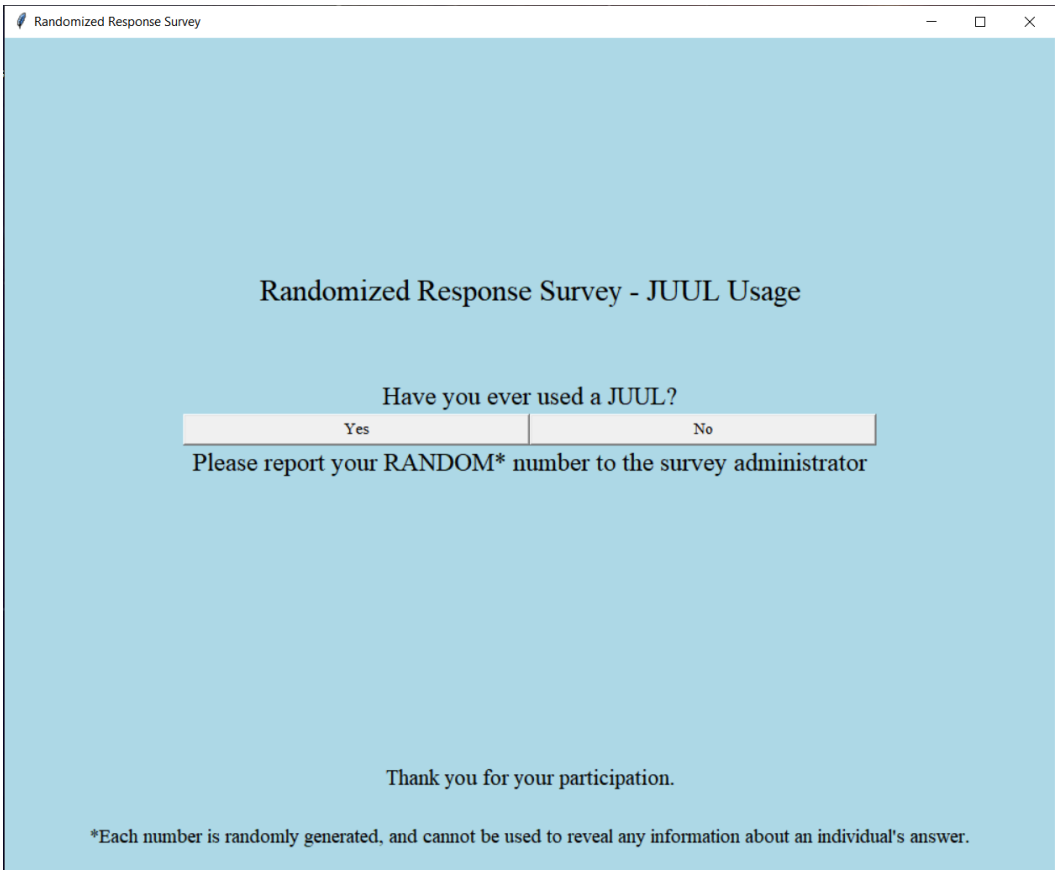
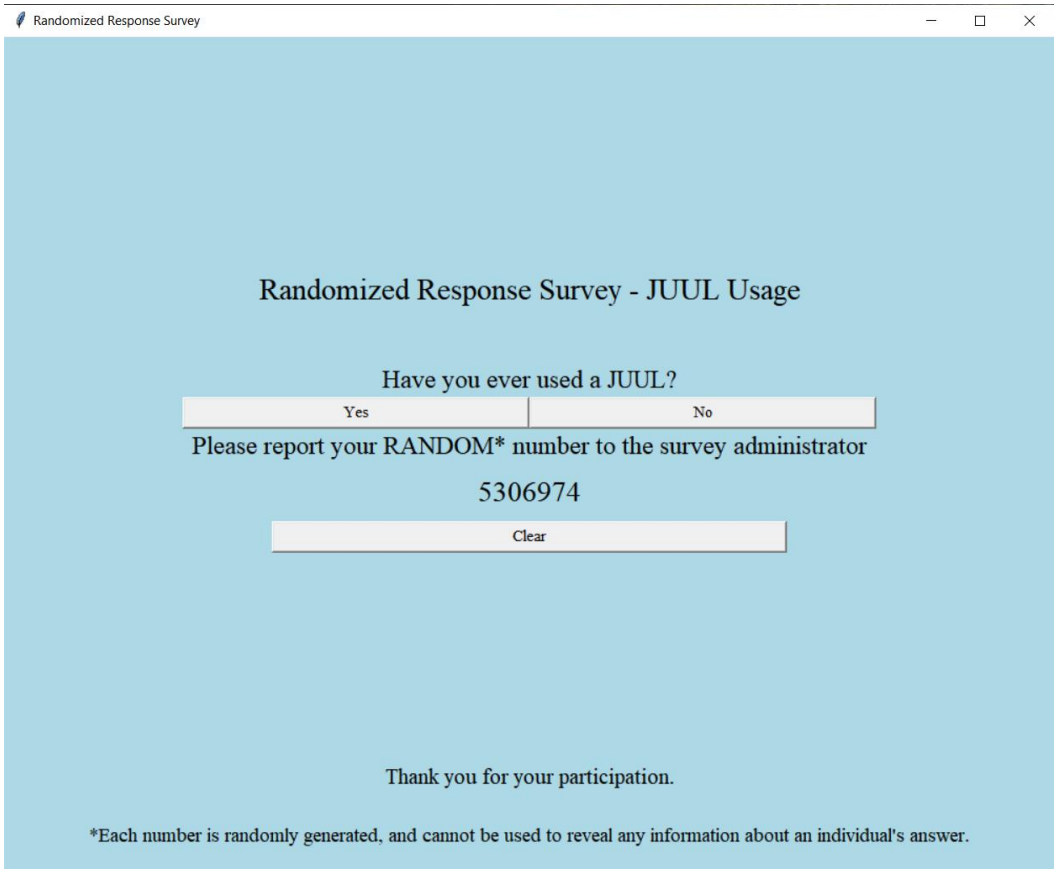
Randomized Response Survey with Python and Tkinter

