Joint Cognitive and Usability Testing of Translated Instruments: Identification of Translation Problems through eye tracking

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Introduction

- More U.S. Census Bureau internet surveys in Spanish
  - American Community Survey, 2013
  - Decennial Census, testing in preparation for 2020
- New testing opportunities
  - Joint usability and cognitive testing
  - Comparison of eye tracking across languages

Research Questions

- Is it possible to identify translation issues through comparison of respondent eye tracking data across languages?
- Do problems identified through cognitive interview probes also appear in respondents' eye movements?

Review of the Literature

- Eye tracking, basic definitions
  - Fixation counts
  - Fixation duration
  - Saccades
  - Regression
- Sources: Olmsted-Hawala, et al. 2011; Galesic et al., 2008; Bax, 2013, Rayner, 1998

Example issues studied through eye tracking

- Optimal placement of instructions
- Optimal location of answer boxes
- Timing to respond to questions for self v. proxy
- Testing in different modes, including paper
- Joint cog and usability testing
- Sources: Kunz and Fuchs, 2012; Lenzner, et al. 2014; Olmsted-Hawala, et al. 2011; Walton et al. 2014; Bergstrom, et al. 2014

Eye tracking and language research

- Cognitive processes during translation
  - Jensen, 2008; Doherty et al. 2010
- Language affects gaze and fixation time
  - Rayner, 1998
- Research out of Spain: Areas of interest in web design; gaze falling longer on incorrect text
  - Lopez-Gil, et al. 2010; Marcos and Rello, 2013
- Malaysian students taking Eng proficiency test
  - Bax, 2013

Evaluation of questionnaire translation through eye tracking

- Lack of literature on the topic
- Relevant literature: eye tracking to identify indications of difficulty (Bax, 2013)
  - Eye fixations typically 200-250ms
  - Mean saccade size 7-9 letter spaces
  - Rightward saccades, moving forward
  - Regressions
  - Return sweeps v. backtracking

Two Census Bureau studies

- 2014 Census test internet instrument
  - Testing on desktop and laptop computers
  - 11 English speakers
  - 10 Spanish speakers
- 2015 Census test internet instrument
  - Testing on respondents' smartphones/tablets
  - 30 English speakers (15 each in 2 mini-rounds)
  - 16 Spanish speakers (10 & 6 in 2 mini-rounds)
- Tobii eye tracking, X120, T120, X2-60

Plans

- Exploratory research
- Compare:
  - Usability issues seen through observation
  - Cognitive issues found through probing
  - Eye tracking fixations

Study 1 (2014)

- Eye tracking issues
  - Desktop in usability lab (English)
  - Laptops remote testing with (Spanish)
  - % accuracy eye tracking (ideal about 75%)
    - English n=9 (range: 59%-88%; average: 75.3%)
    - Spanish n=9 (range: 18%-77.5% average : 51.2%)

Study 2 (2015)

