# THE EFFECTS OF "REDUCE" AND "ELIMINATE" APPEALS ON INDIVIDUAL MEAT CONSUMPTION

awal

Animal Welfare Action Lab

REDUCETARIAN

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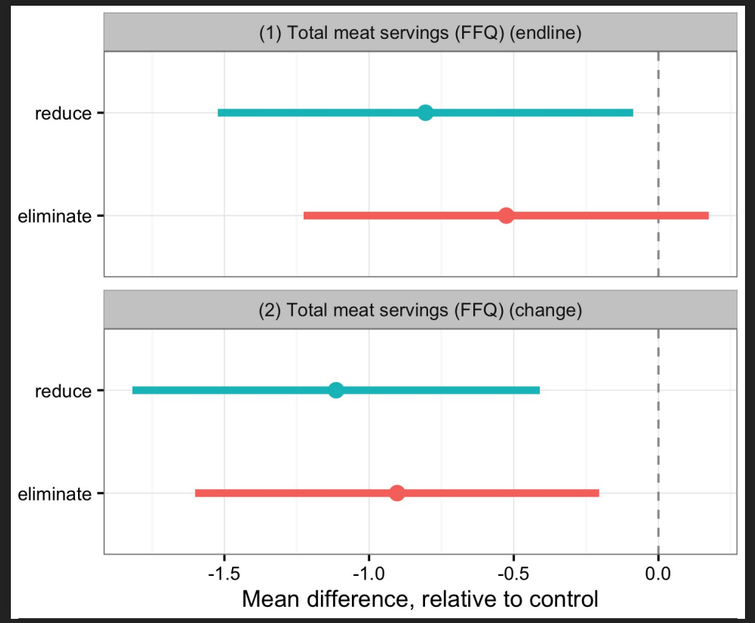
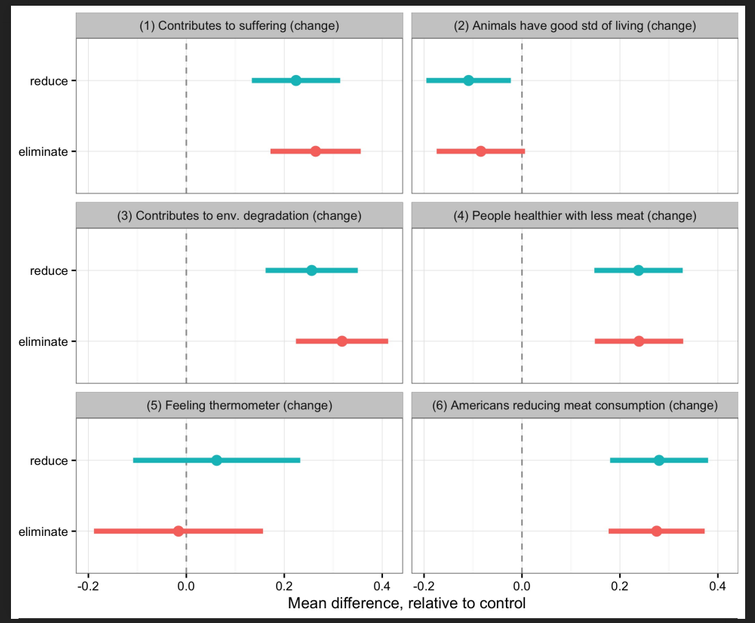
# TAKEAWAYS

- 2,237 MTurk subjects were randomly assigned to receive one of three news articles: a **reduce** appeal, **eliminate** appeal, or control appeal.
- Meat consumption and attitudes were measured 1 week before treatment and 5 weeks after.
- The **reduce** and **eliminate** appeals decreased self-reported meat consumption by 0.9 - 1.1 servings of meat consumed per week (6-7%).
- No evidence that the reduce appeal was any more/less effective than the eliminate appeal.

## Effects on self-reported meat consumption




## Effects on attitudes



# MOTIVATION

- There is a growing literature on vegetarianism, examining:
  - individual motivations for going vegetarian;
  - predictors of vegetarian diet adoption;
  - reasons for vegetarian recidivism;
  - how meat-eaters view vegetarians;
  - ...

*(For reviews, see Ruby et al. 2012; Loughnan et al. 2014.)*

- However...
  - There is little **experimental** research examining the effectiveness of interventions for reducing individual meat consumption.

# RESEARCH QUESTIONS

1. Does reading an article about factory farming inspire people to reduce their consumption of animal products?

2. Is it more effective to ask readers to **stop** eating meat entirely, or to ask them to **reduce** their meat consumption without necessarily eliminating it from their diet altogether?

# RESEARCH DESIGN

- Three-wave MTurk survey experiment:
  - Week 0: Baseline survey (N = 3, 076).
  - Week 1: Treatment exposure (N = 2, 685
    ).
  - Week 6: Endline survey (N = 2, 237
    ).

- Attrition: 2, 237
  of 3, 076
  participants completed all three waves (72.40%).

# EXPERIMENTAL ARMS

## 1. CONTROL APPEAL

Participants were asked to read a news article outlining the benefits of walking as a form of exercise.

### The Simple Yet Potent Exercise That Benefits Everyone

*PUBLISHED: 18 June 2016*

Share

Walking. We all know it's good for us. But why? Not only is walking great for our health, but it has a profound socioeconomic impact on our communities. Due to its widespread benefits, the Surgeon General has declared a call to action to promote walking and increase walkability in our communities. But, what really makes walking so great?

Regular physical activity is essential for good health. It reduces the risk of chronic diseases (like heart disease, stroke, certain cancers and type 2 diabetes), promotes healthy weight, reduces the risk for depression, lowers blood pressure and decreases stress. All it takes is 30 minutes a day. Moderate walking is a terrific form of exercise, as it doesn't over-stress that body like some more intense activities can. Walking is good for

# EXPERIMENTAL ARMS

## 2. "REDUCE" APPEAL

Participants were asked to read a news article about factory farming that described a growing number of people who are **reducing - but not entirely eliminating - their meat consumption** and encouraged readers to do the same.

### Rise of people pledging to become “reducetarian”

*PUBLISHED: 18 June 2016*

Share

*Latest campaign encourages people to go “reducetarian” with respect to their own diets*

You can't help feeling that eating less meat is becoming unavoidably mainstream, with more and more people choosing to become “reducetarians” by reducing their consumption of red meat, poultry, and seafood without cutting these products out of their diets entirely. Recent research from data analysts at Mintel has shown that one in eight adults in the US are eating less meat, including up to one in five young adults. In the US, over six million people have reduced their meat intake, and that number is rising.

