

THE IMPACT OF INFORMATION ON ANIMAL PRODUCT CONSUMPTION

BY

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THESIS

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Abstract

Consumers' dietary preferences for animal products such as meat, dairy, and eggs carry a profound influence on environmental sustainability, public health, and animal rights. While shifting preferences towards plant products is important to many organizations working across those three fields, there are not many peer-reviewed studies available concerning the most effective methods of doing so. This paper describes an impact evaluation of one campaign method for dietary change – distributing factual leaflets modeled after those used by animal advocacy organizations worldwide – in a campus setting at the University of Illinois at Urbana-Champaign. The results could help answer a significant question: in a Midwestern United States school, what is the impact of distributing leaflets that describe the benefits of a plant-based diet on the recipients' consumption of animal products? Further, the study reflects on a more general question in consumer economics: can a single information treatment significantly impact the composition of food demand? I find there was insufficient evidence that the leaflets impacted animal product consumption; however, the results might not direct organizations away from leafleting as an effective technique for advocacy. Instead I recommend that researchers conduct additional independent studies with improved research methods to be published in academic journals, especially given that it appears a larger sample size is required to detect an impact due to the high rate of sample attrition in email surveys.

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Motivation

Overview

The purpose of this study is to learn whether a single exposure to printed information can influence someone's food choices, especially regarding the frequency of meat consumption, by evaluating the impact of two leaflets: one that focuses on the reasons to adopt a vegetarian diet, and one that focuses on how to adopt a vegetarian diet. One potential application is to inform advocacy organizations about the effectiveness of vegan leafleting. Vegan leafleting is one of the most popular forms of animal advocacy, used by organizations like Vegan Outreach, Mercy For Animals, and The Humane League. Such organizations claim there are strong ethical benefits for a vegan diet as well as health and environmental advantages.

Environmental sustainability

Environmentally motivated vegans point to the impact of animal agriculture on greenhouse gas emissions, land use, and water use. First, the Food and Agriculture Organization of the United Nations (2006) reports that animal agriculture is responsible for generating 18 percent of global greenhouse gas emissions as measured in carbon dioxide equivalent, more than is generated by operating vehicles in the entire road transportation industry; this is in large part due to the associated land use change and deforestation, as well as enteric fermentation, more informally known as cow belches and flatulence (Intergovernmental Panel on Climate Change, 2014). The FAO report was no stranger to controversy. For example, the figure for the United States is lower than the global average (Pitesky, Stackhouse, & Mitloehner, 2009) and a later FAO report put the global average at 14.5 percent (Gerber, et al., 2013). However, Eshel and Martin (2006) show that changing from a standard American diet to a vegan diet is a more effective means of reducing greenhouse gas emissions than changing from a Toyota Camry with a fuel efficiency of 30 miles per gallon to a Toyota Prius with a fuel efficiency of 57 miles per gallon. Second, the Food and Agriculture Organization (2006) reports that animal agriculture systems like pastureland and farmland used for feed crops occupy 70 percent of global farmland and 30 percent of the whole planet's land surface, which is the underlying root behind 70 percent

of deforestation in the Amazon. Third, animals and animal feed need high levels of water; Renaulta and Wallender (2000) found that if everyone in developed countries switched to a vegetarian diet, it would reduce global water use enough to provide for 81 percent of the additional water requirements expected by the year 2025. Further, the water footprint of any animal product is larger than that of crop products with equivalent nutritional value (Mekonnen & Hoekstra, 2012). For these reasons combined, reducing the consumption of animal-based foods has been suggested as one strategy for addressing the global gap between the crop calories available in 2006 and the expected calorie demand in 2050 (Ranganathan, Vennard, Waite, Dumas, Lipinski, & Searchinger, 2016). That being said, one common argument against a vegan diet beyond the consumer's affinity for the taste of animal products is that certain types of land are more productive with animal agriculture than vegan agriculture (Lusk & Norwood, 2009), and many of the world's rural poor would have difficulty shifting away from their current livelihoods in animal agriculture.

Public health

Health-motivated vegans cite the benefits from plant-based nutrition. According to the Academy of Nutrition and Dietetics, well-planned vegetarian and vegan diets are healthy and appropriate for individuals of all ages, including athletes (American Dietetic Association, 2009). They conclude that a vegetarian diet can provide adequate protein and is associated with a lower risk of death from heart disease, a lower overall rate of cancer, and a lower rate of type 2 diabetes. Heart disease, cancer, and type 2 diabetes are among the top ten causes of death in the United States (Centers for Disease Control and Prevention, 2013). Plant products like collard greens and kale are good sources of calcium (Physicians Committee for Responsible Medicine, n.d.), and some reinforced types of soy milk and almond milk actually have 50 percent more calcium than dairy milk (Silk, 2016). Because vitamin B12 is not found naturally in plants but rather in microorganisms like bacteria (Martens, Barg, Warren, & Jahn, 2002), vegans argue the most efficient method for intake is a supplement; one study found that among vegans who took a B12 supplement, 100 percent had an adequate intake (Dong & Scott, 1982). Limited evidence suggests a vegan or vegetarian diet may increase life expectancy (Fraser & Shavlik, 2001).