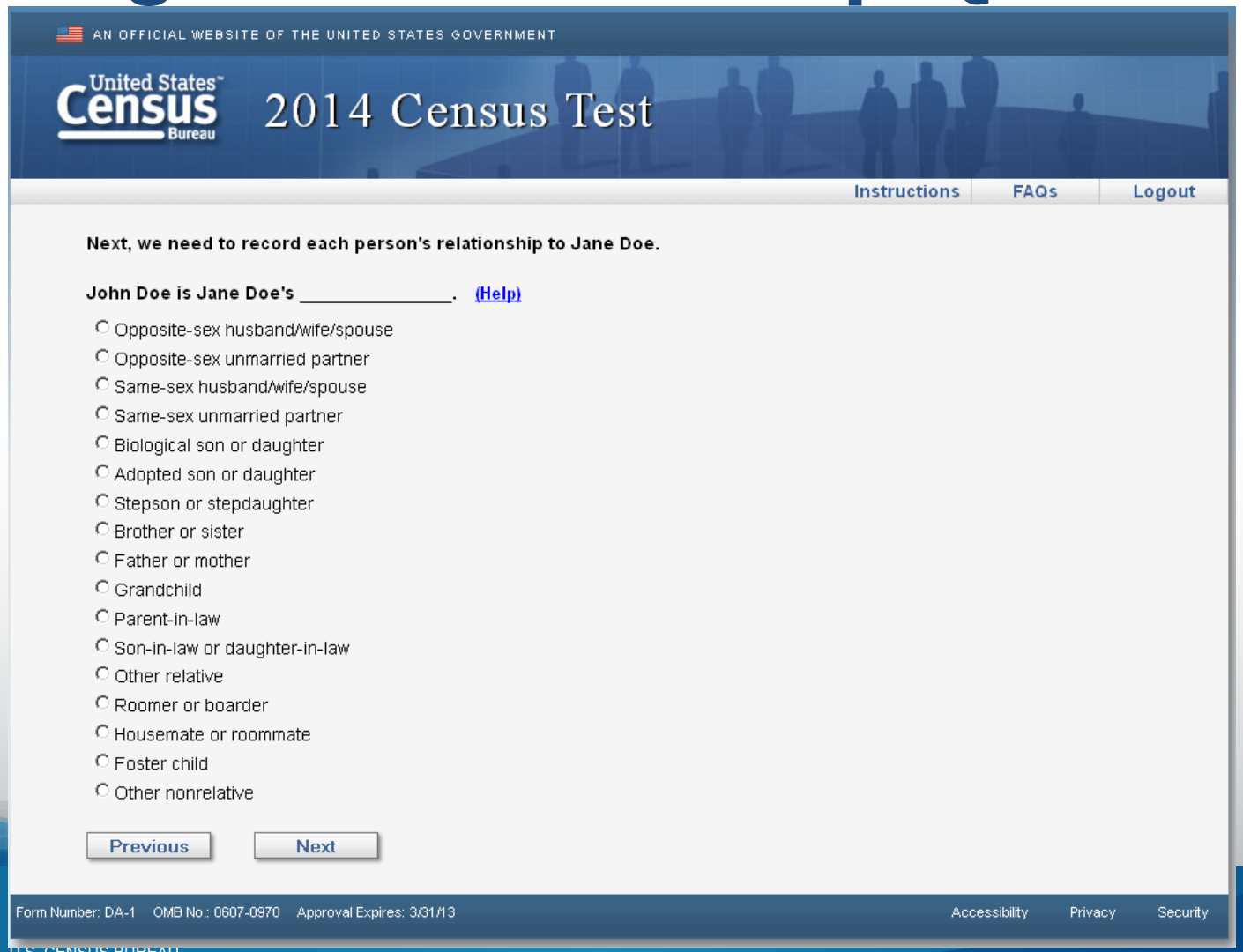
- Eye tracking issues
  - Mobile stand in usability lab and field (English)
  - Mobile stand in field (Spanish)
  - % accuracy eye tracking (ideal 75%, can be lower)
    - English n=15 (range: 0%-66%; average: 24.7%) (mini-round 2)
    - Spanish n=10 (range: 0%-35.5%; average: 10.7%) (mini round 1)