A person participating in the survey will be presented with the following question:

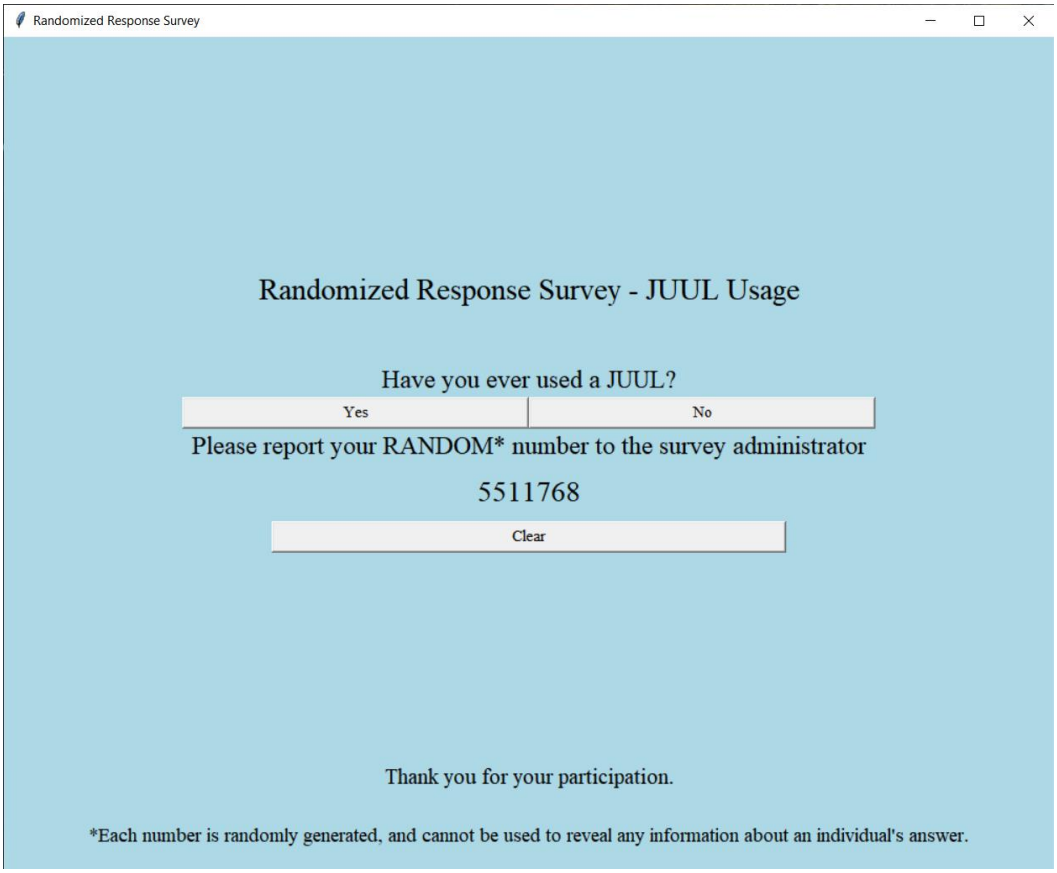


The surveyee will then click either “Yes” or “No”, depending on his status:

If “Yes”, a number will be randomly generated:



If No, a similarly valued number will be generated:



These numbers are generated as the product of a negative binomial distribution and binomial distribution, with the probability of success itself being generated as a beta distribution. Knowing the associated parameters allows utilize the sum of the responses in order to estimate the population proportion which possess the sensitive characteristic. We do this using the following theorem (proven in my thesis to be unbiased).

Theorem 4.1. An unbiased estimator of the population proportion π is given by

$$\hat{\pi}_{zak} = \frac{\frac{1}{n}\sum_{i=1}^{n} Z_i - k_2 t_2}{(k_1 t_1 - k_2 t_2)}, \quad k_1 t_1 \neq k_2 t_2 \qquad (4.2.16)$$

Since the responses are completely randomized, there is no way that an interviewer can guess what an individual's given response was, ensuring their privacy.