Animal rights

Finally, ethically motivated vegans believe that non-human animals hold certain rights, namely the right to freedom from exploitation and slaughter. The vegan argues that exploiting and killing another human is unethical for the principal reason that it deprives the victim of further enjoyable life experiences; therefore, the vegan believes exploiting and killing a non-human animal is unethical for the same reason, and a preference for the taste of animal products fails to justify eating them in a world where palatable and nutritionally sufficient plant-based foods are available. The ability of non-human animals to be aware of their experiences is well documented. Consciousness, or awareness of one's surroundings, has been established in virtually all mammals (Seth, Baars, & Edelman, 2005), and recent research suggests consciousness in other classes of species such as birds and fish is difficult to prove or disprove but many species are likely conscious (Edelman, Baars, & Seth, 2005; Brown, 2015). Moreover, scientists have already demonstrated that effectively all vertebrate animals feel pain (Sneddon, Elwood, Adamo, & Leach, 2014), and a relatively new branch of literature is developing to evaluate animal pleasure (Balcombe, 2009). In short, many American vegans ask the question of dogs and pigs, "Why love one but eat the other?" This question examines the reasoning behind why humans in the United States have designated dogs as loveable pets, but have designated pigs – who are in some ways more intelligent than dogs (Humane Society of the United States, 2009) – as units of production for food.

Key definitions

Vegan leafleting is defined as the activity of distributing leaflets with the intention of persuading recipients to shift towards a vegan diet; this includes leaflets that only explicitly recommend vegan food but may still use the word “vegetarian” or ask for small changes like abstaining from meat consumption on Mondays. Note that I use the words leaflet, booklet, pamphlet, and brochure interchangeably; I define them synonymously as a form of print media limited to a low number of pages (potentially only one double-sided sheet), whereas a flyer is limited to exactly one sheet (double-sided or not), and a vegan leaflet is a leaflet that campaigns for a shift towards a diet free of meat, dairy, and eggs. However, the term leafleting can include passing out flyers as well.

A vegan is often defined as someone who does not buy or use animal products such as meat (beef, chicken, pork, fish, etc.), dairy, eggs, honey, fur, leather, wool, or cosmetics tested on animals. Health-motivated vegans may only abstain from dietary animal products, rather than other animal products like fur, and vegans of any motivation often make exceptions to prevent extreme inconveniences; for example, many vegans consume cane sugar even if it was filtered through bone char from cattle bones. Similarly, a vegetarian is often defined as someone who does not eat meat; some vegetarians are vegan, while others are not.

In the present study, a vegan is defined less strictly than usual as someone who does not eat meat, dairy, or eggs, whereas a vegetarian is defined conventionally as someone who does not eat meat. I used these definitions for the sake of simplicity, and to capture the leaflet’s impact primarily on diet, as diet is a critical component to veganism; in the United States, the vast majority of exploited animals are used primarily for food as opposed to other purposes like clothing or animal testing (Animal Charity Evaluators, c. 2014b).

Literature review

Overview

Non-profits distributing leaflets to promote a vegan diet are motivated by three primary reasons: advancing the rights of animals (Rozin, Markwith, & Stoess, 1997; Ruby, 2012; Rothgerber, 2014; Rothgerber, 2015), promoting environmental sustainability (Pimentel and Pimentel, 2003; Food and Agriculture Organization, 2006; Mekonnen & Hoekstra, 2012; Eshel, Shepon, Makov, & Milo, 2014; World Wildlife Fund, 2014), and encouraging good public health (American Dietetic Association, 2009; Tonstad, Butler, Yan, & Fraser, 2009; Orlich, et al., 2013). However, there is limited formal research into the effectiveness of vegan leafleting. While at least six groundbreaking studies have investigated the subject, not one of the six discussed herein was published in an academic journal and all have severe limitations on internal and external validity. This literature review describes the six previous studies, as well as formally published papers related to dietary leafleting and information treatments.

Is leafleting effective?

Across all disciplines, the impact of leaflets can be expected to vary depending on the quality of the leaflet design and the type of behavioral change promoted. Researchers have learned that a bipartisan get-out-the-vote leaflet can increase voter turnout for independents by roughly 7 percentage points (Gerber & Green, 2000) and a leaflet promoting colorectal cancer screening can reverse the stated intentions to be screened for 55 percent of men and 50 percent of women (Hart, Barone, & Mayberry, 1997). These studies suggest that a vegan leaflet simply asking recipients to do a single task on one day might be successful. Conversely, a randomized controlled trial in Nicaraguan motels showed that even when free condoms were provided, additionally leaving a health education leaflet on the bed did not increase the rate condoms were used for non-commercial sex, and it actually decreased condom use in commercial sex (Egger, Pauw, Lopatzidis, Medrano, Paccaud, & Smith, 2000); when the requested behavioral change impacts perceived pleasure outcomes, as it does with a vegan leaflet, perhaps the leaflet is less likely to succeed. Methods in assessing these impacts vary widely in regards to using observed or

self-reported data and other strategies, but one key theme is to conduct a field experiment that compares changes over time for a treatment group and a control group.

