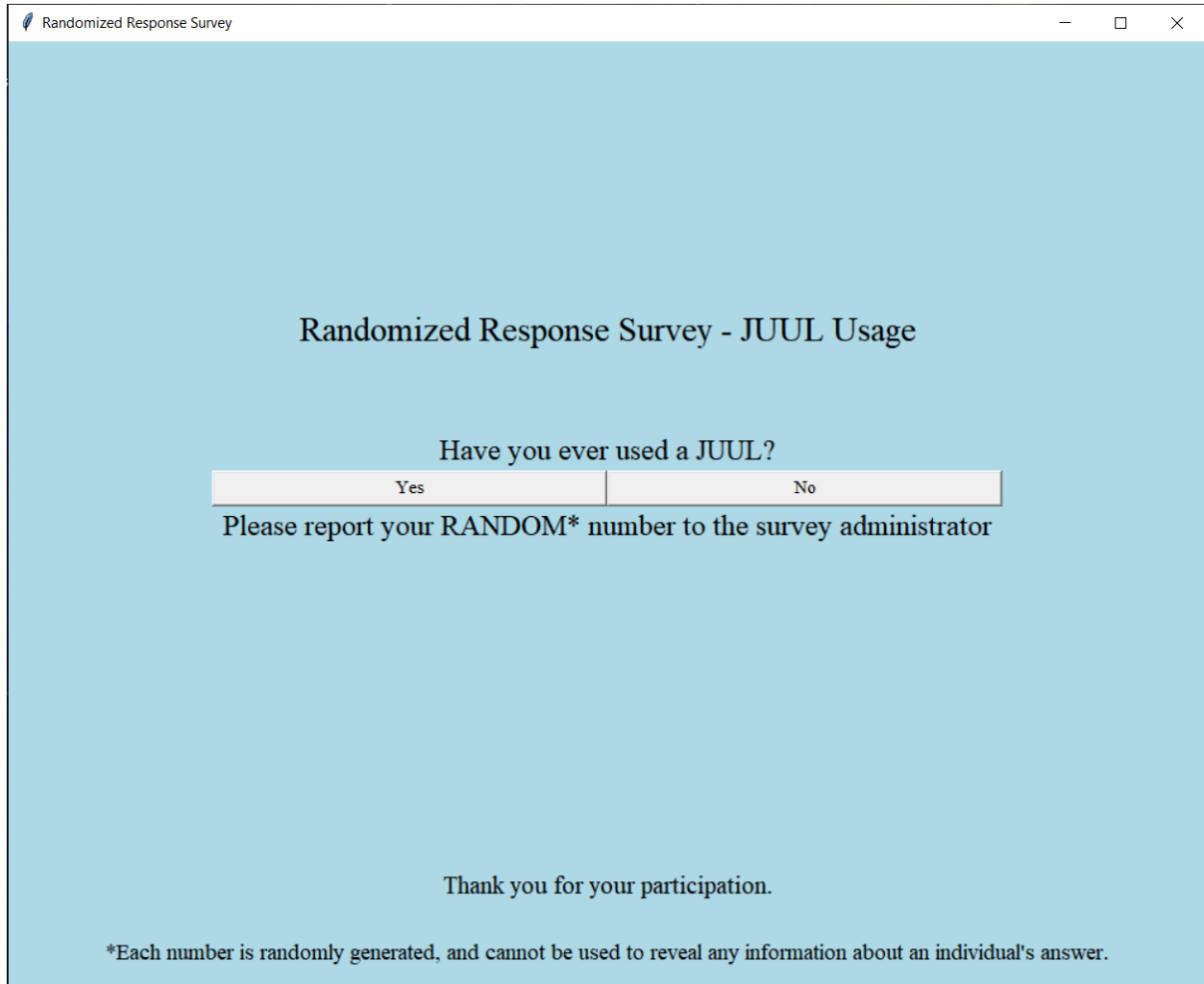


## Randomized Response Survey with Python and Tkinter

A person conducting the survey will be presented with the following question:



The screenshot shows a Tkinter window titled "Randomized Response Survey". The window has a light blue background. The title bar includes a small icon, the text "Randomized Response Survey", and standard window controls (minimize, maximize, close). The main content area contains the following text and elements:

- The title "Randomized Response Survey - JUUL Usage" is centered in a large, black, serif font.
- The question "Have you ever used a JUUL?" is centered below the title.
- Below the question is a horizontal button bar with two buttons: "Yes" on the left and "No" on the right. The buttons are light gray with black text.
- Below the button bar is the instruction "Please report your RANDOM\* number to the survey administrator" in a smaller, black, serif font.
- At the bottom of the window, there is a "Thank you for your participation." message and a footnote: "\*Each number is randomly generated, and cannot be used to reveal any information about an individual's answer."

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

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

Randomized Response Survey

— □ ×

Randomized Response Survey - JUUL Usage

Have you ever used a JUUL?

Yes	No
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Please report your RANDOM\* number to the survey administrator

5306974

Clear

Thank you for your participation.

\*Each number is randomly generated, and cannot be used to reveal any information about an individual's answer.

If No, a similarly valued number will be generated:

Randomized Response Survey - JUUL Usage

Have you ever used a JUUL?

Yes No

Please report your RANDOM\* number to the survey administrator

5511768

Clear

Thank you for your participation.

\*Each number is randomly generated, and cannot be used to reveal any information about an individual's answer.

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 us to compute the sum of the responses and calculate the population proportion which possess the sensitive characteristic.

**Theorem 4.1.** An unbiased estimator of the population proportion  $\pi$  is given by

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

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.