To learn more, I reached out to Jack Thompson, host of a *Future of Food* talk entitled "Why I’m a Reducetarian" and the founder of a new campaign to encourage Americans to reduce their meat intake. A 25-year-old New Yorker who grew up eating a standard American diet, Thompson shared his thoughts with me on why he’s urging people to join the movement and pledge to become reducetarian.

# EXPERIMENTAL ARMS

## 3. "ELIMINATE" APPEAL

Participants were asked to read a news article about factory farming that described a growing number of people who are **eliminating meat from their diet** and encouraged readers to do the same.

### Rise of people pledging to become vegetarian

*PUBLISHED: 18 June 2016*

Share

*Latest campaign encourages people to go vegetarian with respect to their own diets*

You can't help feeling that eliminating meat is becoming unavoidably mainstream, with more and more people choosing to become vegetarians by cutting out red meat, poultry, and seafood from their diets. Recent research from data analysts at Mintel has shown that one in eight adults in the US have stopped eating meat, including up to one in five young adults. In the US, over six million people have eliminated meat from their diets, and that number is rising.

To learn more, I reached out to Jack Thompson, host of a *Future of Food* talk entitled "Why I'm a Vegetarian" and the founder of a new campaign to encourage Americans to leave meat off their plates. A 25-year-old New Yorker who grew up eating a standard American diet, Thompson shared his thoughts with me on why he's urging people to join the

# RESEARCH DESIGN

- Three-wave MTurk survey experiment:
  - Week 0: Baseline survey ($N = 3,076$).
  - **Week 1: Treatment exposure ($N = 2,685$).**
  - Week 6: Endline survey ($N = 2,237$).

- Attrition: $2,237$ of $3,076$ participants completed all three waves (72.40%).

# RESEARCH DESIGN

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# OUTCOME MEASURES

## MAIN OUTCOMES:

- Number of servings of meat per week.
- Attitudes towards factory farming. (1-7 agree/disagree)

## SECONDARY OUTCOMES:

- intentions to change meat consumption. (1-7 scale)
- perceptions of descriptive norms towards meat consumption. (1-7 agree/disagree)
- perceptions of vegetarians. (1-10 feeling therm.)
- perceived difficulty of reducing meat consumption. (1-7 scale)
- perceptions of animal intelligence. (1-7 scale)
- information exposure. (# discussions, # media items read in past 30 days)

## Food frequency questionnaire (FFQ)

Stanford

Thinking about your diet over the past 30 days, please select the responses that best describe how often you eat each of the following types of food.

The image below shows the approximate size of a single serving for different categories of food.

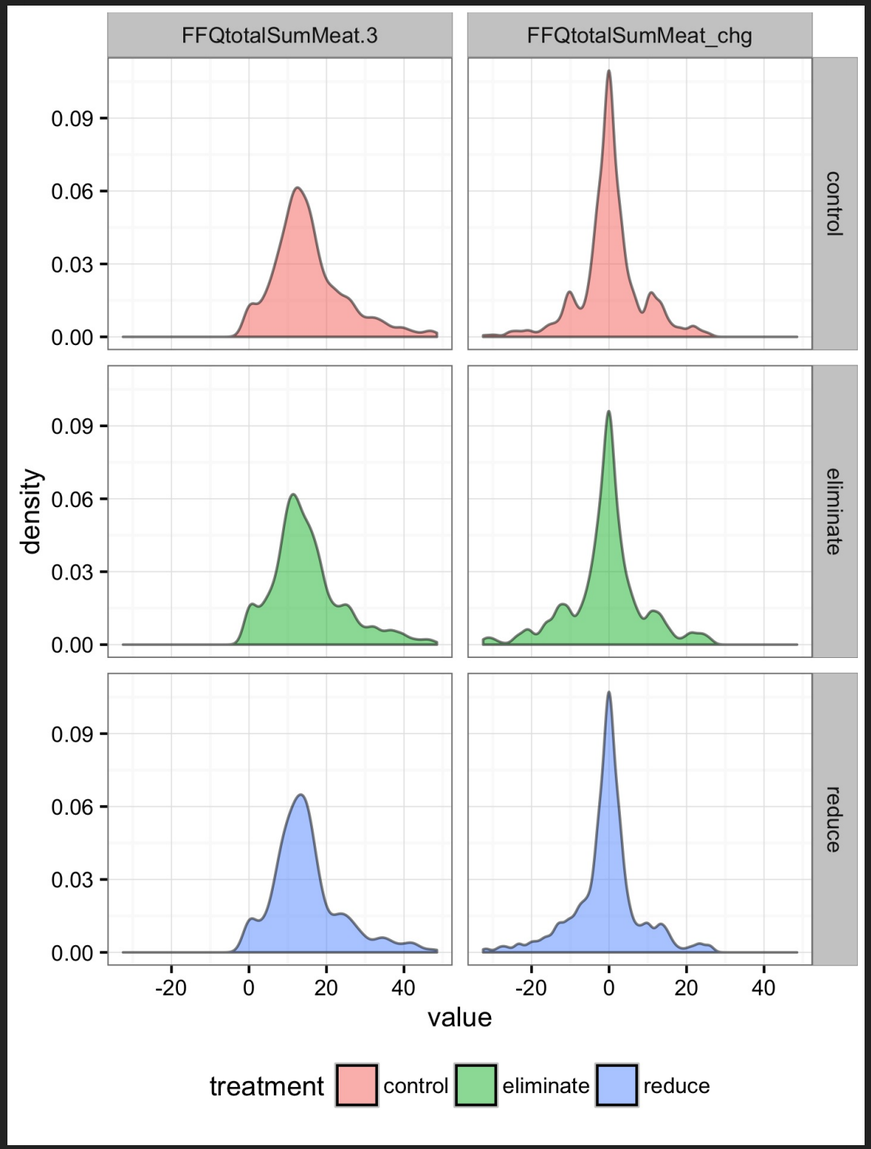
| | Frequency | | | | |
|---|---|---|---|---|---|
| | never | less than 1 time per week | 1-6 times per week | 1-3 times per day | 4 or more times per day |
| Dairy (cheese, milk, yogurt, etc.) | ○ | ○ | ○ | ○ | ○ |
| Turkey (turkey dinner, turkey sandwich, in soup, etc.) | ○ | ○ | ○ | ○ | ○ |
| Vegetables (carrots, mushrooms, potatoes, etc.) | ○ | ○ | ○ | ○ | ○ |
| Nuts (almonds, cashews, walnuts, peanuts, etc.) | ○ | ○ | ○ | ○ | ○ |
| Veggie meats (tofu, veggie dogs, veggie burgers, tempeh, etc.) | ○ | ○ | ○ | ○ | ○ |
| Pork (ham, pork chops, ribs, etc.) | ○ | ○ | ○ | ○ | ○ |
| Fish and seafood (tuna, shrimp, crab, etc.) | ○ | ○ | ○ | ○ | ○ |