The main research question in vegan leafleting studies including the present study is whether leaflets are effective at reducing the consumption of meat, dairy, and eggs. It is currently unproven in the literature whether vegan leafleting is effective, and whether certain leaflet designs are more effective than others. In the fall of 2012, animal advocacy organizations Farm Sanctuary and The Humane League partnered in evaluating the impact of leafleting on the campuses of the University of Delaware and the University of Maryland by surveying 403 students who had received a Vegan Outreach leaflet during their college career (Vegan Outreach, c. 2013). With corrected arithmetic, 1.7 percent of the recipients said they went vegetarian as a result of the leaflet, which implies the information created one new vegetarian for every 59 leaflets distributed. Some students shared the leaflet with a friend, which brings the number down from 59. Limitations included the absence of the following components: a control group comparison, regression analysis, and analysis of statistical significance.

In the fall of 2013, Animal Charity Evaluators coordinated a similar study (Animal Charity Evaluators, c. 2014a), again using Vegan Outreach leaflets but with some key methodological differences: the respondents were students from ten American colleges and one Canadian college while the sample sizes were 123 and 477 for the treatment group and the control group respectively, the treatment group included recipients of a vegan leaflet as well as recipients of a leaflet about puppy mills, and the survey asked for the respondents' current consumption frequency of certain foods as well as what the respondents ate three months earlier (just before volunteers distributed the leaflets). Because the number of recipients for the puppy mill leaflet was too small, the research team focused instead on the rest of the treatment group in comparison to the control group. Using a generalized linear model and a chi-square test, the differences in change in consumption of red meat and poultry (but not fish) between the experimental group and the control group were statistically significant at the 99 percent confidence level. Limitations include the absence of a large sample size for each school, and a heavy dependence on the subjects' recollection of their diet three months prior to the survey. In 2014, Vegan Outreach published a pilot study on the effectiveness of a paid-per-read strategy that paid remote Amazon.com workers to read leaflets, reporting that the results were statistically insignificant in terms of impact on diet (Norris, 2014); the organization later published a larger

study with 1,539 remote workers completing the follow-up survey and found an average of one person adopted a mostly vegan diet for every 75 leaflets actually read, but there was no control group for comparison (Norris & Roberts, 2016).

Which leaflet design is most effective?

One behavioral change model historically applied in dietary change research is the transtheoretical model, which suggests that at any given time, a person is in one of five stages: pre-contemplation, contemplation, preparation, action, or maintenance (Prochaska, DiClemente, & Norcross, 1992). Those who apply the model report that each stage matters, so rushing through the process of behavioral change could result in setbacks. In the context of leafleting, this means giving someone a leaflet that asks them to go vegan before they can learn more in the contemplation stage could weaken the intended effect; asking for a smaller change instead can allow a recipient to go through all stages beforehand. Also, Kristal, Glanz, Curry, and Patterson (1999) found it important not to assume that the recipient has a high level of knowledge on the topic in case they are in the pre-contemplation stage, meaning they are not yet thinking about the change, and to know helping the targeted individual set specific goals can be effective. In cases where the recipient's current stage in this model can be determined, tailoring the information to their stage can boost the information's effectiveness (Campbell, Strecher, & DeVellis, 1994). Information tailored to the other characteristics of an individual has also been shown to be more effective than non-tailored information in changing dietary and other behaviors (Skinner, Campbell, Rimer, Curry, & Prochaska, 1999; Irvine, Ary, Grove, & Gilfillan-Morton, 2004); the present experiment acknowledges that finding by including in the leaflet information about the local dining halls, restaurants, and social organizations, as they play a role among many other factors that influence whether someone stays vegetarian or resumes an omnivorous diet (Barr & Chapman, 2002; Humane Research Council, 2014; Toronto Vegetarian Association, 2015).

The Humane League has also conducted further research, including a 2014 report that found the following: animal cruelty messaging was slightly more motivational than the health benefits, focusing only on chickens weakens the leaflet's impact, and focusing on why to go vegetarian had mixed results compared to focusing on the how (The Humane League, 2014a). Their analysis came from email surveys of concert attendees and students on college campuses

three months after individuals received leaflets and filled out an initial survey. The published summary does not describe a regression analysis or statistical significance, and jumps to the number of animals saved without discussing the changes in animal product consumption. The same year, The Humane League reported that when given the choice between three leaflets, a meat-eater is more likely to read a leaflet with food or people on the cover than a cover with happy animals or suffering animals (The Humane League, 2014b). Moreover, subjects preferred covers featuring non-celebrities over those with celebrities when shown only the cover photo, and even the most moderate images of suffering evoked avoidance among respondents. These findings help to prevent the issue of partial compliance, as described in chapter seven of Glennerster and Takavarasha (2013), to ensure that a study maximizes the number of people in the treatment group who are actually treated by reading the leaflet before throwing it away.

