POWER ANALYSIS OF FEMALE MURDER VICTIMS' RELATIONSHIP WITH OFFENDERS

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IMPORTANCE AND IMPLICATIONS

- Law enforcement agencies and the FBI catalog data on crimes, but this data is limited to both proper reporting documentation by the agency as well as available information on the circumstances of the crime.

- As a limitation of the available data, a power analysis can provide information on whether or not the data available can be used to draw meaningful correlations.

- Murder is the most egregious crime and better understanding the nature of its crimes can help provide direction in crime prevention and intervention.

" THE MOST DANGEROUS PLACE IN THE WORLD FOR A WOMAN IS INSIDE HER OWN HOME. "

- United Nations Office on Drugs and Crime, 2017
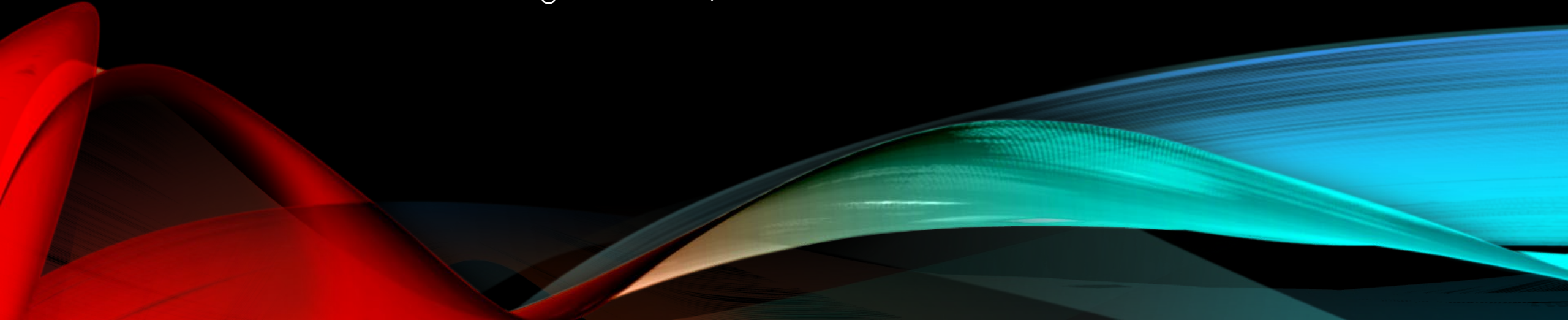
DATASET

National Incident-Based Reporting System (NIBRS)

About The NIBRS:

- Part of the Uniform Crime Reporting Program (UCR)
- Administered by the Federal Bureau of Investigation (FBI)
- Annually compiled dataset focusing on arrests, crime, crime rates, crime reporting, law enforcement agencies, national crime statistics (USA), offenders, offenses, property crimes, Uniform Crime Reports, victims, and violent crime in United States
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2020 Victim Extract Files (0004):
- Simplifies the NIBRS providing only data relating to the victim of a documented crime in 2020

