Final_Report

2025-12-03

Introduction

Introduction goes here... 1) An introduction that poses the research question. 2) Do not include a signposting paragraph. These are tedious and your paper should be well structured enough that it stands without one. 3) A justification – based on either previous research (theory), business intuition (inductive theory), or some other structure (lazy theory) – that informs your reader why you have chosen to conduct this specific experiment. 4) A specific statement of the hypotheses that are up for test and why you think they should show a difference (this comes from #3 above).

Dog Adoption Field Experiment

Potential Outcomes

Comparison of Potential Outcomes - A clear statement is made that describes what potential outcomes are going to be compared to which other. This could come in the form of an explicit appeal to the ROXO comparison, but it need not necessarily be. Clarity in this exposition is crucial.

Randomization Process

Randomization Process - Given the design that you've written down, how will you actually go about creating random assignment into one or more of the groups? If this is not explicitly random, then detail what trade offs you are having to make. If you have any reason to doubt that randomization was not conducted according to plan – that is, it isn't random – then checks to evaluate any deviations should be presented, consequences for these deviations considered, and remedies – to the extent they are possible – proposed.

Treatment

Treatment - What is the treatment? Specifics of the feature, or experience, or intervention should be provided somewhere in the document; frequently this works well in the main body; it can also work well in an appendix. If there was not perfect compliance to the treatment regime, then checks to evaluate deviations should be presented and deviations considered. To the extent that they are possible, remedies should be proposed.

Experiment Population

Your report should make very clear who was considered for involvement in your experiment, who was assigned, and whose data will eventually be used. Consider, as an example, the flow chart on p. 439 of Gerber and Green. (Note that the U.S. Food and Drug Administration calls this information a CONSORT statement.

** I'd say this is where we can talk about how we go from a shelter of 100+ dogs, down to ~60 dogs in our experiment... with the reason being: 1) A dog is not eligible for adoption until a surgery date is scheduled. 2) There are many types of dog intakes, including stray, which require at least a 10 day hold. 3) Since our treatment was to add a bio, we had to ignore any dogs with existing bios (ended up being ~30 dogs I think)

Power Calculation

Power Calculation – Given pre-experiment assumptions about effect size and experiment size, how much power does the experiment anticipate generating.

```
##   Target_Power Sample_Size_Per_Group Actual_Power Total_Size
## 1         0.80                   388        0.801        776
## 2         0.85                   443        0.850        886
## 3         0.90                   519        0.900       1038
## 4         0.92                   559        0.920       1118
## 5         0.95                   642        0.950       1284
```

```
## Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use `linewidth` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.
```


Power vs Sample Size for Binary Outcome Experiment
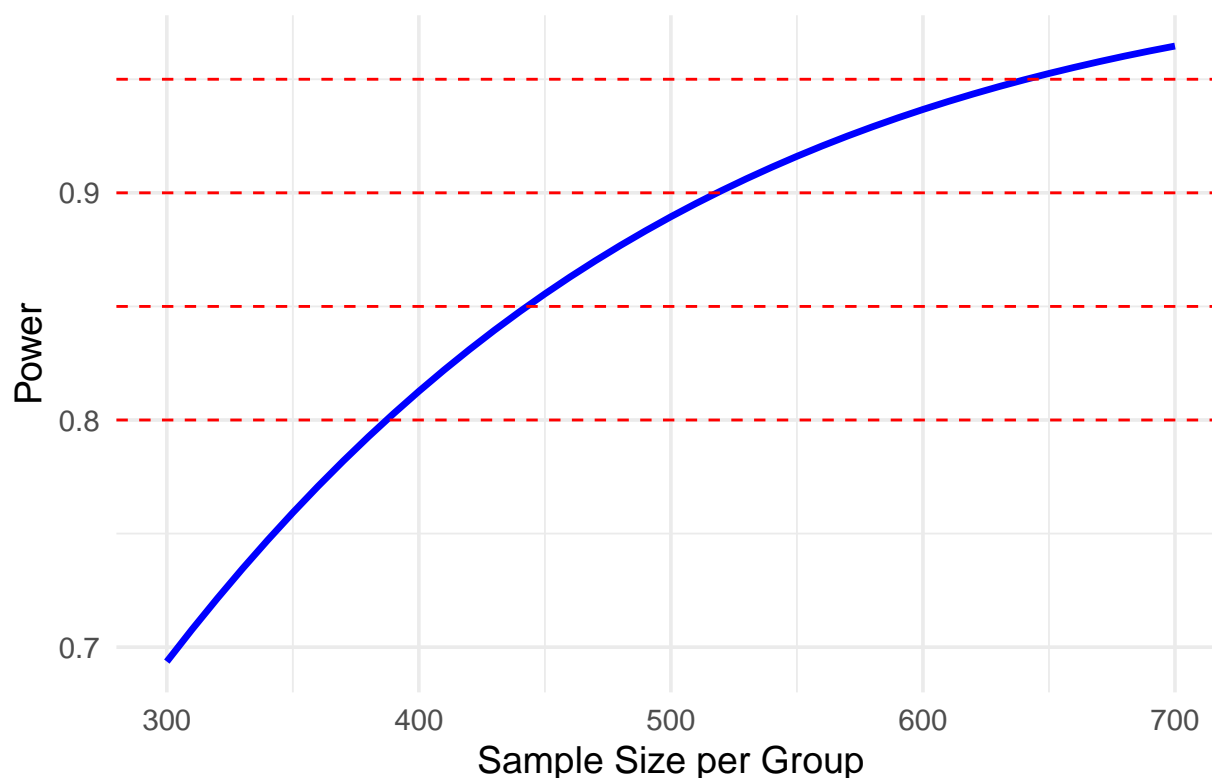
Analysis

Data

Data: the data is clearly detailed, and the reader can understand at a conceptual and operational level - The outcome that is being measured and reasoned about - How the treatment that was described in the /Experimental Details/ section maps into the operational space for the models. - Important covariate features that will be used in the analysis.