Eye tracking mobile stand

Steps taken to correct issues

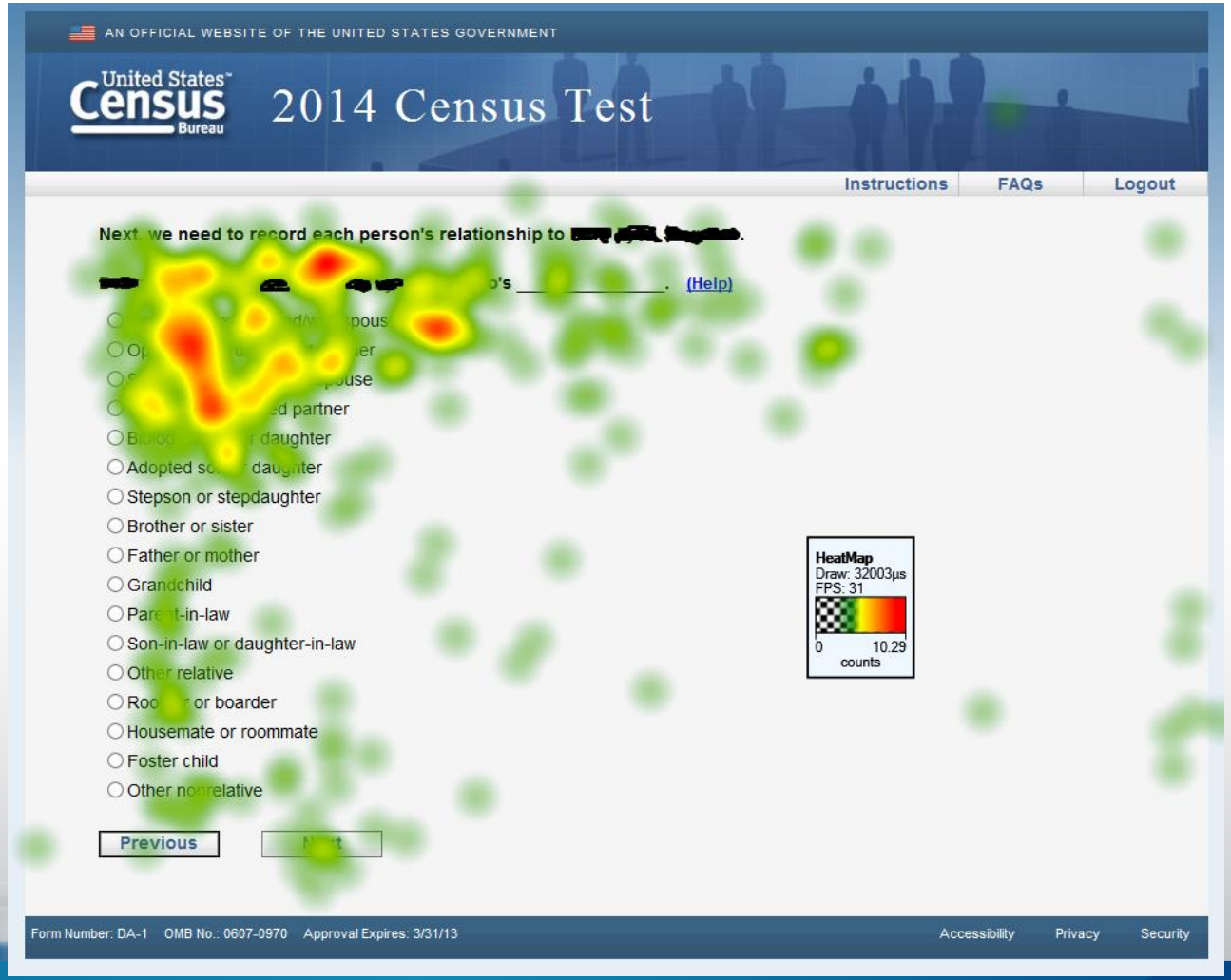
- Met with Tobii representatives
- Practiced eye tracking set up, calibration
- Eye tracking success still extremely poor
- Not enough data to compare across languages