In 2015, The Humane League published a report (The Humane League, 2015a) evaluating four pamphlets that each had a different request: to eat vegan, to eat vegetarian, to eat less meat, and to cut out or cut back on meat and other animal products. This study included a control group that received no leaflet, two rounds of surveys to track the changes, and ANOVA. The major limitation here was the small and unrepresentative control group in the follow-up round ($n = 57$). However, the authors believe they found evidence among 601 follow-up participants that the “cut out or cut back on” message was more effective than the request to go vegetarian or vegan. Another of their reports evaluating reactions to three versions of a single leaflet page (The Humane League, 2015b) found that (1) requesting leaflet recipients to reduce animal product consumption based on animal cruelty was most effective, (2) requesting recipients to eliminate consumption of animal products based on environmental reasons was the second most effective, and (3) requesting recipients to go vegan based on animal cruelty reasons was least effective; however, this analysis is based on intention to change one’s diet, sometimes an unreliable indicator according to one of their previous reports (The Humane League, 2014a).

Which specific theme works best in sustaining dietary change solely among ethics, health, and the environment? While the research in that domain beyond the aforementioned vegan leafleting studies is limited, some research has been done on vegetarian and vegan retention. Stahler, Mangels, Jackson, and Blunt (2014) followed 131 vegetarians from 2006 to 2012 and found that of those survey respondents whose primary motivation was the environment, 100 percent of individuals remained vegetarian as compared to 97 percent for

ethics, and 93 percent for health. Researchers in one study compared health motives to ethical motives in a survey of 246 self-reported vegans; they found that those who had been motivated by ethical reasons had been vegan longer, and ethical reasons were more commonly cited as the motivator in the studies they reviewed (Radnitz, Beezhold, & DiMatteo, 2015). Other articles describe similar results with some exceptions (Fox & Ward, 2008; Ruby, 2012; Hoffman, Stallings, Bessinger, & Brooks, 2013). In the United States, roughly 68 percent of current vegetarians cited animal protection as a reason for adopting the diet, whereas only 27 percent of former vegetarians did, although a number of factors could be in play there (Humane Research Council, 2014).

Effective food interventions often show the advertised food is convenient, attractive, and normal, even if showing an abnormal activity might be more memorable (Wansink, 2015). In one study of healthy eating materials, researchers compared leaflets that emphasized the impact on a consumer's energy level and physical appearance to leaflets that emphasized preventing disease, finding the former had a greater impact on fruit and vegetable intake (Baker et al, 2010). However, Luoto, Levine, and Albert (2011) found that messages framing safe water technologies as both avoiding disease and improving health – as opposed to improving health alone – raised usage rates by four to six percentage points. On top of that, using health information alone appears to be insufficient in changing consumption behavior (Rekhy & McConchie, 2014). Leaflet experiments can also exploit the findings of studies in the field of advertising. Award-winning and effective advertisements are commonly positive in their message, humorous, and more driven by emotion than logic (Frazer & Sheehan, 2002), which could suggest that focusing on the intelligence and cuteness of animals might be more effective than focusing on animal suffering. Generally speaking, media attention to animal welfare has negative effects on the level of meat consumption in the United States (Tonsor & Olynk, 2011) and some people are willing and able to pay more for improvements in farm animal welfare (Lusk & Norwood, 2011; Jonge, Lans, & Trijp, 2015).

In his book, *Change of Heart: What Psychology Can Teach Us About Spreading Social Change*, animal advocate Nick Cooney recommends an approach called “the foot-in-the-door technique” based on a classic study by Freedman and Fraser (1966) where subjects were more likely to put up a large yard sign regarding safe driving if they had already agreed to put a small sticker of the same theme in their house window; people are likely open to a small request

initially, and adopting to use the sticker can help someone identify as a person who cares about safe driving such that they might oblige to the larger request later (Cooney, 2010). Cooney writes that the tone of communication in animal advocacy should be one that helps people feel sympathy for suffering animals through means beyond simply showing images of suffering animals. Citing a study that shows people avoid practicing empathy when they expect it to lead to a significant commitment in time (Shaw, Batson, & Todd, 1994), Cooney applies this concept by suggesting people are more likely to read a booklet if the cover does not explicitly signal the purpose is to advocate for a vegetarian diet. As for the content of a leaflet, he writes that student groups would be more effective if they focused the blame on the companies that are directly responsible, while at the same time urging people to take action by refusing to support those companies. He goes on to emphasize the importance of social norms. Some evidence suggests that door-hanger flyers describing local social norms have influenced home-owners to conserve energy more than door-hanger flyers describing financial savings or environmental protection (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008), and that signs in a bathroom hotel describing how a majority of guests reuse towels are more effective at encouraging towel reuse than signs with an environmental appeal even when over 75 percent of Americans consider themselves to be environmentalists (Goldstein, Cialdini, & Griskevicius, 2008). Further, signs describing how a majority of guests in that very hotel room reused towels were even more effective, in large part because the reference group of the norm becomes more similar to the person reading the sign.