Models

Models: there is a clear, structured, and progressive plan for testing and reporting. - Data - Models use data from units that is appropriate for estimating the causal quantity of interest. - Design - Estimates for causal effects identify the same quantities that are designed for in the /Experiment Details/ section. - Models - Models first estimate simple "treatment-control" contrast, unadorned with additional model features intended to improve precision; - Models - To the extent that it was designed for, models increase precision of estimates using 'good controls' - If implicated in the Theory or Hypotheses, either HTE or subgroup analysis are handled appropriately.

**Spoke with Clinton about this. . . He suggested running/displaying 3 models (ITT or IVreg. . . he said that we are good with using lm and not needing a log model, the lm coefficient will tell us the adaptability rate): 1) Simple model: Outcome ~ Treatment 2) Control Variables: Outcome ~ Treatment + Stigma + Complier 3) All Features: Outcome ~ Treatment + Stigma + Complier + Pretreat_LOS + Pretreat_views + Pretreat_open + Age + Sex + Size + (include F-tests to see if the additional features add any value)

```
head(experiment_data)
```

```
##                   DogName Stigma Treatment Outcome_Experiment Compliance
##                    <char>  <int>     <num>              <int>      <int>
## 1: Chucky [Foster Home]        1         1                  0          1
## 2:            Sebastian        1         0                  0          1
## 3:            Woodstock        1         0                  0          1
## 4:                Goose        1         1                  0          1
## 5:                 Koko        1         1                  1          1
## 6:   Zorua [Foster Home]        1         1                  0          1
##     Pretreat_LOS Pretreat_views Pretreat_open
##            <num>          <num>         <num>
## 1:         416.0           3697           433
## 2:         361.7           6492          1182
## 3:         251.1           2319           399
## 4:         241.9           1688           274
## 5:         193.9           2092           260
## 6:         219.8           1947           191
##                                                Color Black_Dog    Age   Sex
##                                               <char>     <num> <char> <num>
## 1:                     Brown/Chocolate - with White          0  adult     1
## 2: Black - with Brown, Red, Golden, Orange or Chestnut        1  adult     1
## 3:                  Gray/Blue/Silver/Salt & Pepper          0  adult     1
## 4:                                          Brindle          0  adult     1
## 5:                  Gray/Blue/Silver/Salt & Pepper          0  adult     0
## 6:                              Black - with White          0  adult     0
##       Size Housebroken Special_Needs  Kids  Dogs
##     <char>       <num>         <num> <num> <num>
## 1: medium           0             0     1     1
## 2:  large           0             0     1     1
## 3:  large           0             0     1     1
## 4:  large           0             0     1     1
## 5: medium           0             0     1     1
## 6: medium           0             0     1     1
```

ITT Models:

```
# starting with ITT (intent to treat)
model_ITT_1 = lm(Outcome_Experiment ~ Treatment, data = experiment_data)
```

```r
summary(model_ITT_1)
```

```
##
## Call:
## lm(formula = Outcome_Experiment ~ Treatment, data = experiment_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4483 -0.4483 -0.3214  0.5517  0.6786
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.32143    0.09286   3.461  0.00105 **
## Treatment    0.12685    0.13019   0.974  0.33415
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4914 on 55 degrees of freedom
## Multiple R-squared:  0.01697,    Adjusted R-squared:  -0.0009054
## F-statistic: 0.9493 on 1 and 55 DF,  p-value: 0.3342
```

```r
# starting with ITT (intent to treat)
# won't compliance add contamination from outcomes? since that's a post-assignment variable..
# excluded compliance for now.
model_ITT_2 = lm(Outcome_Experiment ~ Treatment + Stigma, data = experiment_data)

summary(model_ITT_2)
```

```
##
## Call:
## lm(formula = Outcome_Experiment ~ Treatment + Stigma, data = experiment_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5239 -0.4063 -0.2235  0.4761  0.7765
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.4063     0.1101   3.689 0.000524 ***
## Treatment     0.1176     0.1292   0.910 0.366749
## Stigma       -0.1827     0.1302  -1.404 0.166184
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4871 on 54 degrees of freedom
## Multiple R-squared:  0.05157,    Adjusted R-squared:  0.01644
## F-statistic: 1.468 on 2 and 54 DF,  p-value: 0.2394
```

```r
# excluded compliance for now since it's a post-treatment variable
model_ITT_3 = lm(Outcome_Experiment ~ Treatment + Stigma + Pretreat_LOS + Pretreat_views +
                 Pretreat_open + Age + Sex + Size + Black_Dog, data = experiment_data)

summary(model_ITT_3)
```

```
##
```

```
## Call:
## lm(formula = Outcome_Experiment ~ Treatment + Stigma + Pretreat_LOS +
##     Pretreat_views + Pretreat_open + Age + Sex + Size + Black_Dog,
##     data = experiment_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5824 -0.3699 -0.1311  0.4548  0.7140
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)     5.834e-01  2.424e-01   2.407   0.0211 *
## Treatment       1.106e-01  1.442e-01   0.767   0.4480
## Stigma         -1.291e-01  1.673e-01  -0.772   0.4451
## Pretreat_LOS   -1.761e-03  1.616e-03  -1.090   0.2826
## Pretreat_views -4.596e-05  1.012e-04  -0.454   0.6524
## Pretreat_open   5.907e-04  6.974e-04   0.847   0.4023
## Agepuppy        5.778e-01  5.156e-01   1.121   0.2695
## Agesenior      -4.637e-01  5.264e-01  -0.881   0.3839
## Ageyoung        3.829e-02  1.685e-01   0.227   0.8215
## Sex            -2.073e-01  1.586e-01  -1.307   0.1990
## Sizemedium      7.253e-02  1.934e-01   0.375   0.7097
## Sizesmall       8.461e-01  5.460e-01   1.550   0.1295
## Black_Dog      -1.572e-01  1.656e-01  -0.949   0.3486
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4799 on 38 degrees of freedom
##   (6 observations deleted due to missingness)
## Multiple R-squared:  0.2485, Adjusted R-squared:  0.01123
## F-statistic: 1.047 on 12 and 38 DF,  p-value: 0.4287
```

```
# made a fourth, slightly simpler model because I don't like including views/clickthrough rates. Feels

model_ITT_4 = lm(Outcome_Experiment ~ Treatment + Stigma + Age + Sex + Size + Black_Dog, data = experime

summary(model_ITT_4)
```

```
##
## Call:
## lm(formula = Outcome_Experiment ~ Treatment + Stigma + Age +
##     Sex + Size + Black_Dog, data = experiment_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.66124 -0.38190 -0.09678  0.48070  0.71044
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.46847    0.21796   2.149   0.0368 *
## Treatment    0.09227    0.12940   0.713   0.4793
## Stigma      -0.28512    0.13975  -2.040   0.0470 *
## Agepuppy     0.52683    0.35810   1.471   0.1479
## Agesenior   -0.60587    0.50438  -1.201   0.2357
## Ageyoung     0.05537    0.14814   0.374   0.7103
```

```
## Sex          -0.17884     0.14439   -1.239    0.2216
## Sizemedium    0.13740     0.17617    0.780    0.4393
## Sizesmall     0.94012     0.52103    1.804    0.0776 .
## Black_Dog    -0.16237     0.14904   -1.089    0.2815
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4695 on 47 degrees of freedom
## Multiple R-squared:  0.233,  Adjusted R-squared:  0.0861
## F-statistic: 1.586 on 9 and 47 DF,  p-value: 0.1471
```