# MODEL SPECIFICATION

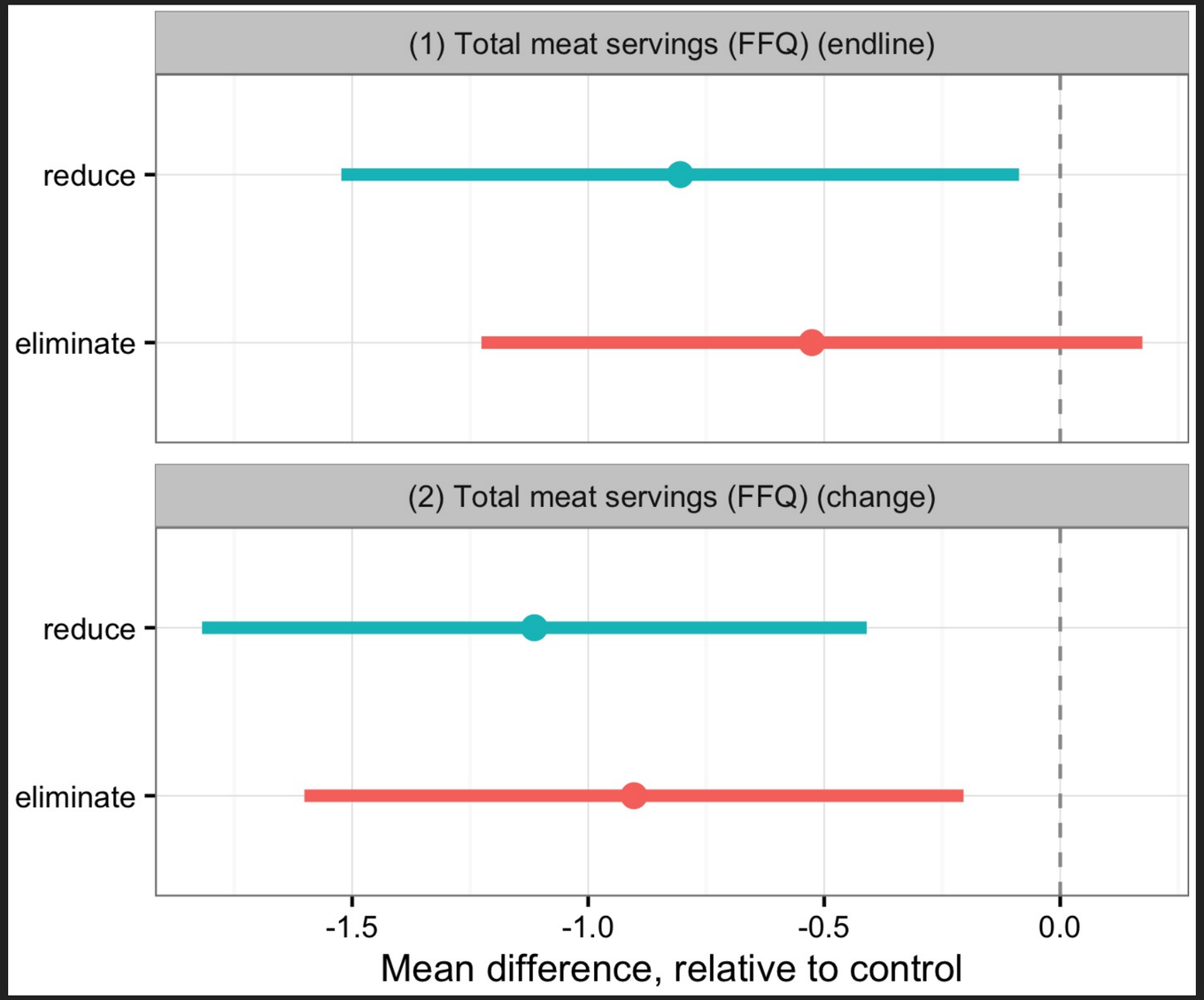
$$y_i = \alpha_0 + \tau_0 \mathbf{1}(reduce_i) + \tau_1 \mathbf{1}(eliminate_i) + \sum_{k=1}^{K} \delta_k b_i$$

$y_i =$ outcome measure for subject $i$.
$\alpha_i =$ model intercept.
$\tau_0 =$ Average treatment effect (ATE) of reduce appeal.
$\tau_1 =$ Average treatment effect (ATE) of eliminate appeal.
$\mathbf{1}(reduce_i) =$ 1 if assigned to reduce appeal, 0 otherwise.
$\mathbf{1}(eliminate_i) =$ 1 if assigned to eliminate appeal, 0 otherwise.
$\delta_k =$ block coefficient.
$b_i =$ block indicator.