DATA PREPARATION

- Filtered Down To Columns Of Interest
  - Type Of Crime
  - Sex Of Victim
  - Relationship To Offender
- Included only Murder/Nonnegligent Manslaughter
- Added In Grouping Column To Categorize Relationship To Offender
  - Intimate Partner
  - Family Member
  - Friend / Otherwise Known
  - Stranger
  - Unknown
- Created two subsets of data
  - Female Murder Victims
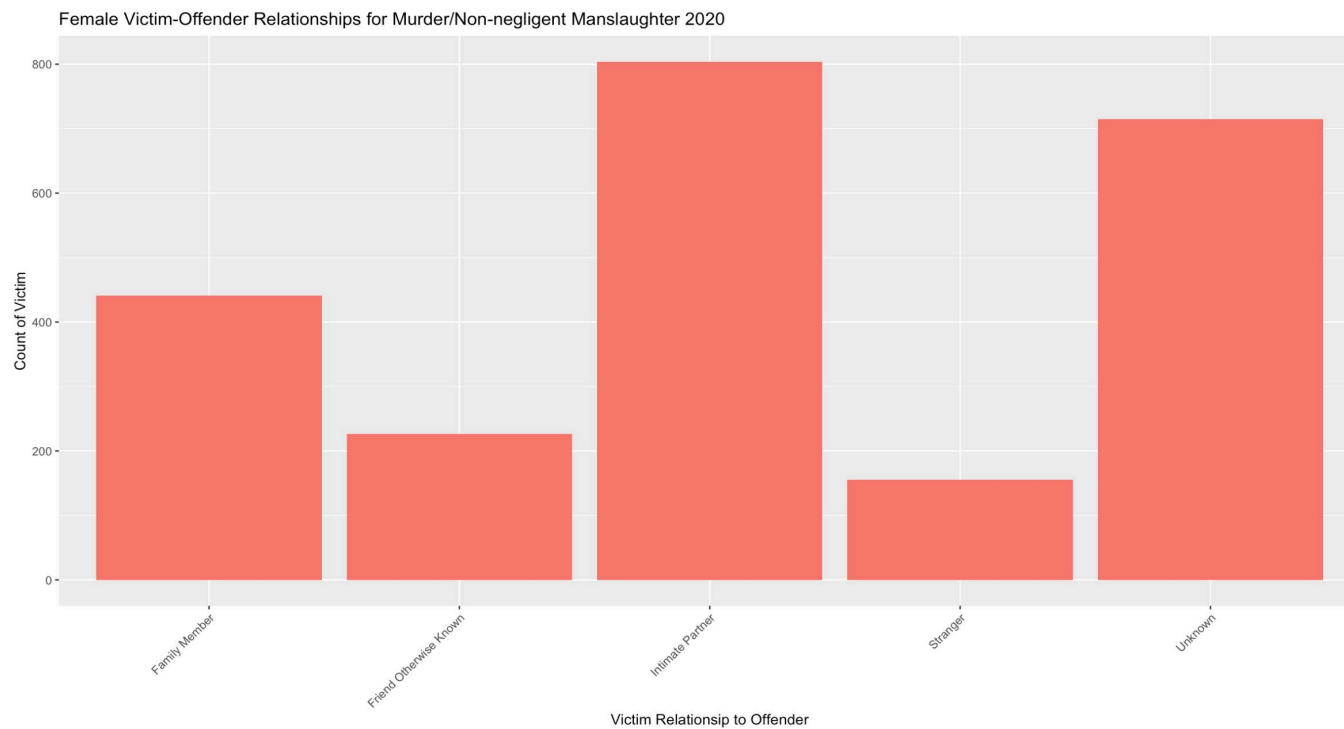 - Male Murder Victims
