activity and contraceptive use, followed by pregnancies and marriages/cohabitation. We detected significant differences of calendar use by age, ethnicity, and education, with the youngest respondents (15–18 years old) being the least likely to use the calendar, those with higher education being more likely to use their own calendar or app, and Hispanics being more likely to use the calendar.

The electronic LHC seemed to be used more sporadically by respondents relative to the paper calendar— more than half of the CAWI respondents (60%) reported using the calendar at some point, but not throughout the survey. In contrast, only 38% of CAPI respondents reported using the calendar at some point, and at least half used it throughout the survey.

6. References

Belli, R. F., Shay, W. L., & Stafford, F. P. (2001). Event history calendars and question list surveys: A direct comparison of interviewing methods. *Public Opinion Quarterly*, *65*(1), 45–74.