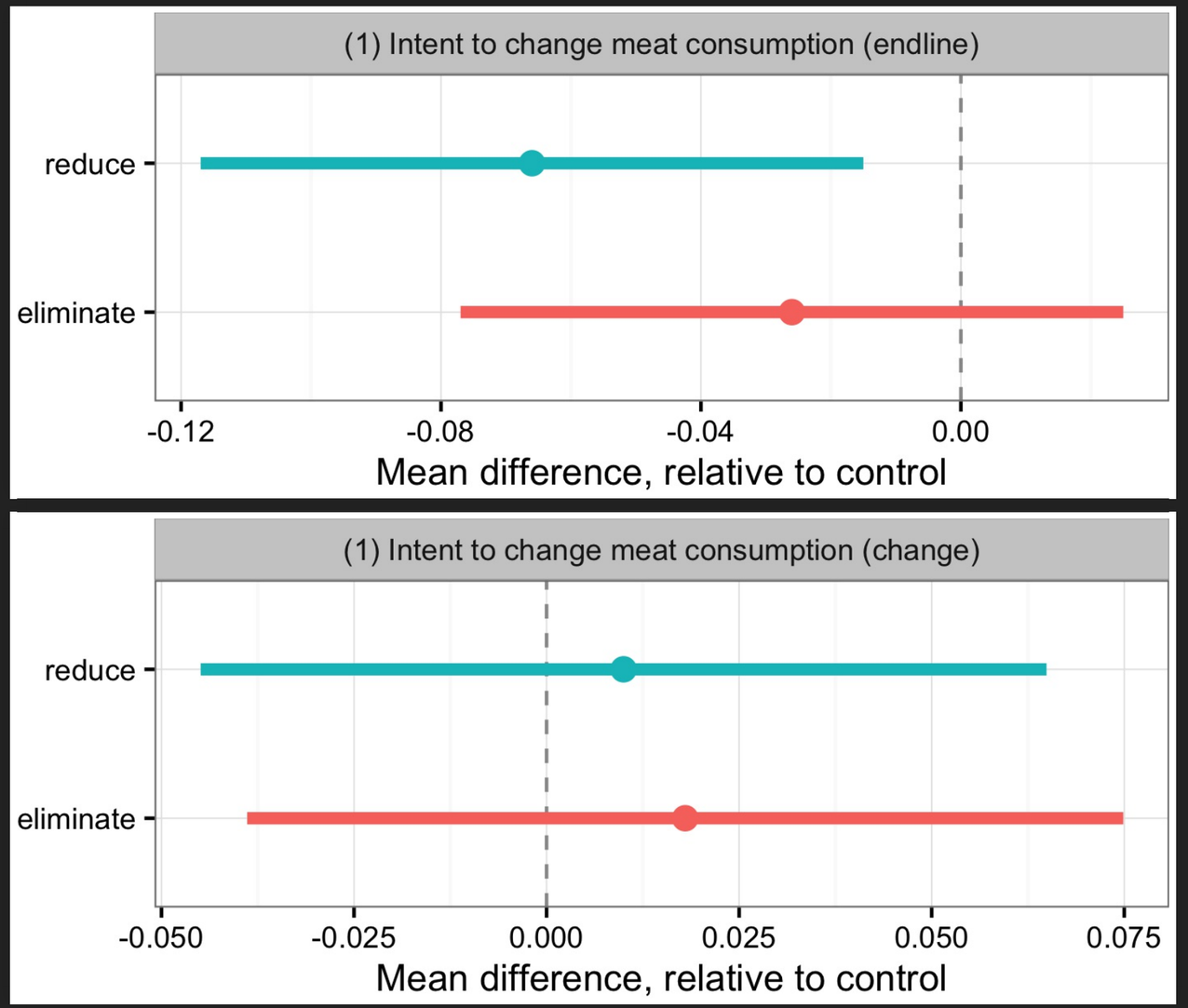
# SELF-REPORTED MEAT CONSUMPTION



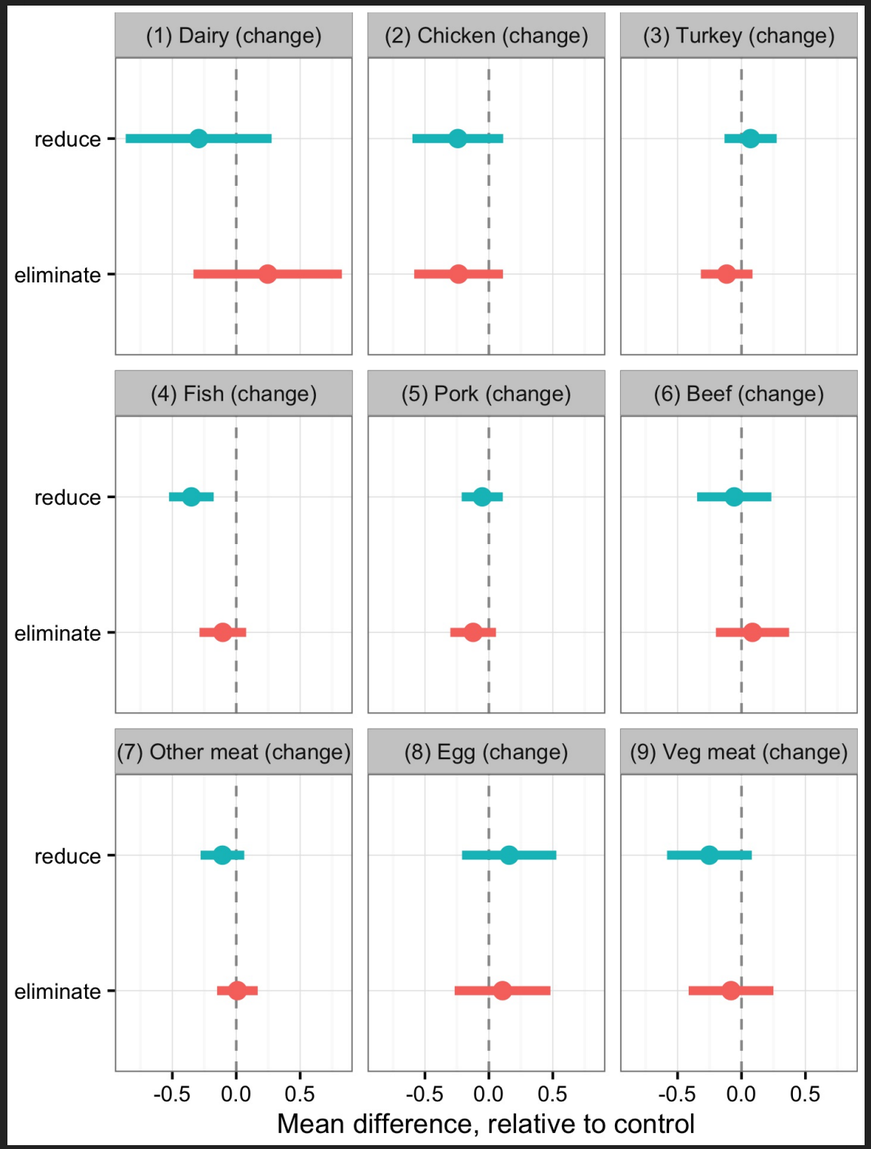
# EFFECTS ON SELF-REPORTED MEAT CONSUMPTION