Instrumental Variable Models:

```
# IV regression data prep
treatmentgrp_and_treated = (experiment_data$Treatment == 1 & experiment_data$Compliance == 1)

controlgrp_and_treated = (experiment_data$Treatment == 0 & experiment_data$Compliance == 0)


experiment_data$actually_treated = (treatmentgrp_and_treated | controlgrp_and_treated)

head(experiment_data)
```

```
##                   DogName Stigma Treatment Outcome_Experiment Compliance
##                    <char>  <int>     <num>              <int>     <int>
## 1: Chucky [Foster Home]        1         1                  0          1
## 2:           Sebastian        1         0                  0          1
## 3:           Woodstock        1         0                  0          1
## 4:               Goose        1         1                  0          1
## 5:                Koko        1         1                  1          1
## 6:   Zorua [Foster Home]      1         1                  0          1
##     Pretreat_LOS Pretreat_views Pretreat_open
##            <num>          <num>         <num>
## 1:         416.0           3697           433
## 2:         361.7           6492          1182
## 3:         251.1           2319           399
## 4:         241.9           1688           274
## 5:         193.9           2092           260
## 6:         219.8           1947           191
##                                            Color Black_Dog    Age   Sex
##                                           <char>     <num> <char> <num>
## 1:                   Brown/Chocolate - with White         0  adult     1
## 2: Black - with Brown, Red, Golden, Orange or Chestnut     1  adult     1
## 3:               Gray/Blue/Silver/Salt & Pepper         0  adult     1
## 4:                                        Brindle         0  adult     1
## 5:               Gray/Blue/Silver/Salt & Pepper         0  adult     0
## 6:                           Black - with White         0  adult     0
##      Size Housebroken Special_Needs  Kids  Dogs actually_treated
##    <char>       <num>         <num> <num> <num>           <lgcl>
## 1: medium           0             0     1     1             TRUE
## 2:  large           0             0     1     1            FALSE
## 3:  large           0             0     1     1            FALSE
## 4:  large           0             0     1     1             TRUE
## 5: medium           0             0     1     1             TRUE
## 6: medium           0             0     1     1             TRUE
```

```
# check how many non-compliers overall. Only six because we filtered out dogs assigned to control who e
table(experiment_data$Compliance)
```

```
##
## 0  1
## 6 51
```