Preliminary findings 2014: English relationship Q. v. 1



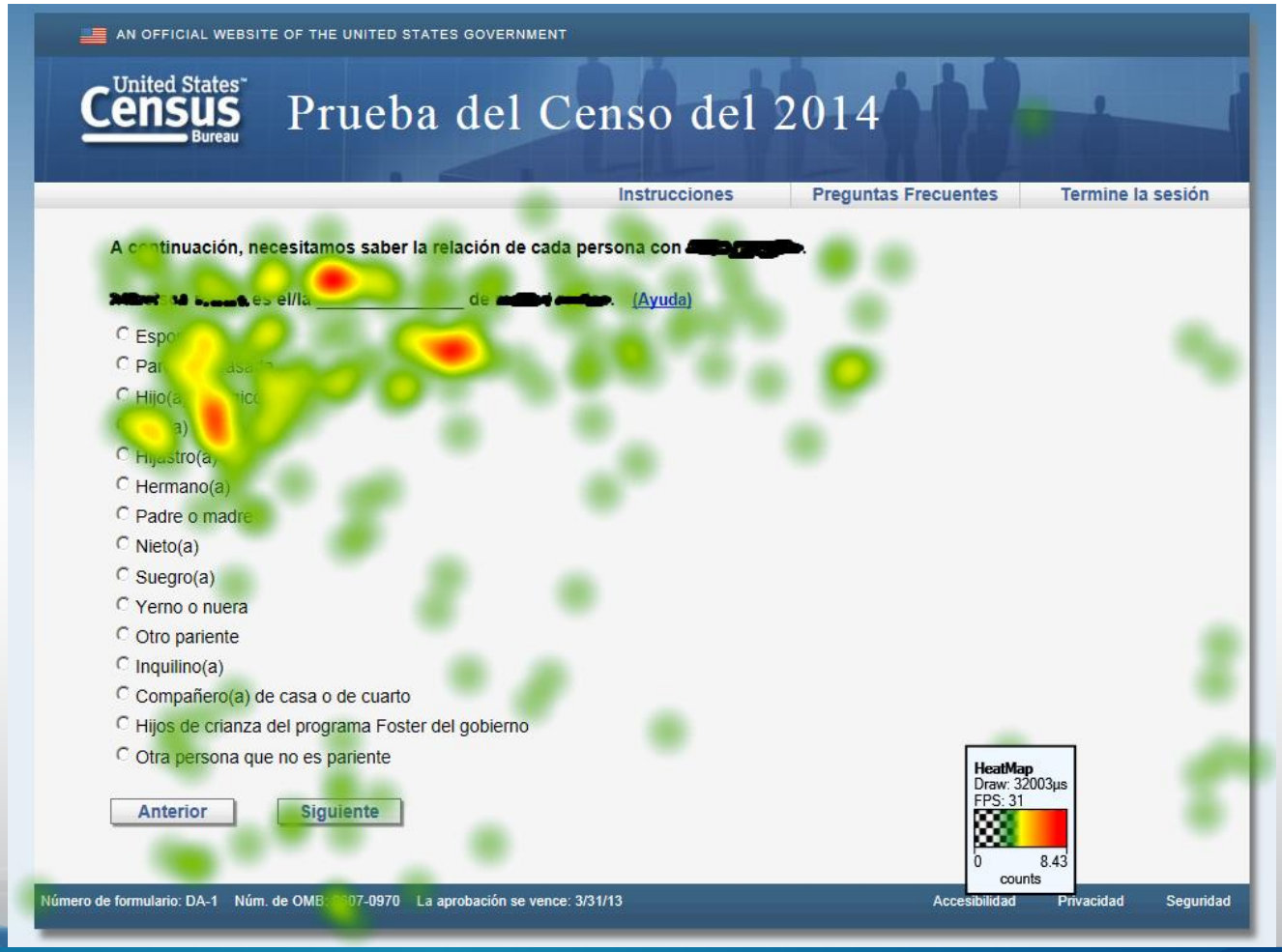
English eye tracking heat map v. 1

- Combined heat map for 6 English speakers

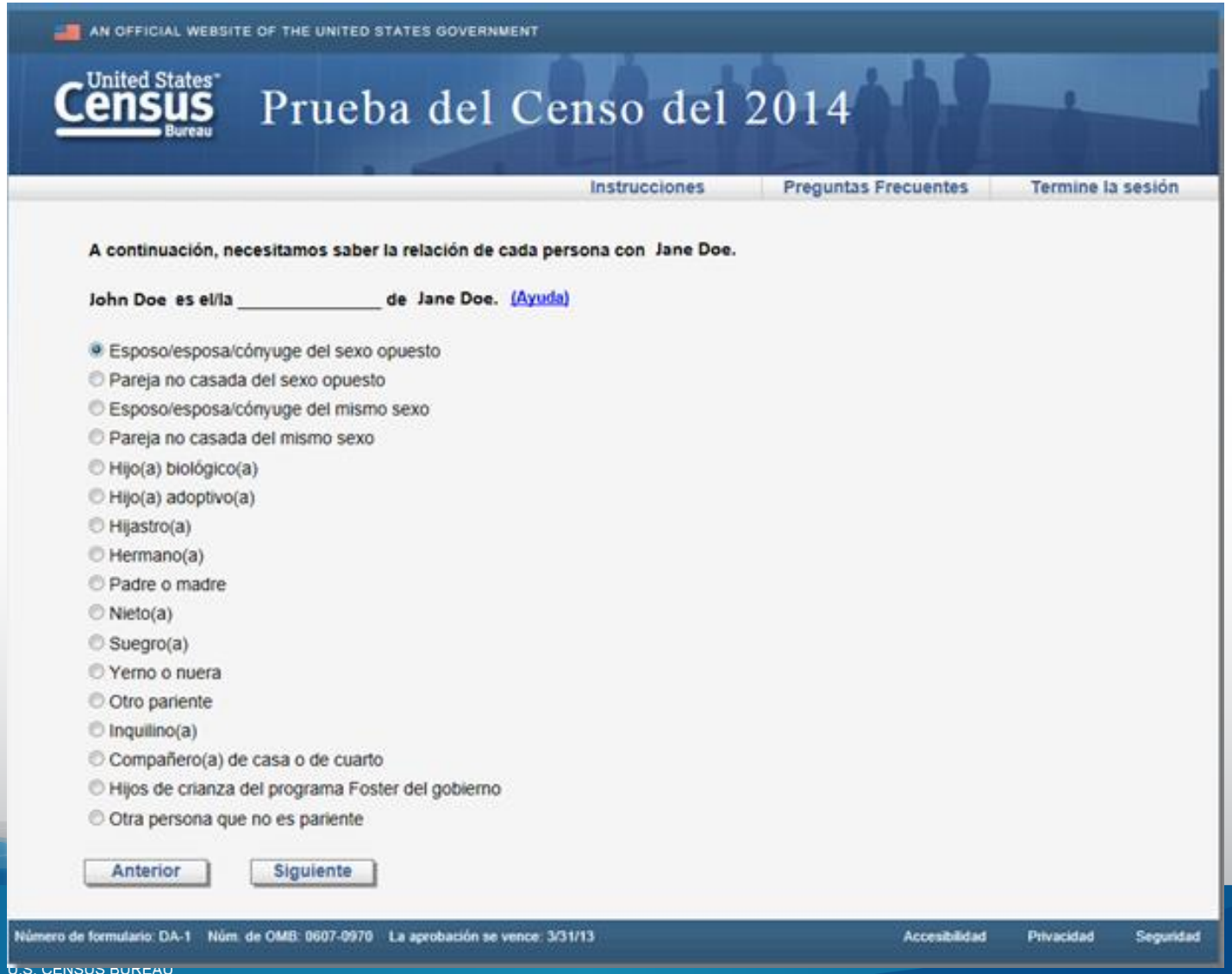