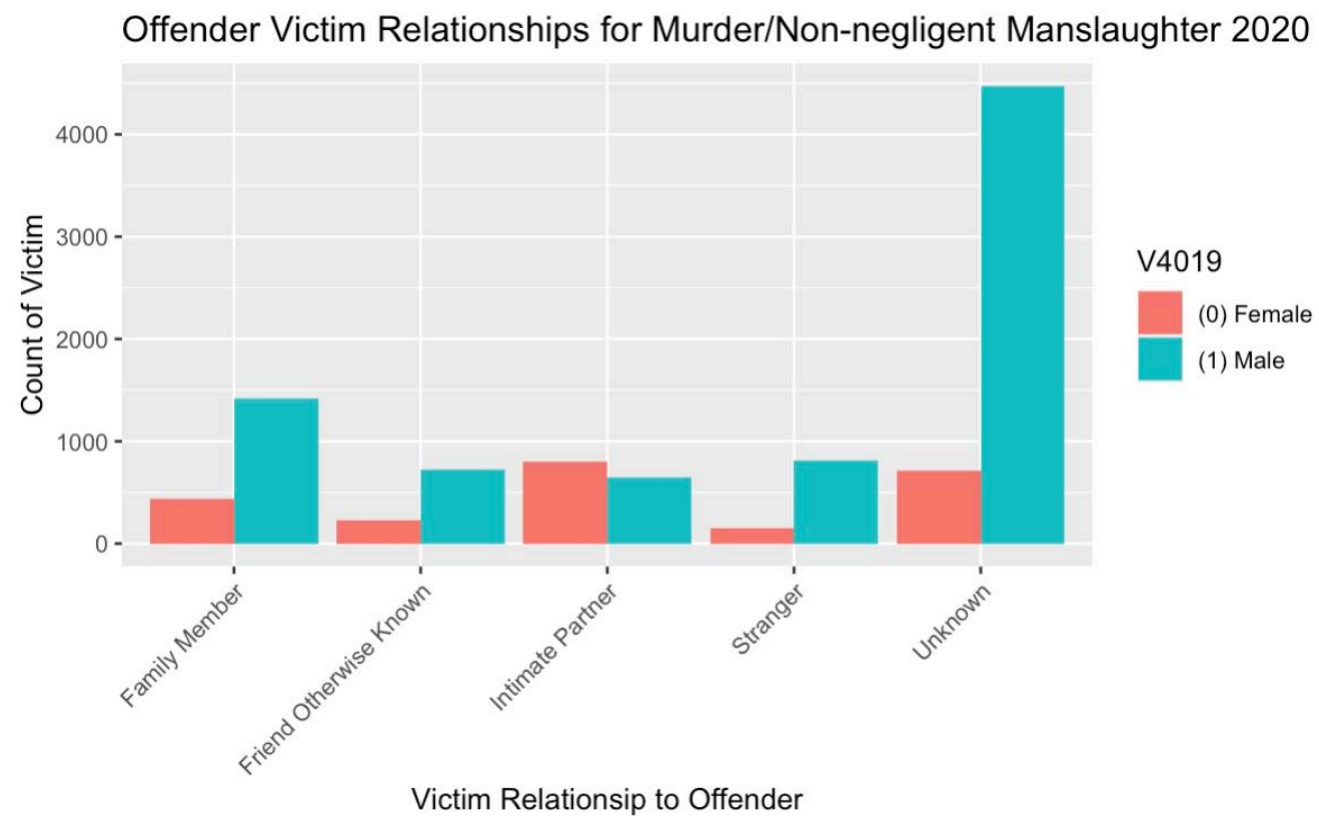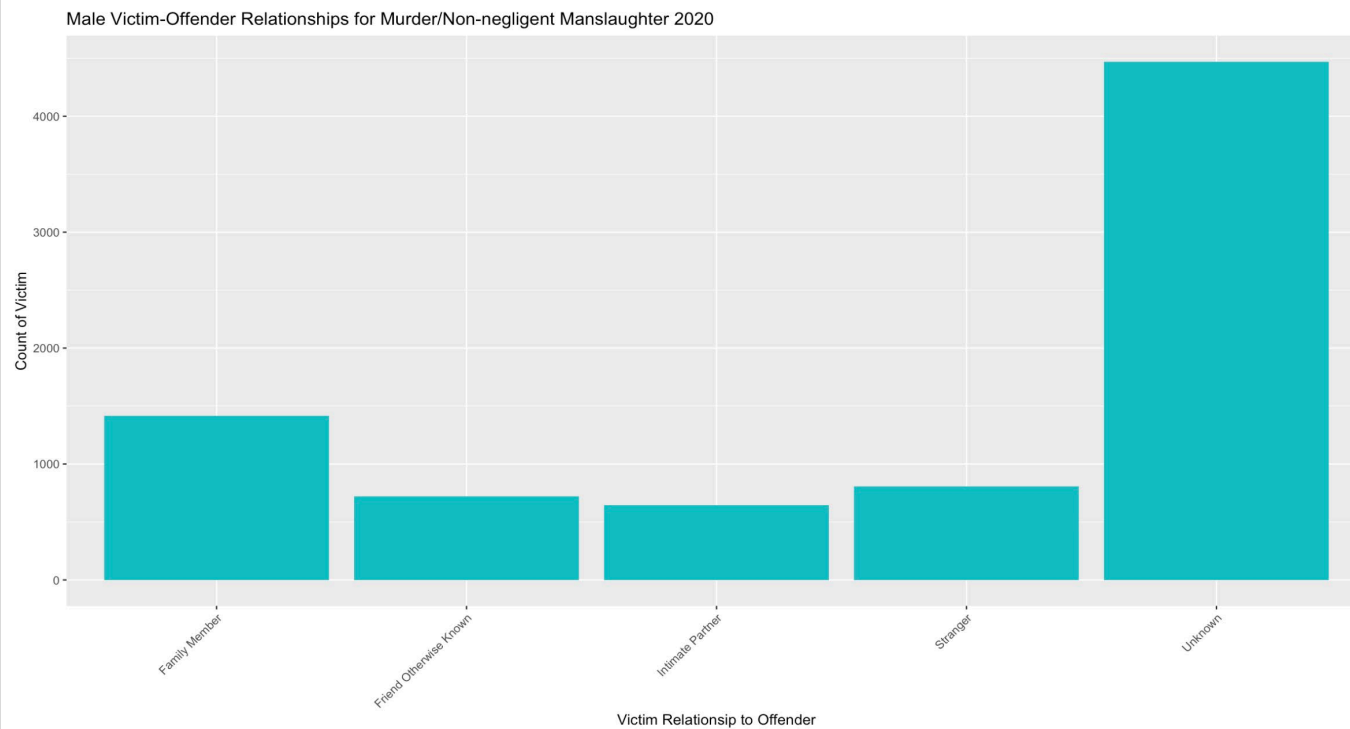
DATA VISUALIZATION
RELATIONSHIP GROUPING SUMMARY
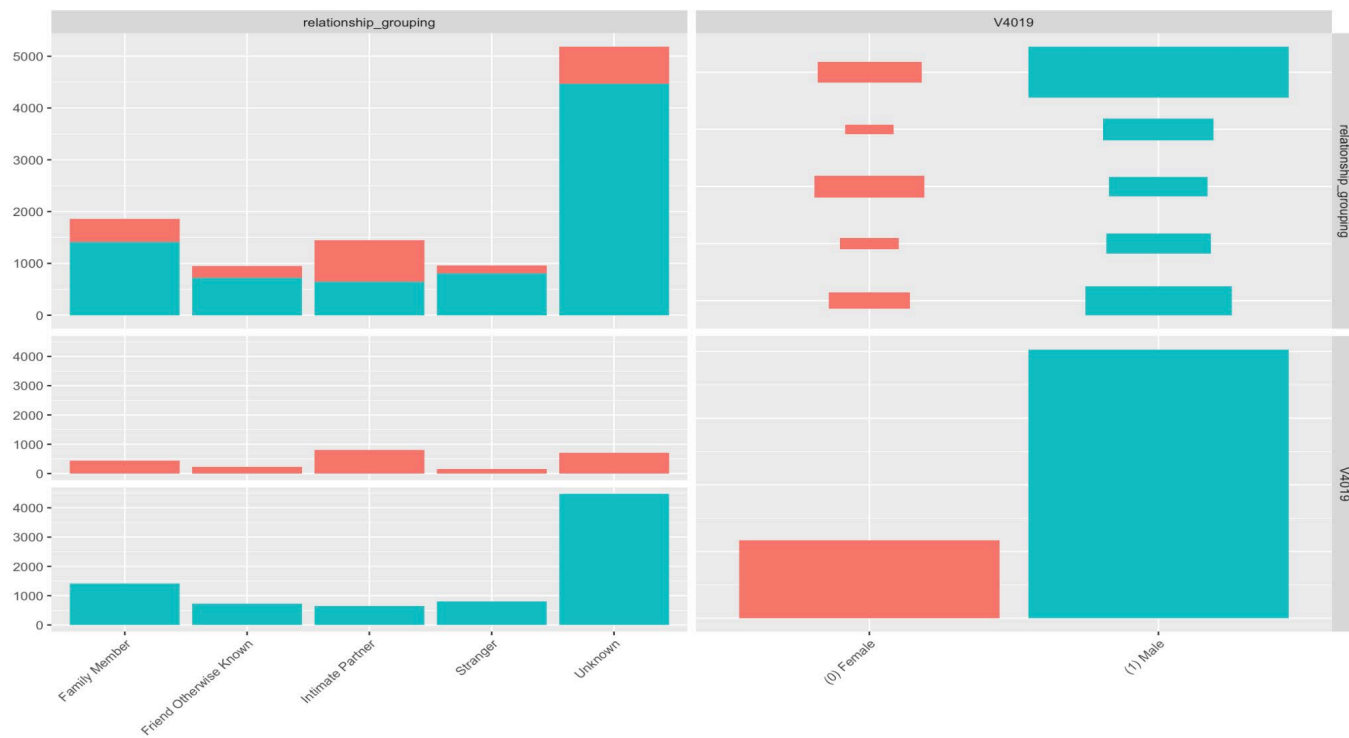
DATA VISUALIZATION
GGPAIRS PLOT