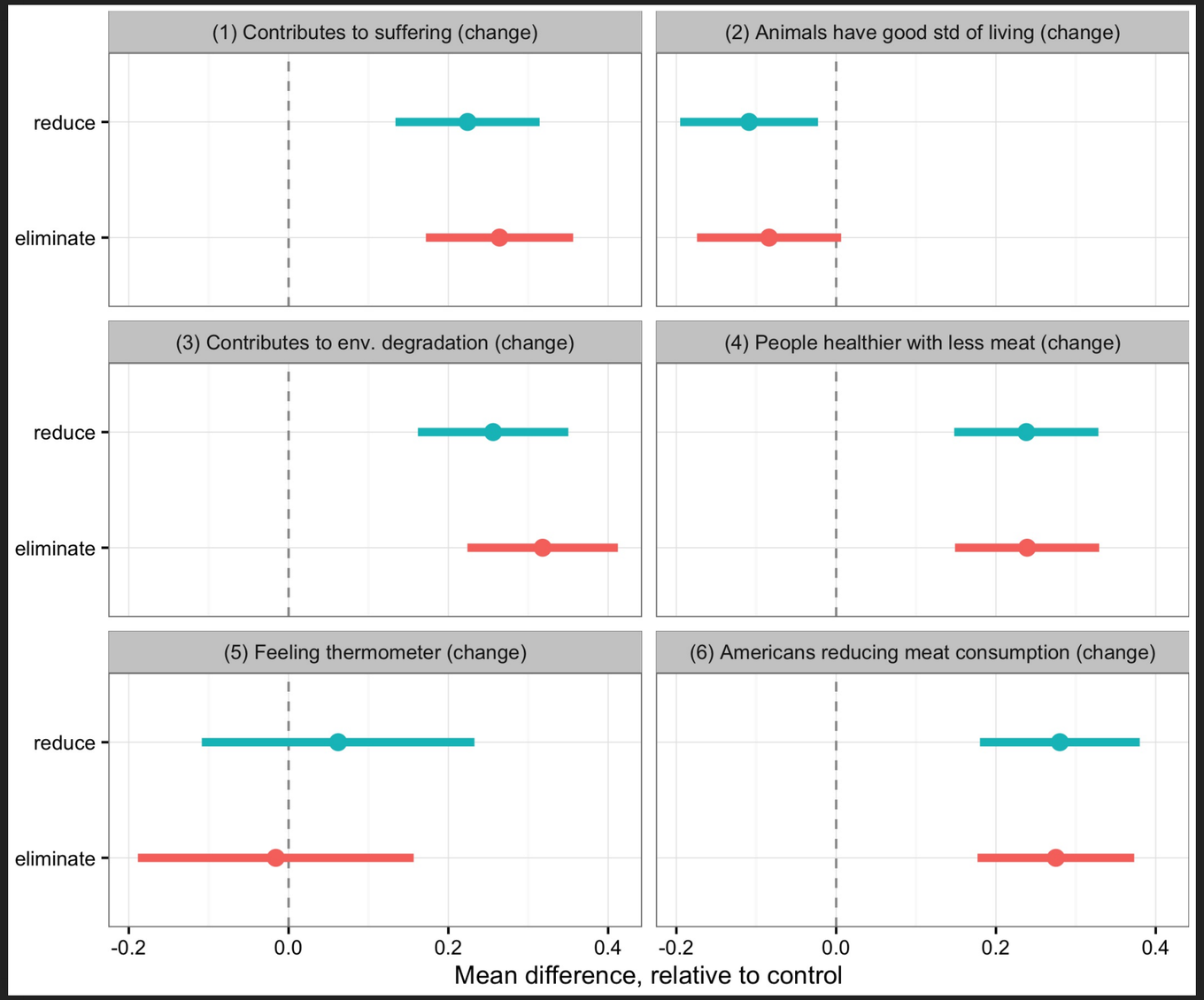
# EFFECTS ON INTENTIONS TO CHANGE MEAT CONSUMPTION



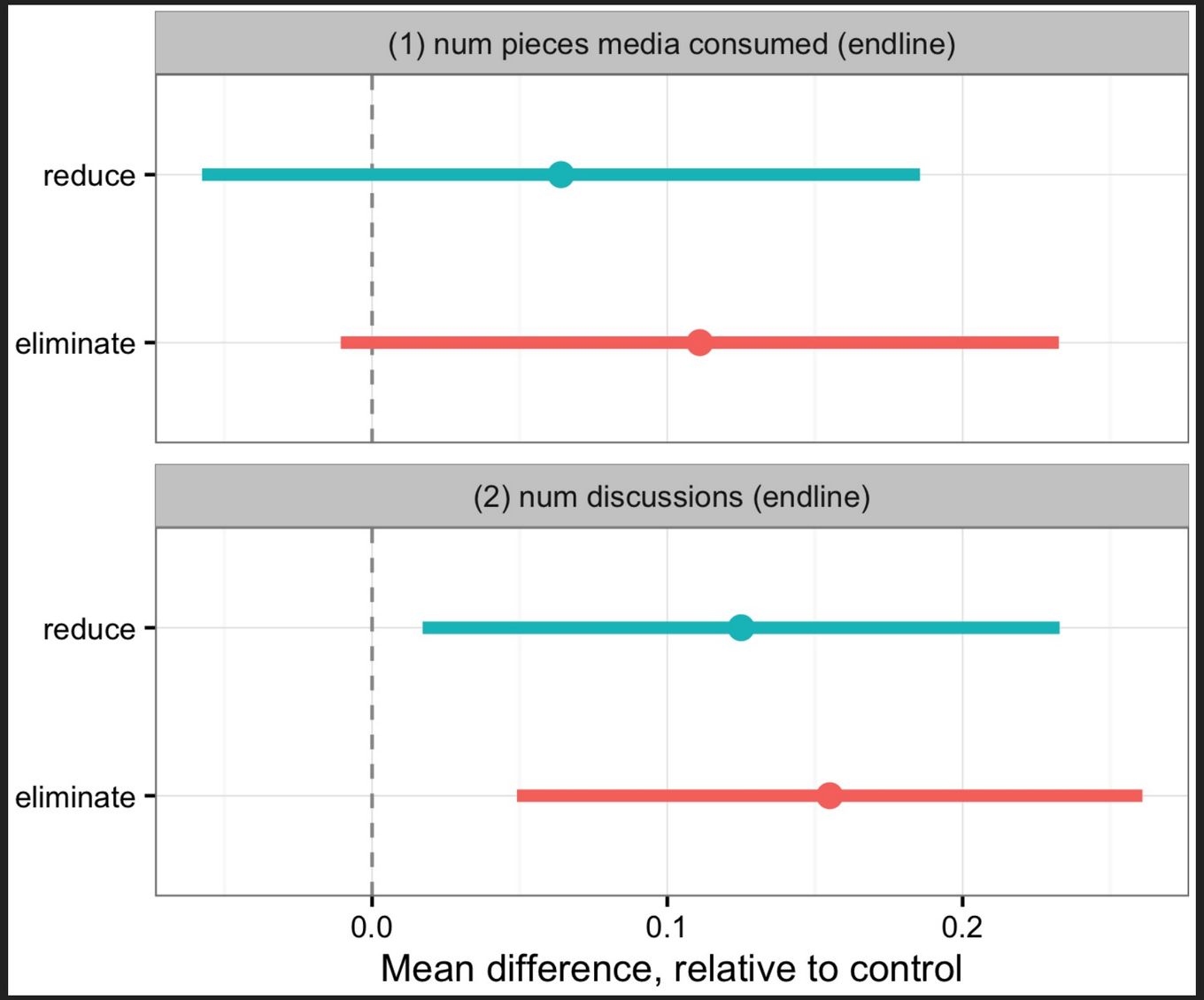
# EFFECTS ON CONSUMPTION, BY ANIMAL TYPE