Spanish eye tracking heat map v. 1

- Combined heat map for 2 Spanish speakers

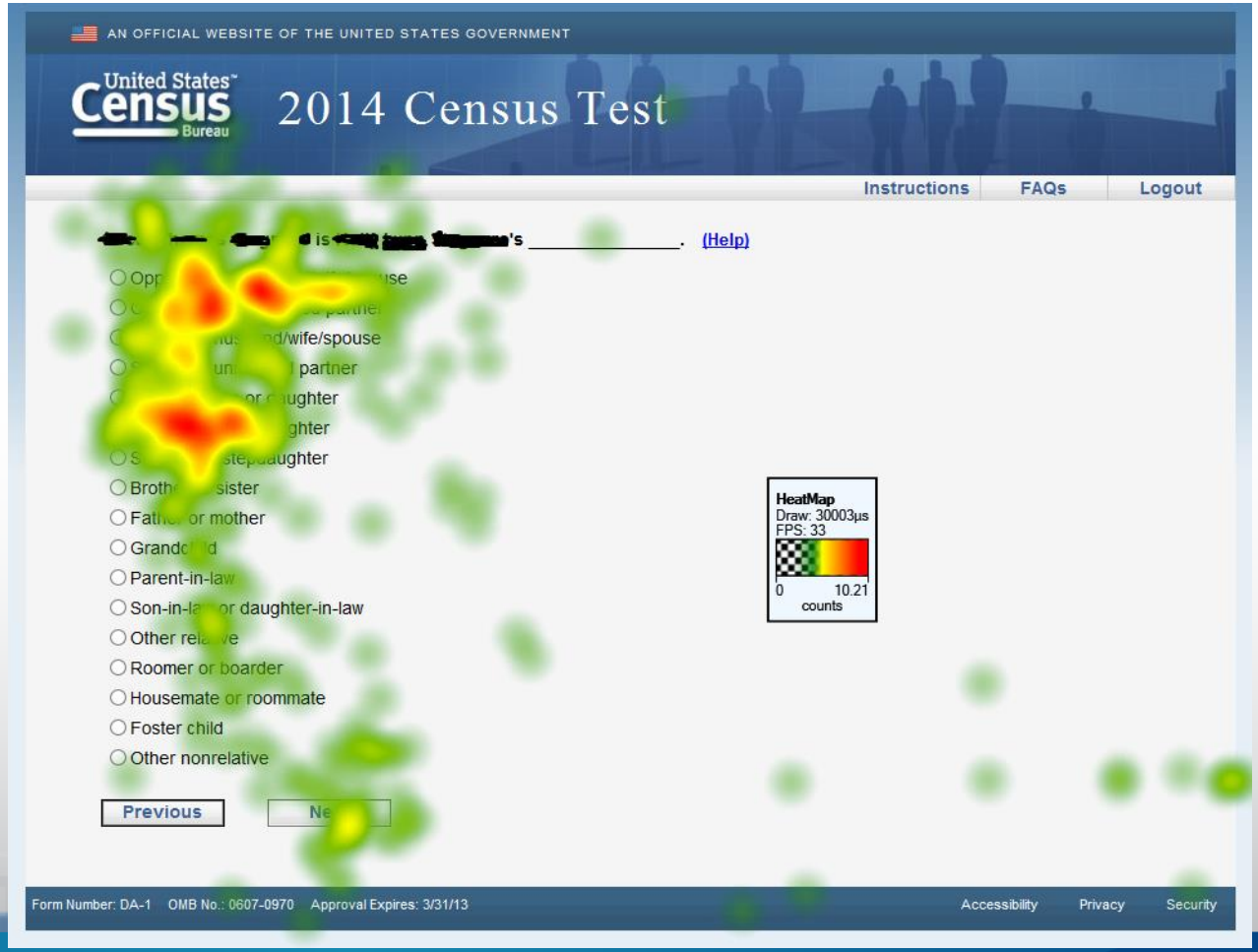


Spanish relationship Q. v. 1



English relationship Q v.2

- Combined heat map for 8 English speakers