DATA
VISUALIZATION
FEMALE MURDER/NON-
NEGLIGENT DEATH VICTIMS

DATA VISUALIZATION
MALE MURDER/NON-NEGLIGENT DEATH VICTIMS

MODEL DESCRIPTION

Two Main Questions:
1. Is there a statistically significant difference between men and women when looking at the proportion at which they were in an intimate relationship with the offender?
   - Proportional Analysis
2. How confident are we that the results from this proportional analysis is genuine and significant (meaning, it is not due to chance)?
   - Power Analysis of binary data sets (searching for power rating)
     - Power Analysis of binary data sets (searching for smallest sample to maintain high power rating)

MODEL DESCRIPTION

What Is A Power Analysis?
- Determines how likely researches are to commit a type II error
- **Power:** probability between 0 and 1 that an effect that is present is detected.
  - The closer a power rating is to 1, the more confident you can be that the effect you are detecting is genuine and not due to chance.
  - For example, with power = 0.80, if there are genuine effects to be found in 10 different studies, they will only be found in 8 of the studies.
  - Typically, it understood that a power score of 0.80 is a "good" power level.
- **Effect size:** proportion of effect
  - in your data between 0 and 1. For our data, we utilized the calculated significantly different proportions from our proportion test.
- **Sample size:** number of people in a sample population.
- **Alpha:** significance level
  - typically set 0.05.
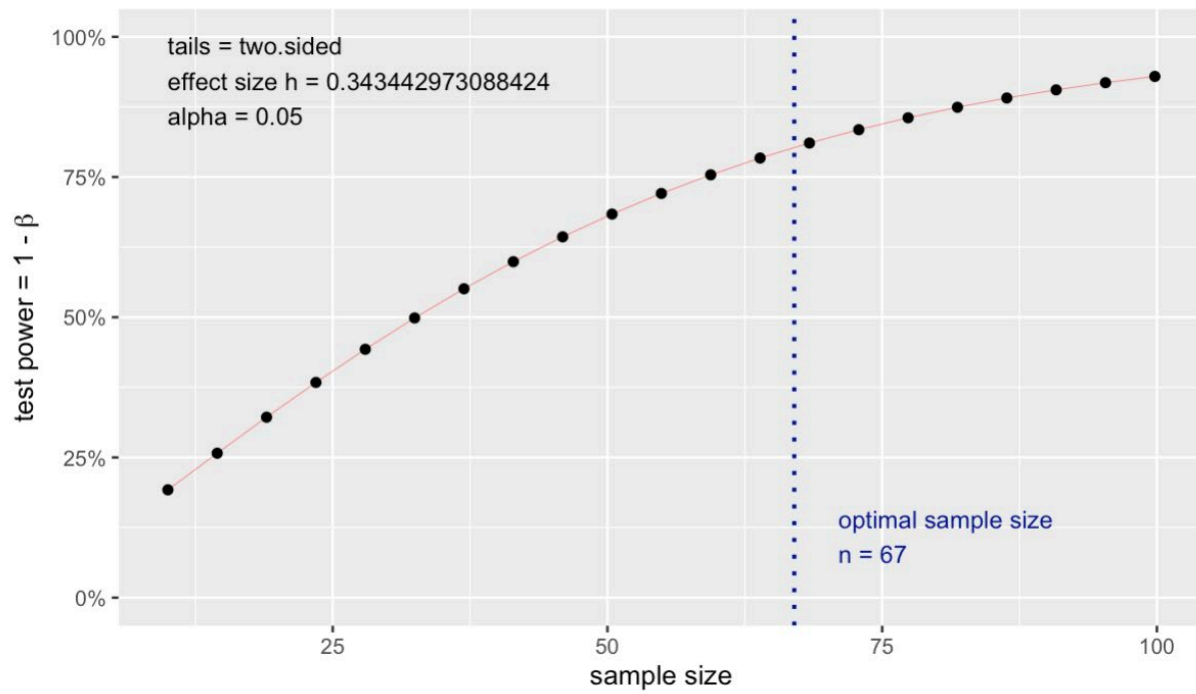
ANALYSIS