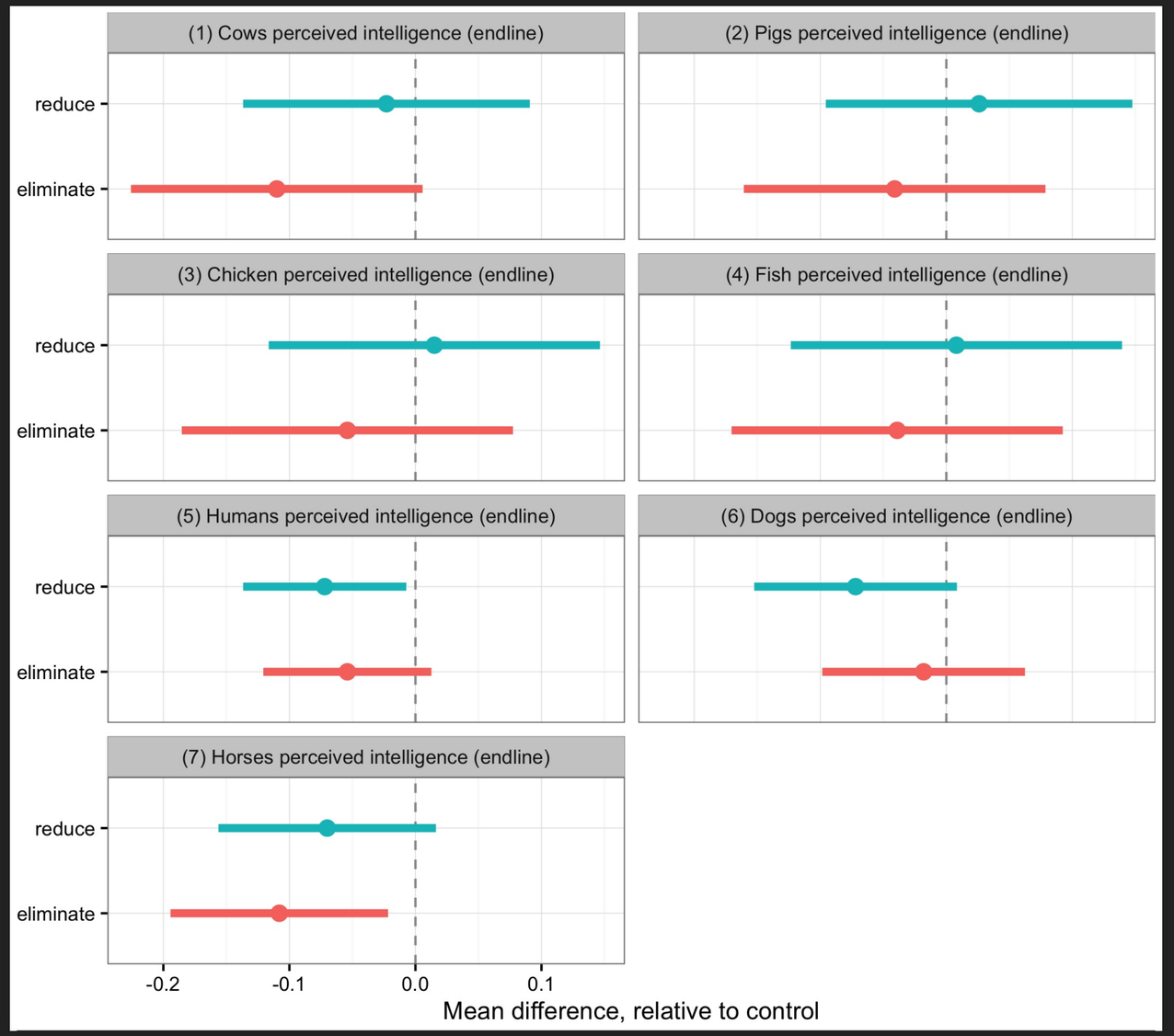
# EFFECTS ON ATTITUDES



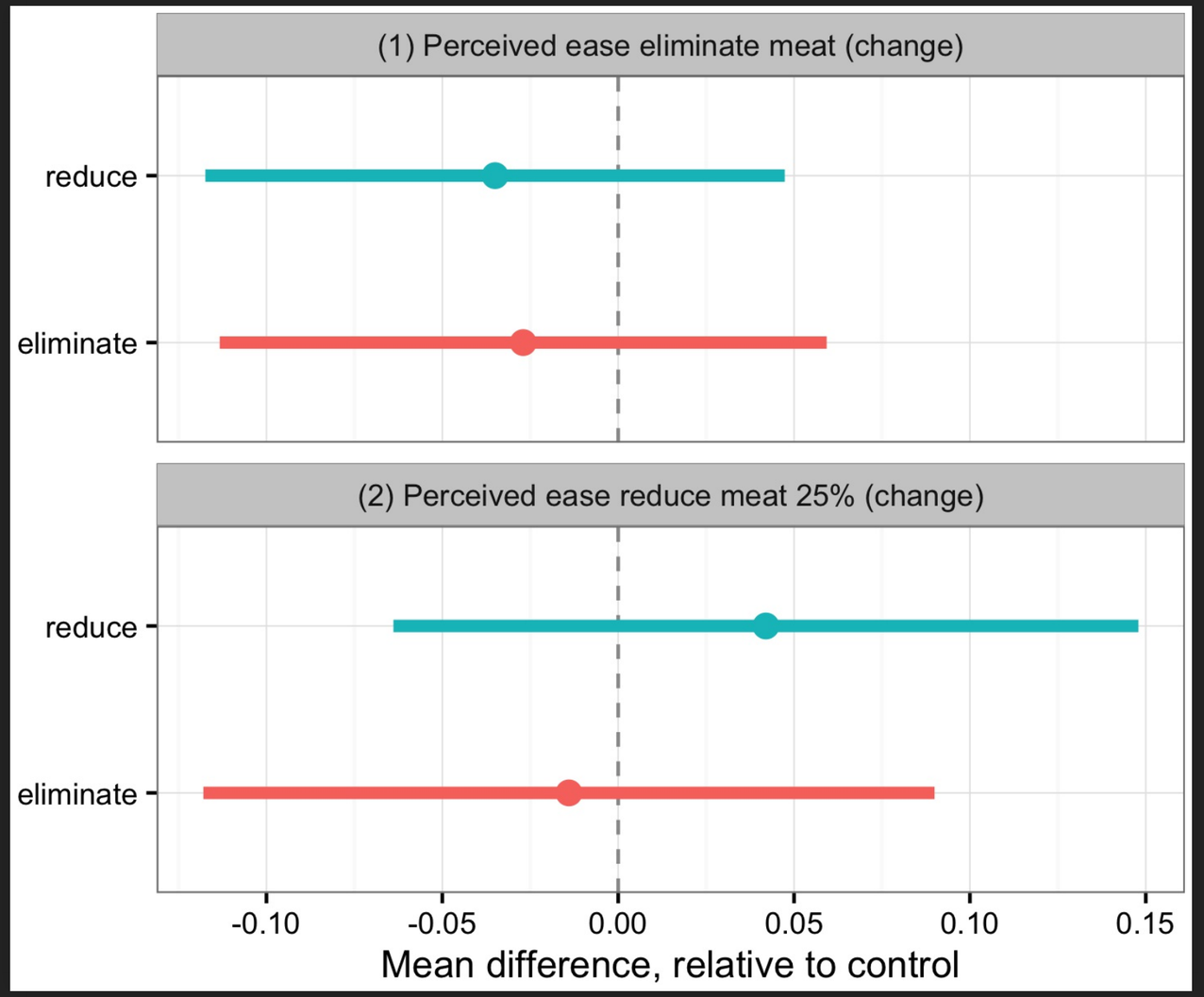
# EFFECTS ON INFORMATION EXPOSURE



# EFFECTS ON PERCEPTIONS OF ANIMAL INTELLIGENCE



# EFFECTS ON PERCEIVED DIFFICULTY OF REDUCING MEAT CONSUMPTION



# ROBUSTNESS

- Concern: was there differential attrition across treatment groups, leading to compositional differences that bias the estimated treatment effects?
- Response: **No. Pre-treatment outcomes and covariates are balanced across groups.**

# PRE-TREATMENT BALANCE (REDUCE)

Table 1: Balance table for reduce appeal

| | Treatment | | Control | | Difference | |
|---|---|---|---|---|---|---|
| | Mean | N | Mean | N | Mean diff. | p-value |
| Dairy (baseline) | 9.64 | 739 | 9.50 | 741 | 0.14 | 0.70 |
| Chicken (baseline) | 4.53 | 728 | 4.46 | 729 | 0.08 | 0.72 |
| Turkey (baseline) | 2.21 | 735 | 2.18 | 734 | 0.03 | 0.87 |
| Fish (baseline) | 2.14 | 735 | 2.15 | 735 | −0.02 | 0.90 |
| Pork (baseline) | 2.21 | 737 | 2.18 | 741 | 0.03 | 0.83 |
| Beef (baseline) | 3.54 | 729 | 3.45 | 736 | 0.09 | 0.64 |
| Other meat (baseline) | 1.42 | 732 | 1.19 | 734 | 0.22 | 0.12 |
| Egg (baseline) | 4.07 | 729 | 4.52 | 734 | −0.45 | 0.04 |
| Veg meat (baseline) | 1.70 | 725 | 1.68 | 736 | 0.02 | 0.91 |
| Total meat servings (FFQ) (baseline) | 15.55 | 719 | 15.37 | 726 | 0.17 | 0.74 |
| How often eat meat (baseline) | 5.11 | 739 | 5.06 | 742 | 0.05 | 0.51 |
| Contributes to suffering (baseline) | 4.09 | 737 | 4.13 | 741 | −0.04 | 0.68 |
| Animals have good std of living (baseline) | 3.09 | 723 | 3.01 | 732 | 0.08 | 0.28 |
| Contributes to env. degradation (baseline) | 4.12 | 738 | 4.13 | 742 | −0.02 | 0.85 |
| People healthier with less meat (baseline) | 4.44 | 738 | 4.38 | 742 | 0.06 | 0.48 |
| Feeling thermometer (baseline) | 6.42 | 671 | 6.59 | 655 | −0.18 | 0.19 |
| Americans reducing meat consumption (baseline) | 4.24 | 720 | 4.23 | 726 | 0.01 | 0.84 |
| Intent to change meat consumption (baseline) | 3.80 | 716 | 3.83 | 715 | −0.03 | 0.29 |
| Perceived ease eliminate meat (baseline) | 2.25 | 738 | 2.32 | 742 | −0.07 | 0.42 |
| Perceived ease reduce meat 25% (baseline) | 4.04 | 738 | 4.08 | 742 | −0.05 | 0.62 |
| Intent to change fruit/veg consumption (baseline) | 4.88 | 737 | 4.97 | 737 | −0.09 | 0.05 |
| Fruit servings (FFQ) (baseline) | 8.88 | 737 | 9.04 | 742 | −0.16 | 0.67 |
| Veg servings (FFQ) (baseline) | 9.81 | 734 | 10.61 | 737 | −0.80 | 0.03 |