IV Regression Models:

```
model_IV_1 = ivreg(Outcome_Experiment  ~ actually_treated | Treatment, data = experiment_data)

summary(model_IV_1)
```

```
##
## Call:
## ivreg(formula = Outcome_Experiment ~ actually_treated | Treatment,
##     data = experiment_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4814 -0.3214 -0.3214  0.5186  0.6786
##
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)           0.32143    0.09473   3.393  0.00129 **
## actually_treatedTRUE  0.15994    0.16746   0.955  0.34371
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5013 on 55 degrees of freedom
## Multiple R-Squared: -0.02307,    Adjusted R-squared: -0.04167
## Wald test: 0.9122 on 1 and 55 DF,  p-value: 0.3437
```

```
model_IV_2 = ivreg(Outcome_Experiment  ~ actually_treated + Stigma | Treatment + Stigma, data = experime

summary(model_IV_2)
```

```
##
## Call:
## ivreg(formula = Outcome_Experiment ~ actually_treated + Stigma |
##     Treatment + Stigma, data = experiment_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5608 -0.4135 -0.2152  0.5865  0.7848
##
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)            0.4135     0.1070   3.864 0.000301 ***
## actually_treatedTRUE   0.1473     0.1644   0.896 0.374159
## Stigma                -0.1983     0.1325  -1.497 0.140255
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4948 on 54 degrees of freedom
## Multiple R-Squared: 0.0215,  Adjusted R-squared: -0.01474
```

```
## Wald test: 1.423 on 2 and 54 DF,  p-value: 0.2499
model_IV_3 = ivreg(Outcome_Experiment  ~ actually_treated + Stigma + Pretreat_LOS + Pretreat_views +
                   Pretreat_open + Age + Sex + Size + Black_Dog | Treatment + Stigma + Pretreat_LOS + P:
                   Pretreat_open + Age + Sex + Size + Black_Dog, data = experiment_data)

summary(model_IV_3)

##
## Call:
## ivreg(formula = Outcome_Experiment ~ actually_treated + Stigma +
##     Pretreat_LOS + Pretreat_views + Pretreat_open + Age + Sex +
##     Size + Black_Dog | Treatment + Stigma + Pretreat_LOS + Pretreat_views +
##     Pretreat_open + Age + Sex + Size + Black_Dog, data = experiment_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5824 -0.3699 -0.1311  0.4548  0.7140
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)          5.834e-01  2.424e-01   2.407   0.0211 *
## actually_treatedTRUE 1.106e-01  1.442e-01   0.767   0.4480
## Stigma              -1.291e-01  1.673e-01  -0.772   0.4451
## Pretreat_LOS        -1.761e-03  1.616e-03  -1.090   0.2826
## Pretreat_views      -4.596e-05  1.012e-04  -0.454   0.6524
## Pretreat_open        5.907e-04  6.974e-04   0.847   0.4023
## Agepuppy             5.778e-01  5.156e-01   1.121   0.2695
## Agesenior           -4.637e-01  5.264e-01  -0.881   0.3839
## Ageyoung             3.829e-02  1.685e-01   0.227   0.8215
## Sex                 -2.073e-01  1.586e-01  -1.307   0.1990
## Sizemedium           7.253e-02  1.934e-01   0.375   0.7097
## Sizesmall            8.461e-01  5.460e-01   1.550   0.1295
## Black_Dog           -1.572e-01  1.656e-01  -0.949   0.3486
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4799 on 38 degrees of freedom
## Multiple R-Squared: 0.2485,  Adjusted R-squared: 0.01123
## Wald test: 1.047 on 12 and 38 DF,  p-value: 0.4287
# made a fourth, slightly simpler model because I don't like including views/clickthrough rates. Feels
model_IV_4 = ivreg(Outcome_Experiment  ~ actually_treated + Stigma + Age + Sex + Size + Black_Dog | Trea

summary(model_IV_4)

##
## Call:
## ivreg(formula = Outcome_Experiment ~ actually_treated + Stigma +
##     Age + Sex + Size + Black_Dog | Treatment + Stigma + Age +
##     Sex + Size + Black_Dog, data = experiment_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6660 -0.3715 -0.1040  0.4559  0.7272
```

```
## 
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)           0.46491    0.22111   2.103   0.0409 *
## actually_treatedTRUE  0.11505    0.16267   0.707   0.4829
## Stigma               -0.29449    0.14058  -2.095   0.0416 *
## Agepuppy              0.57098    0.36965   1.545   0.1291
## Agesenior            -0.61046    0.50747  -1.203   0.2350
## Ageyoung              0.05554    0.14937   0.372   0.7117
## Sex                  -0.18144    0.14558  -1.246   0.2188
## Sizemedium            0.14555    0.17611   0.826   0.4127
## Sizesmall             0.95548    0.52745   1.812   0.0765 .
## Black_Dog            -0.15626    0.15133  -1.033   0.3071
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 0.4734 on 47 degrees of freedom
## Multiple R-Squared: 0.2203,  Adjusted R-squared: 0.07101
## Wald test:  1.56 on 9 and 47 DF,  p-value: 0.1552
```

To do in model section:

(1) Decide if we are doing IV reg or ITT

(2) F-tests

```
experiment_data
```

```
##                              DogName Stigma Treatment Outcome_Experiment Compliance
##                               <char>  <int>     <num>              <int>      <int>
##  1:           Chucky [Foster Home]      1        1                  0          1
##  2:                     Sebastian      1        0                  0          1
##  3:                     Woodstock      1        0                  0          1
##  4:                         Goose      1        1                  0          1
##  5:                          Koko      1        1                  1          1
##  6:            Zorua [Foster Home]      1        1                  0          1
##  7:                     Ava Grace      1        0                  0          1
##  8:           Cole [Foster Home]      0        1                  0          1
##  9:                           Kim      0        1                  0          1
## 10:                         Tanya      0        0                  0          1
## 11:                      Gretchen      1        0                  0          1
## 12:         Journey [Foster Home]      0        0                  0          1
## 13:                         Kirby      1        1                  0          1
## 14:                        Landon      0        0                  1          1
## 15:                         Ralph      0        1                  1          1
## 16:                       Twister      0        1                  0          1
## 17:          Yukiko [Foster Home]      1        0                  0          1
## 18:                        Auggie      1        0                  1          1
## 19:           Lotus [Foster Home]      1        1                  0          1
## 20:                         Craig      0        1                  0          0
## 21:           Dingo [Foster Home]      0        1                  0          1
## 22:                       Elliott      1        0                  0          1
## 23:                        Emmett      0        0                  0          1
## 24:                          Feta      0        0                  0          1
## 25: Pocahontas [Foster To Adopt]      0        0                  1          1
## 26:                          Roux      1        1                  1          1
```