Proportional Analysis
* 2-sample test for equality of proportions with continuity correction
* p-value < 2.2e-16
* significant difference in proportion between women who were killed by intimate partners in 2020 when compared to men
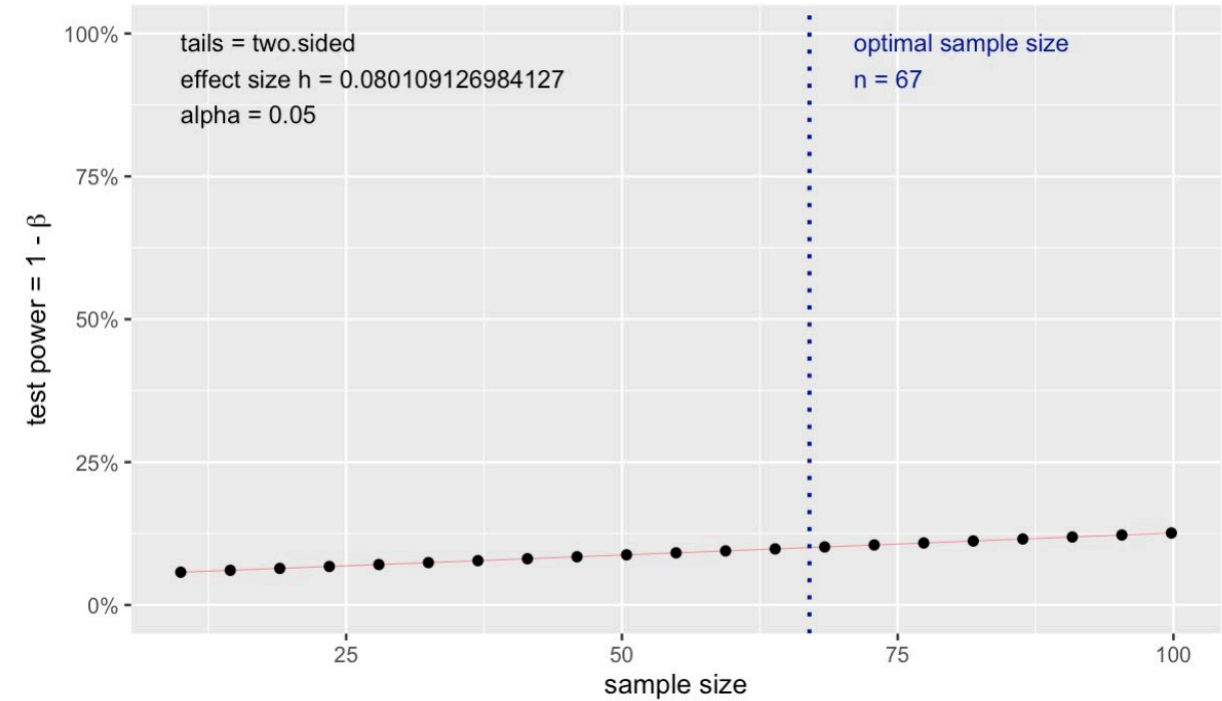
Power Analysis
* proportion power calculation for binomial distribution (arcsine transformation)
  * Female Victim Data Set: Power = 1
  * Male Victim Data Set: Power = 0.9999
* finding smallest sample size needed to still correctly reject our null hypothesis while maintaining a high power (0.8)
  * Female Victim Data Set: Smallest Sample = ~67 female murder/non-negligent death victims (~23 of which with intimate partner relationship)
  * Male Victim Data Set: ~1223 male murder/non-negligent death victims (~97 of which with intimate partner relationship)
  * **Comparing Yielded Power With An Equal Sample Size**

Female Victims Power Analysis

tails = two.sided
effect size h = 0.343442973088424
alpha = 0.05

optimal sample size
n = 67

Male Victims Power Analysis

tails = two.sided
effect size h = 0.080109126984127
alpha = 0.05

optimal sample size
n = 67

MODEL EVALUATION

Limitations
- Male versus female power analysis
- Data Set Limitations
  - High rate of unknown victim-offender relationship grouping
  - Missing state data

Possible Enhancements
- missing data
- offender details
- victim diversity statistics

CONCLUSION

Not only has our analysis proved our initial hypothesis, that women are most likely to be killed by an intimate partner, but we additionally proved that this effect is significantly disproportionate when compared to male murder/non-negligent death victims.

2341 women were reported victims of murder or non-negligent death in 2020. 804 of these women died at the hands of an intimate partner. Yet, women are still not believed when they report intimate partner abuse. Women are not believed despite the fact that they are statistically more likely to be killed by their partner than they are by any other known and unknown relationship. If our analysis provides nothing more than a warning for women currently experiencing intimate partner abuse, it will have been well worth it. Seek help, find support.