| Nuts servings (FFQ) (baseline) | 3.66 | 723 | 3.79 | 726 | −0.13 | 0.55 |
| Beans servings (FFQ) (baseline) | 3.27 | 731 | 3.07 | 737 | 0.20 | 0.29 |
| Grain servings (FFQ) (baseline) | 10.83 | 731 | 10.35 | 732 | 0.48 | 0.20 |

# PRE-TREATMENT BALANCE (ELIMINATE)

Table 2: Balance table for eliminate appeal

| | Treatment | | Control | | Difference | |
|---|---|---|---|---|---|---|
| | Mean | N | Mean | N | Mean diff. | p-value |
| Dairy (baseline) | 9.37 | 754 | 9.50 | 741 | −0.13 | 0.73 |
| Chicken (baseline) | 4.60 | 737 | 4.46 | 729 | 0.14 | 0.51 |
| Turkey (baseline) | 2.28 | 748 | 2.18 | 734 | 0.09 | 0.54 |
| Fish (baseline) | 2.19 | 753 | 2.15 | 735 | 0.03 | 0.80 |
| Pork (baseline) | 2.48 | 751 | 2.18 | 741 | 0.29 | 0.05 |
| Beef (baseline) | 3.41 | 750 | 3.45 | 736 | −0.04 | 0.82 |
| Other meat (baseline) | 1.27 | 748 | 1.19 | 734 | 0.08 | 0.55 |
| Egg (baseline) | 4.41 | 745 | 4.52 | 734 | −0.11 | 0.62 |
| Veg meat (baseline) | 1.67 | 748 | 1.68 | 736 | −0.01 | 0.96 |
| Total meat servings (FFQ) (baseline) | 15.95 | 738 | 15.37 | 726 | 0.58 | 0.28 |
| How often eat meat (baseline) | 5.11 | 756 | 5.06 | 742 | 0.05 | 0.51 |
| Contributes to suffering (baseline) | 4.09 | 755 | 4.13 | 741 | −0.04 | 0.67 |
| Animals have good std of living (baseline) | 3.02 | 747 | 3.01 | 732 | 0.01 | 0.89 |
| Contributes to env. degradation (baseline) | 4.08 | 753 | 4.13 | 742 | −0.05 | 0.55 |
| People healthier with less meat (baseline) | 4.36 | 754 | 4.38 | 742 | −0.02 | 0.78 |
| Feeling thermometer (baseline) | 6.64 | 698 | 6.59 | 655 | 0.04 | 0.74 |
| Americans reducing meat consumption (baseline) | 4.24 | 739 | 4.23 | 726 | 0.01 | 0.87 |
| Intent to change meat consumption (baseline) | 3.81 | 730 | 3.83 | 715 | −0.02 | 0.49 |
| Perceived ease eliminate meat (baseline) | 2.27 | 755 | 2.32 | 742 | −0.05 | 0.57 |
| Perceived ease reduce meat 25% (baseline) | 4.10 | 756 | 4.08 | 742 | 0.02 | 0.86 |
| Intent to change fruit/veg consumption (baseline) | 4.91 | 742 | 4.97 | 737 | −0.06 | 0.19 |
| Fruit servings (FFQ) (baseline) | 8.70 | 754 | 9.04 | 742 | −0.34 | 0.35 |
| Veg servings (FFQ) (baseline) | 10.35 | 745 | 10.61 | 737 | −0.26 | 0.49 |
| Nuts servings (FFQ) (baseline) | 3.80 | 743 | 3.79 | 726 | 0.01 | 0.95 |
| Beans servings (FFQ) (baseline) | 3.35 | 748 | 3.07 | 737 | 0.28 | 0.14 |
| Grain servings (FFQ) (baseline) | 10.39 | 741 | 10.35 | 732 | 0.04 | 0.92 |