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```
## 27:                       Royal      1         0              0          1
## 28:                       Deebo      1         1              1          1
## 29: Captain Crunch [Foster Home]     0         1              1          1
## 30:                       Cheech      0         1              0          1
## 31:                      Claudia      1         1              1          1
## 32:                        Homer      0         0              1          1
## 33:                         Jovi      0         0              0          1
## 34:          Luca [Foster Home]      0         0              0          1
## 35:         Madre [Foster Home]      0         1              1          1
## 36:                        Marge      0         1              1          0
## 37:          Mary [Foster Home]      1         1              0          0
## 38:                          Max      0         0              0          1
## 39:      Maya [Foster To Adopt]      1         0              1          1
## 40:                      Rooster      0         0              0          1
## 41:        Shells [Foster Home]      1         1              0          1
## 42:                        Tramp      1         0              0          1
## 43:                        Vanna      0         0              0          1
## 44:                        Bruno      0         1              1          0
## 45:                        Deeno      0         1              0          1
## 46:                         Earl      0         0              1          1
## 47:                         Fufu      0         1              1          1
## 48:                        Gomez      0         0              1          1
## 49:                       Gunner      0         1              1          1
## 50:                        Harry      1         0              0          1
## 51:                      Hershey      0         1              0          1
## 52:                         Java      0         0              1          1
## 53:                       Lainey      1         0              1          1
## 54:                        Moana      0         1              1          0
## 55:                         Reno      1         0              0          1
## 56:                        Rocky      1         1              0          1
## 57:                        Rufus      0         1              1          0
##                          DogName Stigma Treatment Outcome_Experiment Compliance
##      Pretreat_LOS Pretreat_views Pretreat_open
##            <num>          <num>          <num>
##  1:        416.0           3697            433
##  2:        361.7           6492           1182
##  3:        251.1           2319            399
##  4:        241.9           1688            274
##  5:        193.9           2092            260
##  6:        219.8           1947            191
##  7:        125.9           1599            191
##  8:        128.9           2002            627
##  9:        124.8           1749            118
## 10:        119.9           1142            121
## 11:        103.0           1217            134
## 12:        101.9           1228            127
## 13:        119.9           1625            166
## 14:         95.8           1085            151
## 15:         94.9           3996            198
## 16:        119.9            943            193
## 17:         97.9           4587            180
## 18:         77.0           1502            124
## 19:         80.0           1355             92
## 20:           NA           3152             64
```

```
## 21:          93.4           2083           88
## 22:          74.8            714           55
## 23:          61.9            600          118
## 24:          59.0           1061          110
## 25:          60.0            700          133
## 26:          61.9            983           81
## 27:          72.9            684           44
## 28:          77.0            738          141
## 29:          56.0           1109          341
## 30:          55.0            630           60
## 31:          62.1            972           64
## 32:          37.9           1100          154
## 33:          94.9            478           24
## 34:          27.0            521          101
## 35:          52.1            533           55
## 36:            NA           1094          101
## 37:            NA           1075           69
## 38:          94.8            409           47
## 39:          53.9            831           77
## 40:          42.0            810           99
## 41:          52.9            792           45
## 42:          61.8            454           39
## 43:          75.0           1059           79
## 44:            NA              0            0
## 45:          37.0            885           70
## 46:          17.8              0            0
## 47:          26.2            439           78
## 48:          24.8              0            0
## 49:          44.9            452           30
## 50:          30.8              0            0
## 51:          49.3            636          171
## 52:          37.0              0            0
## 53:          47.0              0            0
## 54:            NA              0            0
## 55:          75.0              0            0
## 56:          42.3            497           19
## 57:            NA              0            0
##      Pretreat_LOS Pretreat_views Pretreat_open
##                                                                  Color Black_Dog    Age  Sex
##                                                                 <char>     <num> <char> <num>
## 1:                             Brown/Chocolate - with White              0  adult    1
## 2: Black - with Brown, Red, Golden, Orange or Chestnut              1  adult    1
## 3:                       Gray/Blue/Silver/Salt & Pepper              0  adult    1
## 4:                                              Brindle              0  adult    1
## 5:                       Gray/Blue/Silver/Salt & Pepper              0  adult    0
## 6:                                  Black - with White              0  adult    0
## 7:                                Brindle - with White              0  adult    0
## 8:                                                Black              1  young    1
## 9:                                                Black              1  adult    0
## 10:                         Tan/Yellow/Fawn - with Black              0 senior    0
## 11:                       Gray/Blue/Silver/Salt & Pepper              0  young    0
## 12:                   Tricolor (Tan/Brown & Black & White)              0  adult    1
## 13:              Gray/Silver/Salt & Pepper - with White              0  adult    1
## 14:                         Brown/Chocolate - with White              0  adult    1
```