Previous reports have described the demographics of current and former vegetarians (Amato & Patridge, 1989; Haverstock & Forgays, 2012; Ruby, 2012; Rizzo, Jaceldo-Siegl, Sabate, & Fraser, 2013; The Humane League, 2014c; Humane Research Council, 2014; Lusk, 2014). And while they did not consider materials directly promoting veganism, several studies consider the impact of mailed correspondence on weight loss outcomes. Cameron et al (1990) evaluated a program wherein all treated participants received 15 weekly lessons via mail, and three features were varied: weekly homework, interim weigh-ins, and participation deposits. In the follow-up round a year after treatment, the researchers found no differential Body Mass Index (BMI) effects across treatment groups but the program reduced the average BMI of the treatment group. O'Loughlin, Paradis, Meshefedjian, and Kishchuk (1998) adopted a slightly different approach by mailing 18 leaflets over eight weeks, emphasizing self-acceptance and

downplaying weight loss; they found the treatment group participants were more satisfied with their weight than the control group despite the lack of change in their BMI. Helsel, Jakicic, and Otto (2007) analyzed a 16-week correspondence program for diet and physical activity, where they randomly assigned participants to either a traditional self-monitoring strategy or a simplified strategy; they found no difference in weight loss, so the simplified self-monitoring strategy may be beneficial for study participants to continue the process consistently over time. The results of Cameron et al (1990) be extrapolated to imply that repeated exposure to vegan leaflets, rather than one single exposure, may be necessary if it is shown that a single exposure is not enough.

The term “behavior change communication” refers to programs designed to bring about behaviors that will improve health status and related long-term outcomes through platforms including printed media and the Internet; research in this field is relevant as well. Kincaid (2000) analyzed a mass media campaign promoting contraceptive use in the Philippines; within a nationally representative sample of women, the ten television spots increased modern contraceptive use by 2.1 percentage points. Prior contraception intention and behavior, current beliefs, and prior beliefs were among the best predictors of contraceptive behavior. Krenn, Cobb, Babalola, Odeku, and Kusemiju (2014) found that the combined impact of a massive campaign including mobile service delivery as well as television and radio spots, posters, flyers, and t-shirts increased modern contraceptive use by 9.9 percentage points in four Nigerian cities, showing that information can significantly change behavior but additional services may multiply the impact. Evans, Rozelle, Lasater, Dembroski, and Allen (1970) compared the impact of five different messages on tooth-brushing behavior: (1) a high-fear message with recommendations, (2) a low-fear message with recommendations, (3) a positive message with recommendations, (4) only the recommendations, and (5) an elaborated set of recommendations. They found that the elaborated recommendations and the positive message were the most effective in changing actual tooth-brushing behavior as documented by a chemical indicator, but a high-fear message and recommendations alone were the most effective in changing reported behavior.

The Humane League (2014c) has also found documentaries and movies to be the most cited informational source influencing a person’s decision to go vegan or vegetarian. But given that a leaflet’s effectiveness varies by its quality and the behavioral change promoted, further studies are necessary in the effectiveness of vegan leafleting if non-profit organizations are to have an evidence-based rationale for their work. Beyond studies that have looked at campaigns

for diets with reduced fat or increased consumption of plant products, the present study looks at the impact of advocating for a transition towards the complete elimination of animal products from the diet on the basis of an appeal combining information about environmental sustainability, health, and animal rights.

Methods

Overview

This study is different than the six previous informal studies in a number of ways. Most importantly, it is a randomized controlled trial where the control group is survey respondents who received no leaflet at all, and I explain detailed methods of regression analysis to speak towards the statistical insignificance. It is also concentrated at a single university, which allows the sample to come closer to representing the university in a generalizable way. More than one in nine college students are vegetarian (Hopkins, 2011); this makes the university campus a prime location for vegan advocacy, and the ideal setting for a study. The treatment is a double-sided tri-fold leaflet instead of a longer leaflet, which may either reduce or enhance the impact. I designed leaflets instead of using those designed by an animal advocacy organization, as required by my academic department; one leaflet focused more on why to go vegetarian while the other focused more on how to go vegetarian. To incentivize respondents to participate, thereby discouraging pro-vegetarian respondent bias, I gave participants food and gift cards for food; food could draw in a broader range of people, rather than those who are interested in completing a dietary survey.

Leaflet design

I designed the leaflet using Adobe Illustrator software. Given the findings from my literature review, I selected a cover with a picture of food as opposed to suffering animals, I recommended documentaries, I used information relevant at the local level to tailor the approach, I asked for the relatively small change of going vegetarian or eating less meat to employ the foot-in-the-door technique, I included in both leaflet versions at least some information on how to go vegetarian as well as why, and I showed pictures of vegetarian celebrities in the why-focused leaflet to demonstrate a social norm.

In the second leaflet, I removed the health information except for a reference to the position paper of the Academy of Nutrition and Dietetics on vegetarian diets but kept the environmental page and the animal page; I did this out of speculation that the environmental and ethical reasons would motivate college students more than the health reasons. Further, I removed

the celebrity pictures. And finally, with the extra space, I added more information about how to go vegetarian, from local food options to cookbooks; this allows for a potential comparison between a why-focused leaflet and a how-focused leaflet.