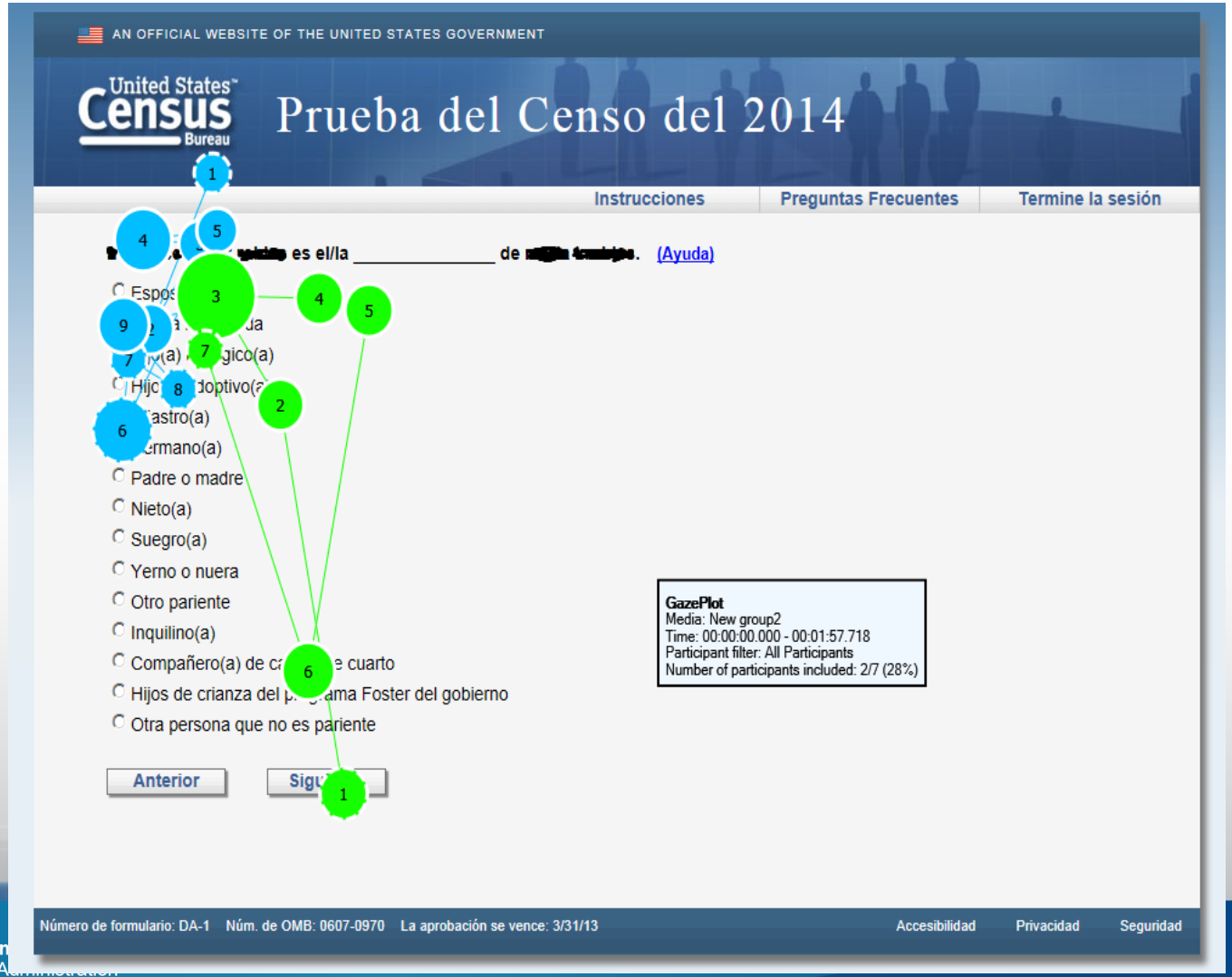


Spanish relationship Q v. 2

- Combined heat map for 2 Spanish speakers

Spanish gaze plot

- 2 Spanish speakers



Future Plans

- Investigate different types of eye tracking equipment in our lab
- Wait for future data to be gathered, possibly next project that does not involve mobile devices
- More research on best ways to measure differences across language
- Controlled experiment

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