```
## 15:                                         White - with Black         0 adult    1
## 16:                                                         Black         1 adult    1
## 17:                       Black - with Tan, Yellow or Fawn         1 young    0
## 18:              Gray/Silver/Salt & Pepper - with White         0 young    1
## 19:                                       Brown/Chocolate         0 young    0
## 20:                                                         Black         1 adult    1
## 21:                           Tan/Yellow/Fawn - with White         0 young    1
## 22:                           Brown/Chocolate - with White         0 adult    1
## 23:                   Tricolor (Tan/Brown & Black & White)         0 adult    1
## 24:                     White - with Tan, Yellow or Fawn         0 adult    1
## 25:                           Tan/Yellow/Fawn - with White         0 adult    0
## 26:                               White - with Gray or Silver         0 adult    0
## 27:            Red/Golden/Orange/Chestnut - with White         0 adult    0
## 28:                                                     Brindle         0 young    1
## 29:                                           Tan/Yellow/Fawn         0 young    1
## 30:                           Tan/Yellow/Fawn - with Black         0 young    1
## 31:                     White - with Tan, Yellow or Fawn         0 young    0
## 32:                           Tan/Yellow/Fawn - with Black         0 puppy    1
## 33:                     Black - with Tan, Yellow or Fawn         1 adult    0
## 34:            Red/Golden/Orange/Chestnut - with White         0 adult    1
## 35:                                   Black - with White         1 adult    0
## 36:                           Tan/Yellow/Fawn - with Black         0 puppy    1
## 37:                                                         White         0 young    0
## 38:                     Black - with Tan, Yellow or Fawn         1 adult    1
## 39:                                   Brindle - with White         0 young    0
## 40:                     Black - with Tan, Yellow or Fawn         1 adult    1
## 41:                                           Tan/Yellow/Fawn         0 adult    0
## 42:                                                         Black         1 adult    1
## 43:                                                         White         0 young    0
## 44:            Red/Golden/Orange/Chestnut - with White         0 adult    1
## 45:                                           Tan/Yellow/Fawn         0 adult    1
## 46:                                   Black - with White         0 adult    1
## 47:                   Tricolor (Tan/Brown & Black & White)         0 adult    0
## 48:                                   Black - with White         1 young    1
## 49:                                                         Black         1 adult    1
## 50:                                   Black - with White         1 young    1
## 51:                                       Brown/Chocolate         0 young    1
## 52:                           Brown/Chocolate - with Black         0 young    1
## 53:                           Tan/Yellow/Fawn - with White         0 young    0
## 54:                           Red/Golden/Orange/Chestnut         0 young    0
## 55:        White - with Red, Golden, Orange or Chestnut         0 adult    1
## 56:                                   Brindle - with White         0 adult    1
## 57:                                   Black - with White         1 adult    1
##                                                         Color Black_Dog    Age  Sex
##        Size Housebroken Special_Needs  Kids  Dogs actually_treated
##      <char>      <num>          <num> <num> <num>            <lgcl>
##  1: medium          0              0     1     1              TRUE
##  2:  large          0              0     1     1             FALSE
##  3:  large          0              0     1     1             FALSE
##  4:  large          0              0     1     1              TRUE
##  5: medium          0              0     1     1              TRUE
##  6: medium          0              0     1     1              TRUE
##  7:  large          0              0     1     1             FALSE
##  8: medium          0              0     1     1              TRUE
```

```
##  9: medium             0             0      1     1            TRUE
## 10: medium             0             0      1     1           FALSE
## 11: medium             0             0      1     1           FALSE
## 12:  large             0             0      1     1           FALSE
## 13:  large             0             0      1     1            TRUE
## 14: medium             0             0      1     1           FALSE
## 15: medium             0             0      1     1            TRUE
## 16:  large             0             0      1     1            TRUE
## 17: medium             0             0      1     1           FALSE
## 18:  small             0             0      1     1           FALSE
## 19: medium             0             0      1     1            TRUE
## 20: medium             0             0      1     1           FALSE
## 21: medium             0             0      1     1            TRUE
## 22: medium             0             0      1     1           FALSE
## 23: medium             0             0      1     1           FALSE
## 24: medium             0             0      1     1           FALSE
## 25:  large             0             0      1     1           FALSE
## 26: medium             0             0      1     1            TRUE
## 27: medium             0             0      1     1           FALSE
## 28: medium             0             0      1     1            TRUE
## 29: medium             0             0      1     1            TRUE
## 30: medium             0             0      1     1            TRUE
## 31: medium             0             0      1     1            TRUE
## 32: medium             0             0      1     1           FALSE
## 33: medium             0             0      1     1           FALSE
## 34: medium             0             0      1     1           FALSE
## 35: medium             0             0      1     1            TRUE
## 36: medium             0             0      1     1           FALSE
## 37: medium             0             0      1     1           FALSE
## 38:  large             0             0      1     1           FALSE
## 39: medium             0             0      1     1           FALSE
## 40: medium             0             0      1     1           FALSE
## 41: medium             1             0      1     1            TRUE
## 42: medium             0             0      1     1           FALSE
## 43: medium             0             0      1     1           FALSE
## 44: medium             0             0      1     1           FALSE
## 45:  large             0             0      1     1            TRUE
## 46:  large             0             0      1     1           FALSE
## 47: medium             0             0      1     1            TRUE
## 48: medium             1             0      1     1           FALSE
## 49: medium             0             0      1     1            TRUE
## 50: medium             0             0      1     1           FALSE
## 51: medium             0             0      1     1            TRUE
## 52: medium             0             0      1     1           FALSE
## 53: medium             0             0      1     1           FALSE
## 54: medium             0             0      1     1           FALSE
## 55: medium             0             0      1     1           FALSE
## 56: medium             0             0      1     1            TRUE
## 57: medium             0             0      1     1           FALSE
##        Size Housebroken Special_Needs  Kids  Dogs actually_treated
```

```r
m1 <- experiment_data[ , lm(Outcome_Experiment~Treatment)]
m2 <- experiment_data[ , lm(Outcome_Experiment~Treatment+Stigma)]
m1$vcovHC_ <- vcovHC(m1)
```

```
m2$vcovHC_ <- vcovHC(m2)
stargazer(m1, m2,
          type = "text",
          se = list(sqrt(diag(m1$vcovHC_)),sqrt(diag(m2$vcovHC_))),
          title = "Treatment Effects With and Without Block Average Controls",
          column.labels = c("Without Block", "With Block"),
          covariate.labels = c("Treatment", "Block Average"),
          dep.var.labels = "Adoption Rate",
          model.numbers = FALSE,
          notes = "Robust standard errors in parentheses")
```

```
##
## Treatment Effects With and Without Block Average Controls
## ===========================================================
##                          Dependent variable:
##                      ---------------------------------------
##                                  Adoption Rate
##                       Without Block        With Block
## ----------------------------------------------------------
## Treatment                 0.127               0.118
##                          (0.132)             (0.133)
##
## Block Average                                 -0.183
##                                              (0.132)
##
## Constant                 0.321***            0.406***
##                          (0.092)             (0.115)
##
## ----------------------------------------------------------
## Observations               57                  57
## R2                        0.017               0.052
## Adjusted R2              -0.001               0.016
## Residual Std. Error   0.491 (df = 55)     0.487 (df = 54)
## F Statistic         0.949 (df = 1; 55)   1.468 (df = 2; 54)
## ===========================================================
## Note:                             *p<0.1; **p<0.05; ***p<0.01
##                        Robust standard errors in parentheses
```

The simple model tells us that having a bio leads to a ~13% greater probability of being adopted. When controling for stigma breeds, by being a stigma breed there is a ~18% reduction in adoption rate, however when being a stigma breed and having a bio that improves to only a ~6.5% reduction in adoption rate. However, the standard errors are very large which leads these coefficients to bot being stat sig.