Survey methods

The study is an impact evaluation of an information treatment on a university campus. The experiment included two rounds of surveys distributed at the University of Illinois at Urbana-Champaign: the baseline and the follow-up. The baseline round occurred entirely on the university's main quad in attempt to capture a sample representative of the entire campus population. Participants used cell phones, tablets, and computers to take the survey through Qualtrics. The baseline survey asked questions regarding demographics, contact information, and the respondent's consumption frequency for certain food groups whereas the email follow-up survey with Qualtrics included the same food frequency questionnaire in addition to other topics like the respondent's beliefs. The food frequency questions asked about the number of days in the past week a participant ate foods belonging to the listed food groups; note that a participant who eats meat one day per week, for example, could still eat more meat than someone who eats meat three days per week. However, the number is still a rough indicator for meat consumption levels and I believe it is more reliable than asking the respondents to estimate meat consumption by weight, and more informative about the subject's general eating habits than asking them once for a 24-hour food consumption recall because a single day is less representative than a whole week.

I decided not to ask about the consumption of animal products other than meat, dairy, or eggs in the surveys given the extremely high probability of misreporting the consumption of a product like honey, and because the first diet-related priority of vegan advocacy is generally to reduce the consumption of meat, dairy, and eggs, which constitute the three main food products for which farmed animals are slaughtered (Humane Society of the United States, 2016). Further, some self-defined vegetarians eat chicken or fish given the differing definitions of meat, which means asking subjects if they are vegetarian or vegan would yield inaccurate results (Haddad & Tanzman, 2003).

Survey respondents received a cookie or cupcake from a local restaurant called The Dancing Dog for completing the baseline survey, then a \$10 gift card for fruits and vegetables from the UIUC Sustainable Student Farm after completing the follow-up survey. The baseline sample size was 694 survey respondents, where (1) the treatment group was all such respondents (344 people) who the trained survey enumerators randomly assigned to receive a leaflet after they completed the baseline survey, and (2) the control group was all such respondents (350 people) who were not randomly assigned to receive a leaflet. I conducted regression analysis to track the leaflet's impact on the quantity of animal products consumed for each group, using survey responses as an indicator for consumption levels. The cookies, cupcakes, and gift cards were the major strategy for mitigating sample attrition; attrition is a serious problem, especially where a certain type of participant drops out of the study and affects the representative nature of the sample, as described in chapter seven of Glennerster and Takavarasha (2013). Beyond that, I also made sure to keep the surveys short, to select an appropriate time in the academic season when students are not overoccupied with exams, and to follow up shortly after the baseline round.

The pilot study round occurred in the period of February 29th to March 10th, 2016. 14 of my classmates in the Department of Agricultural and Consumer Economics completed a shortened mock-trial version of both the baseline and follow-up.

The baseline round occurred in the period of March 28th to April 1st, 2016, when the weather was warm enough to reach enough students outdoors and the final exam season had yet to begin; that round included both surveying and giving leaflets to survey respondents who were randomly assigned to the treatment group.

The follow-up round (consisting of surveying only) began approximately three weeks later and lasted for the period of April 20th to April 28th, 2016, with surveys staggered to ensure they were sent close to exactly three weeks later and resent to remind anyone who had not yet completed the survey. The short amount of time between treatment and the follow-up survey allows for a direct link between treatment and dietary changes, focusing on the people with an immediate reaction instead of tracking long-term adherence, and missing a few potential leaflet recipients who might change their diet later at least in part due to the leaflet.

The baseline survey conducted in person collected demographic details, contact information, and food frequency details as modeled after food frequency questionnaires (Cade,

Burley, Warm, Thompson, & Margetts, 2004). The email follow-up survey contained the same food frequency questions, but also tested the respondent on their recall of information from the leaflet and gauged the respondent on their attitude towards animals with a question modeled after the Belief in Animal Mind Questionnaire (Knight, Vrij, Cherryman, & Nunkoosing, 2004). The ordering of the questions was important, and as such, it would have been counterproductive to randomize the order in an attempt to mitigate ordering effects; for example, I asked respondents about their attitude towards cows after asking about their meat consumption to prevent social desirability bias. Survey enumerators wore clothing without the words “vegan” or “vegetarian” so as to prevent biasing the sample. When there was a group of two or more persons who wanted to participate, we assigned them all to receive the same leaflet (or no leaflet) to prevent a spillover effect; a person who receives a leaflet might share the leaflet with their friend in the control group, but only selecting passersby who were alone could have yielded an unrepresentative sample of subjects. The full survey instruments for the baseline and follow-up are included in the appendices.

Statistical methods

My set of regression models estimated in Stata are two equations represented as follows:

$$Y_i = \beta_0 + \beta_1 F_i + \beta_2 S_i + \beta_3 X_i + U_i \quad (EQ1)$$

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 X_i + U_i \quad (EQ2)$$

Y is a class of outcome variables defined below, F is a dummy variable that takes on a value of 1 for individuals in the first treatment group (receiving the why-oriented leaflet), S is a dummy variable that takes on a value of 1 for individuals in the second treatment group (receiving the how-oriented leaflet), X is a class of control variables defined below, U represents the error term, T is a dummy variable that takes on a value of 1 for individuals in either treatment group, and subscript *i* denotes the individual’s unique identification number. A statistically significant result for β_1 in EQ1, for example, would mean that the first leaflet had a significant effect on the outcome variable as compared to the control group among demographically similar people. For cases where the outcome variable is a dummy variable, this becomes a linear probability model. For all regressions using EQ1 and EQ2, as well as the other regressions discussed hereafter such as the regressions checking the balance of the sample, I employed the

Stata command “robust”; this calculates standard errors that are unbiased in the presence of heteroscedasticity, as there is a potential non-constant variance of the error term.