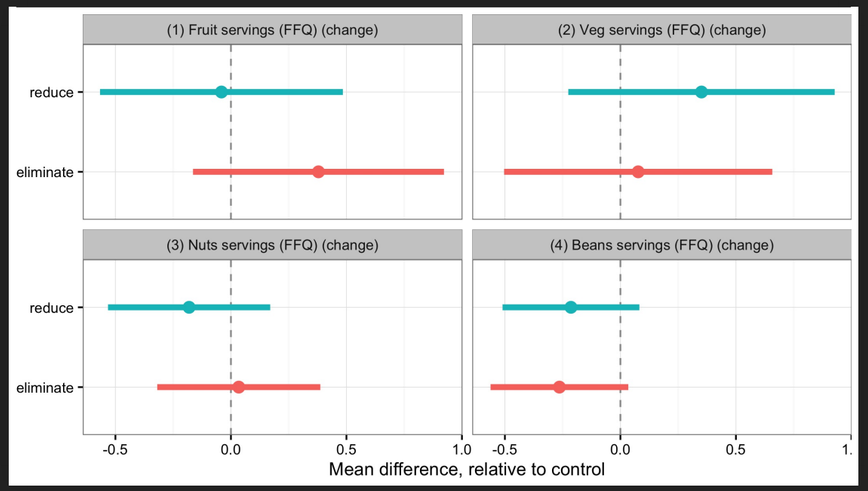
# ROBUSTNESS

- Concern: multiple hypothesis testing leads to false positives (p-hacking!).
- Response: **results are robust to p-value corrections using a constraint on the weighted false discovery rate.** (Benjamini and Hochberg 1997)

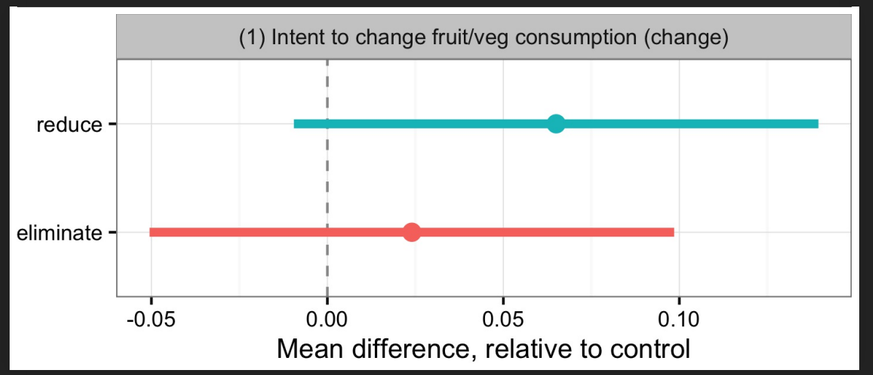
# ROBUSTNESS

- Concern: social desirability bias.
- Response:
  - **Would require subjects to make the link between treatment and survey 5 weeks later.**
  - **We don't observe large effects on other variables prone to social desirability.** (e.g. intentions to change, perceptions of animal intelligence)
  - **We don't observe effects on "placebo outcomes".** (e.g. intent to change fruit/veg consumption)

## Effects on non-meat consumption




## Effects on intentions to change fruit/veg consumption



# WHERE DO WE GO FROM HERE?

## AVENUES FOR FURTHER RESEARCH:

- Examine longer term effects.
- Collect *behavioral* measures.
- Increase ecological validity (field experiments!).
- Examine a wider range of messaging appeals.
- Examine messaging appeals in other domains (e.g. leaflets, online ads).

# WHERE DO WE GO FROM HERE?

## PRACTICAL IMPLICATIONS:

- Are "reduce" appeals more effective than "eliminate" appeals?
  - **We did not find any evidence to suggest one appeal is more effective than another.**
- Should animal advocates use explicit "reduce" and "eliminate" appeals instead of other messaging appeals they are currently using?
  - **Too early to say. We don't have strong evidence on the effectiveness of many appeals.**
- Are the effects of reduce/eliminate appeals likely to be similar in mediums other than news articles (e.g. leaflets, online ads)?
  - **Not sure. This study only estimated the effects of reduce/eliminate appeals in the context of a news article.**

# THE EFFECTS OF "REDUCE" AND "ELIMINATE" APPEALS ON INDIVIDUAL MEAT CONSUMPTION

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Animal Welfare Action Lab

REDUCETARIAN

Read the working paper: osf.io/nxrx3/
Raw data and code: github.com/bnjmacdonald/reducetarian-messaging-study
Study pre-registration: osf.io/f3s25/

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# EFFECTS ON SELF-REPORTED MEAT CONSUMPTION

Table 3: Reduce appeal effects on main outcomes (with blocking)

| | Control mean | Treated mean | Effect | SE | p-value |
|---|---|---|---|---|---|
| Total meat servings (FFQ) (endline) | 15.39 | 14.94 | −0.80 | 0.37 | 0.03 |
| Total meat servings (FFQ) (change) | 0.30 | −0.70 | −1.11 | 0.36 | 0.00 |

Table 4: Eliminate appeal effects on main outcomes (with blocking)

| | Control mean | Treated mean | Effect | SE | p-value |
|---|---|---|---|---|---|
| Total meat servings (FFQ) (endline) | 15.39 | 15.11 | −0.53 | 0.36 | 0.14 |
| Total meat servings (FFQ) (change) | 0.30 | −0.79 | −0.90 | 0.36 | 0.01 |