```
first_stage <- lm(Treatment ~ Compliance + Stigma, data = experiment_data)
summary(first_stage)
```

```
##
## Call:
## lm(formula = Treatment ~ Compliance + Stigma, data = experiment_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.45788 -0.44485 -0.01086  0.54212  0.55515
##
## Coefficients:
```

```
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.99783    0.19861   5.024 5.89e-06 ***
## Compliance  -0.55298    0.21248  -2.603   0.0119 *
## Stigma       0.01303    0.13141   0.099   0.9214
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4835 on 54 degrees of freedom
## Multiple R-squared:  0.1138, Adjusted R-squared:  0.08093
## F-statistic: 3.466 on 2 and 54 DF,  p-value: 0.03837
```

```r
m3 <- experiment_data[ , ivreg(
  Outcome_Experiment ~ Compliance + Stigma | Treatment + Stigma
)]
m4 <- experiment_data[ , ivreg(
  Outcome_Experiment ~ Compliance + Stigma + Pretreat_LOS + Pretreat_views + Pretreat_open + Age + Sex
)]
m3$vcovHC_ <- vcovHC(m3)
m4$vcovHC_ <- vcovHC(m4)
```

```
## Warning in meatHC(x, type = type, omega = omega): HC3 covariances are
## numerically unstable for hat values close to 1 (and undefined if exactly 1) as
## for observation(s) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, ...
```

```r
stargazer(m3, m4,
          type = "text",
          se = list(sqrt(diag(m3$vcovHC_)),sqrt(diag(m4$vcovHC_))),
          title = "Treatment Effects of Compliars",
          column.labels = c("Small Model with Compliance (CATE)","Large Model with Compliance (CATE)"),
          dep.var.labels = "Adoption Rate",
          model.numbers = FALSE,
          notes = "Robust standard errors in parentheses")
```