Outcome variable definitions

Meat2: number of days in the past seven days meat was consumed when asked in the follow-up

MeatYesterday: a dummy variable that takes on a value of 1 if the respondent ate meat yesterday when asked in the follow-up

Dairy2: number of days in the past seven days dairy was consumed when asked in the follow-up

Eggs2: number of days in the past seven days eggs were consumed when asked in the follow-up

Total: sum of Meat2, Dairy2, and Eggs2

Sentience: dummy variable for the belief in a cow’s sentience

Humane: dummy variable for supporting the humane treatment of cows

Find: dummy variable for knowing where to find vegetarian meals

App: dummy variable for having the UI Dining app, which provides information about meal options for the University of Illinois dining halls

Unlikely: dummy variable for being less likely to go vegetarian

For the Unlikely variable, I do not focus on people who say they are more likely to go vegetarian because intention to change is a bad predictor of future behavior, especially when there could be social desirability bias. I also do not focus on people who say their likelihood did not change, since theoretically there was no damage done to their probability of going vegetarian. I created the dummy variable only using the “less likely to go vegetarian” option to track any harm done by the leaflet.

Control variable definitions

Each control variable is categorical in nature, and as such each one was decomposed into a series of dummy variables that covers all stated responses.

Age: a categorical variable for age in years

Sex: a categorical variable for female, intersex, and male

Affiliation: university affiliation (undergraduate student, graduate student, professor, etc.)

Education: educational attainment (high school degree, bachelor's degree, graduate degree, etc.)

Continent: continent of origin

Race: racial group

Meat1: number of days in the past seven days meat was consumed when asked in the baseline

Dairy1: number of days in the past seven days dairy was consumed when asked in the baseline

Eggs1: number of days in the past seven days eggs were consumed when asked in the baseline

Hypotheses

Because previous informal studies have found a negative effect for the impact of leaflets on meat consumption with varying effects on the consumption of eggs and dairy, and the present leaflet only asks recipients to adjust meat consumption, I proposed the following hypotheses.

Note that for all equations in which the hypothesis for EQ2 is that the treatment group will have an effect, the hypothesis is that each leaflet type in EQ1 will have that same effect. As a note on interpreting the table, the first entry represents a rejection of the null hypothesis below that the treatment will have no statistically significant impact on meat consumption:

$$H_o: \beta_1 = 0$$

Table 1. Specification of regression models and corresponding hypotheses

Outcome variable Y	Hypothesis for EQ2	Hypothesized sign of treatment impact
Meat2	$\beta_1 \neq 0$	(-)
MeatYesterday	$\beta_1 \neq 0$	(-)
Dairy2	$\beta_1 = 0$	No impact
Eggs2	$\beta_1 = 0$	No impact
Total	$\beta_1 = 0$	No impact
Sentience	$\beta_1 \neq 0$	(+)
Humane	$\beta_1 \neq 0$	(+)
Find	$\beta_1 \neq 0$	(+)

Table 1 (cont.)

Outcome variable Y	Hypothesis for EQ2	Hypothesized sign of treatment impact
App	$\beta_1 = 0$	No impact
Unlikely	$\beta_1 = 0$	No impact

I expected that in EQ1 and EQ2, 11 regressions would have statistically significant results, namely those with the outcome variables Meat2 (EQ1, EQ2, as well as a variant of EQ2 without control variables), MeatYesterday (EQ1 and EQ2), Sentience (EQ1 and EQ2), Humane (EQ1 and EQ2), and Find (EQ1 and EQ2). By running 20 random regressions, for example, one could expect that one regression's null hypothesis would be rejected at the 5 percent significance level by chance alone; given that I expected a significant result for 11 regressions, the probability of a false positive is actually somewhat high.

For the Meat2 variable, the regression estimates the impact of the leaflet on meat consumption among all follow-up participants; I chose not to restrict the sample for any of the regressions because I controlled for the baseline animal product consumption variables. If a future study with a similar design restricted that sample to baseline omnivores alone, it would assume with some risk that people whose consumption of meat was zero at baseline did not start to eat more meat after treatment (1) out of spite, (2) because the subject was falsely labeled vegetarian in the baseline round, or (3) because the subject was going to eat more meat on a different week regardless of the leaflet.