```
##
## Treatment Effects of Compliars
## =================================================================================
##                                       Dependent variable:
##                  ----------------------------------------------------------------
##                                          Adoption Rate
##                  Small Model with Compliance (CATE) Large Model with Compliance (CATE)
## ---------------------------------------------------------------------------------
## Compliance                    -0.584
##                              (0.678)
##
## Stigma                        -0.121                           -0.144***
##                              (0.167)                            (0.028)
##
## Pretreat_LOS                                                   -0.002***
##                                                                (0.0003)
##
## Pretreat_views                                                -0.00004***
##                                                                (0.00001)
##
## Pretreat_open                                                  0.001***
##                                                                (0.0001)
```

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```
##
## Agepuppy                                                     0.517***
##                                                               (0.024)
##
## Agesenior                                                    -0.539***
##                                                               (0.037)
##
## Ageyoung                                                      0.039
##                                                               (0.071)
##
## Sex                                                          -0.210***
##                                                               (0.033)
##
## Sizemedium                                                    0.097***
##                                                               (0.006)
##
## Sizesmall                                                     0.817***
##                                                               (0.052)
##
## Black_Dog                                                    -0.176**
##                                                               (0.080)
##
## Constant                           0.961*                     0.615***
##                                    (0.577)                    (0.029)
##
## -------------------------------------------------------------------------------
## Observations                         57                         51
## R2                                  0.025                      0.237
## Adjusted R2                        -0.011                      0.022
## Residual Std. Error           0.494 (df = 54)            0.477 (df = 39)
## ===============================================================================
## Note:                                             *p<0.1; **p<0.05; ***p<0.01
##                                                 Robust standard errors in parentheses
```

```r
m5 <- experiment_data[Compliance==1, lm(Outcome_Experiment ~ Treatment)]
m6 <- experiment_data[Compliance==1, lm(Outcome_Experiment ~ Treatment + Stigma)]
m7 <- experiment_data[Compliance==1, lm(Outcome_Experiment ~ Treatment + Stigma +
                                Pretreat_LOS + Pretreat_views + Pretreat_open +
                                Age + Sex + Size + Black_Dog)]

# Use HC2 instead of HC3
vcov5 <- vcovHC(m5, type = "HC1")
vcov6 <- vcovHC(m6, type = "HC1")
vcov7 <- vcovHC(m7, type = "HC1")
```

```
## Warning in meatHC(x, type = type, omega = omega): HC1 covariances become (close
## to) singular if hat values are (close to) 1 as for observation(s) 10, 18, 31
```

```r
stargazer(
  m5, m6, m7,
  type = "text",
  se = list(
    sqrt(diag(vcov5)),
    sqrt(diag(vcov6)),
    sqrt(diag(vcov7))
```

```
  ),
  title = "Treatment Effects With and Without Block Average Controls",
  column.labels = c("Simple Model", "Blocked Model", "Full Model"),
  dep.var.labels = "Adoption Rate",
  model.numbers = FALSE,
  notes = "HC2 robust standard errors in parentheses"
)
```

```
##
## Treatment Effects With and Without Block Average Controls
## ================================================================================
##                                    Dependent variable:
##                    ----------------------------------------------------------
##                                       Adoption Rate
##                    Simple Model       Blocked Model        Full Model
## --------------------------------------------------------------------------------
## Treatment              0.070             0.072               0.111
##                       (0.137)           (0.138)             (0.151)
##
## Stigma                                  -0.117              -0.129
##                                         (0.136)             (0.159)
##
## Pretreat_LOS                                                -0.002
##                                                             (0.001)
##
## Pretreat_views                                             -0.00005
##                                                            (0.0001)
##
## Pretreat_open                                               0.001
##                                                             (0.001)
##
## Agepuppy                                                   0.578***
##                                                             (0.199)
##
## Agesenior                                                  -0.464**
##                                                             (0.220)
##
## Ageyoung                                                    0.038
##                                                             (0.189)
##
## Sex                                                        -0.207
##                                                             (0.161)
##
## Sizemedium                                                  0.073
##                                                             (0.170)
##
## Sizesmall                                                  0.846***
##                                                             (0.242)
##
## Black_Dog                                                  -0.157
##                                                             (0.163)
##
## Constant              0.321***          0.376***            0.583**
##                       (0.090)           (0.115)             (0.240)
```

```
## 
## -------------------------------------------------------------------------------
## Observations                 51              51              51
## R2                         0.005           0.020           0.249
## Adjusted R2               -0.015          -0.021           0.011
## Residual Std. Error  0.486 (df = 49)   0.488 (df = 48)    0.480 (df = 38)
## F Statistic      0.261 (df = 1; 49) 0.494 (df = 2; 48) 1.047 (df = 12; 38)
## ===============================================================================
## Note:                                        *p<0.1; **p<0.05; ***p<0.01
##                                   HC2 robust standard errors in parentheses
```

```r
# 1) Subset data first
d <- experiment_data[Compliance == 1, ]

# 2) Fit models
m5 <- lm(Outcome_Experiment ~ Treatment, data = d)
m6 <- lm(Outcome_Experiment ~ Treatment + Stigma, data = d)
m7 <- lm(
  Outcome_Experiment ~ Treatment + Stigma +
    Pretreat_LOS + Pretreat_views + Pretreat_open +
    Age + Sex + Size + Black_Dog,
  data = d
)

# 3) Helper to get robust SE vector that is aligned to the coef() order
robust_se <- function(model, type = "HC1") {
  V <- vcovHC(model, type = type)
  se <- sqrt(diag(V))
  # ensure order matches coef()
  se[match(names(coef(model)), names(se))]
}

se_m5 <- robust_se(m5, type = "HC1")
se_m6 <- robust_se(m6, type = "HC1")
se_m7 <- robust_se(m7, type = "HC1")
```

```
## Warning in meatHC(x, type = type, omega = omega): HC1 covariances become (close
## to) singular if hat values are (close to) 1 as for observation(s) 10, 18, 31
```

```r
# (optional) sanity checks
length(coef(m5)); length(se_m5)
```

```
## [1] 2
```

```
## [1] 2
```

```r
length(coef(m6)); length(se_m6)
```

```
## [1] 3
```

```
## [1] 3
```

```r
length(coef(m7)); length(se_m7)
```

```
## [1] 13
```

```
## [1] 13
```

```r
# 4) Stargazer with aligned SEs
stargazer(
  m5, m6, m7,
  type = "text",
  se = list(se_m5, se_m6, se_m7),
  title = "Treatment Effects With and Without Block Average Controls",
  column.labels = c("Simple Model", "Blocked Model", "Full Model"),
  dep.var.labels = "Adoption Rate",
  model.numbers = FALSE,
  notes = "Robust standard errors (HC2) in parentheses"
)
```

```
##
## Treatment Effects With and Without Block Average Controls
## ==========================================================================
##                                     Dependent variable:
##                      -----------------------------------------------------
##                                        Adoption Rate
##                      Simple Model     Blocked Model        Full Model
## --------------------------------------------------------------------------
## Treatment                0.070            0.072               0.111
##                         (0.137)          (0.138)             (0.151)
##
## Stigma                                   -0.117              -0.129
##                                          (0.136)             (0.159)
##
## Pretreat_LOS                                                 -0.002
##                                                              (0.001)
##
## Pretreat_views                                              -0.00005
##                                                             (0.0001)
##
## Pretreat_open                                                0.001
##                                                              (0.001)
##
## Agepuppy                                                    0.578***
##                                                              (0.199)
##
## Agesenior                                                   -0.464**
##                                                              (0.220)
##
## Ageyoung                                                     0.038
##                                                              (0.189)
##
## Sex                                                         -0.207
##                                                              (0.161)
##
## Sizemedium                                                   0.073
##                                                              (0.170)
##
## Sizesmall                                                   0.846***
##                                                              (0.242)
##
## Black_Dog                                                   -0.157
```

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```
##                                                                  (0.163)
##
## Constant                    0.321***          0.376***          0.583**
##                             (0.090)           (0.115)           (0.240)
##
## ------------------------------------------------------------------------------
## Observations                   51                51                51
## R2                           0.005             0.020             0.249
## Adjusted R2                  -0.015            -0.021             0.011
## Residual Std. Error  0.486 (df = 49)    0.488 (df = 48)    0.480 (df = 38)
## F Statistic         0.261 (df = 1; 49) 0.494 (df = 2; 48) 1.047 (df = 12; 38)
## ==============================================================================
## Note:                                        *p<0.1; **p<0.05; ***p<0.01
##                               Robust standard errors (HC2) in parentheses
```

Results

Tables: The findings of the experiment can be read through a limited number of tables. Tables: - Communicate a specific point - Are titled, have axes labeled, and legends included. - Include a caption that is informative enough that the figure is readable without reading more than the Abstract of the paper and knowing the treatments and outcome measures.

Supporting Figures: - Communicate a specific point - Are titled, have axes labeled, and legends included. - Include a caption that is informative enough that the figure is readable without reading more than the Abstract of the paper and knowing the treatments and outcome measures.

**Clinton suggested: - SJ plot - Box plot - Scatter plot with mean adoption rate for treatment/control

Lessons Learned and Further Research Suggestions