Power calculation

In order to calculate the necessary sample size to obtain statistically significant results, I referred to chapter six of Glennerster and Takavarasha (2013), in which the authors present a method of power calculation. A power calculation, they write, is useful for answering two questions. First, given the true effect, what chance do you have of finding a statistically significant result? And second, given a certain sample size, what is the minimum detectable effect (MDE) at which you can reject the null hypothesis at the 95 percent confidence level such that the chance of the result being due to chance is only 5 percent? They point out that based on

many educational experiments, “a view has emerged that an effect size on test scores of 0.2 SD [standard deviations] is small but respectable, whereas an effect size of 0.4 SD is large.” However, achieving an effect of 0.2 standard deviations with a small budget could be considered a large impact, and achieving an effect of 0.2 standard deviations could mean something completely different in other settings such as the behavioral change outcome in the present study; it may be appropriate to select a low MDE for a low-budget treatment when cost-effectiveness is a priority. The Stata command “*sampsi*” allows users to plug in numbers to calculate the sample size necessary to achieve the desired power.

I estimated my study required a sample size of 140 in each of the two groups in order to detect causal changes in the number of days per week that subjects consume animal products. Without using the standard deviation of the meat outcome variable from the experiment, I obtained the number 140 with the Stata command *sampsi 5 4.33, power(0.8) sd1(2) sd2(2)*, where “5” represents the average number of days per week the control group ate meat in the follow-up survey for a hypothetical estimate, “4.33” represents the number of days the treatment group ate meat in the follow-up survey for a hypothetical situation where the leaflet had a small impact not unlike the previous studies (here being that two thirds of recipients did not change and one third of recipients changed from five to three days per week with meat), “0.8” represents the power level, and “2” is plugged in twice for the estimated standard deviation of the aforementioned outcome variable for each group. I estimated the standard deviation for days with meat consumption per week to be that number as pure speculation, reasoning that the average person would eat meat on roughly five days per week with typical other people ranging from three to seven days per week. A similar Stata command with different numbers could be used for eggs and dairy. Therefore, if the true effect of the leaflet is that one third of recipients eat meat for two fewer days per week, the data should capture that effect size of 0.67 (going from an average of 5 days with meat consumption to 4.33) at a statistically significant level.

In hindsight, the estimated standard deviations for meat consumption came close to the actual standard deviations revealed in the baseline data: the actual standard deviations were 2.22 and 2.27 respectively. Redoing the power calculation with those actual standard deviations, the total sample’s actual mean baseline meat consumption value of 4.93, and a more conservative estimated impact at 10 percent of leaflet recipients reducing their meat consumption from 4.93 days per week to 3.93 days per week (equivalent to one person going vegetarian for every 70

leaflets) with a command of *sampsi 4.93 4.83, power(0.8) sd1(2.22) sd2(2.27)* yields an output of 7,913 subjects in each of the two groups at a minimum. I believe this is roughly the power calculation that future researchers should use.

I also conducted a sensitivity analysis to determine the minimum detectable effect by adjusting the outcome variable mean, using both the observed standard deviations and baseline mean as well as the observed follow-up round sample sizes of 170 for the control group and 157 for the treatment group. The command *sampsi 4.93 4.03, sd1(2.22) sd2(2.27) n1(170) n2(157)* returns a statistically significant result while the command *sampsi 4.93 4.04, sd1(2.22) sd2(2.27) n1(170) n2(157)* reveals a statistically insignificant result, implying that the outcome mean must fall from 4.93 to at least 4.03 in order to be a statistically significant difference. Therefore, I find that the minimum detectable effect in the present study would actually be an average of 0.9 fewer days with meat consumption on average, or a standardized effect size of 0.41 standard deviations below the control group. Given this relatively high MDE, I would have needed a larger sample size to detect a realistic effect.

Selection of the outcome variable is critical, as it may require an unrealistic sample size of about 14,128 individuals per group to detect casual changes in the percentage of subjects who are vegetarian. If the percentage of the leaflet recipients who are vegetarian goes from 10 percent pre-treatment to 11 percent post-treatment, a researcher should be able to detect the change with 14,128 individuals per group as indicated by the command *sampsi 0.10 0.11, power(0.8) sd1(0.3) sd2(0.3)*, where the standard deviation of 0.3 is inferred from assuming 10 percent of the pre-treatment sample is vegetarian. This means roughly 142 of 23,391 recipients would need to go vegetarian to detect the change, potentially making that metric a poor tool in leafleting research.

Adjusted standard deviations for regression coefficients

The treatment was randomized at the group level; if a group of three friends took the baseline survey together, either all of them received the same leaflet or all of them were assigned to the control group. Some participants held social relationships with other participants in the sample, which presents the risk of a spillover effect; at the very least, it is likely that those who spend time together have correlated standard errors for the outcome variables. It was not realistic to determine who was in the same cluster because groups of friends did not always take the

survey in person together, but rather sent their friends to take it later in order to obtain the food incentive. As such, I corrected the standard deviations of the relevant regression coefficients by applying equation 8.2.5 from Angrist and Pischke (2008), taken as

$$\frac{V(\hat{\beta}_1)}{V_c(\hat{\beta}_1)} = 1 + \left[\frac{V(n_g)}{\bar{n}} + \bar{n} - 1 \right] \rho_x \rho_e$$

and solved for the variance of the regression coefficient. I then found the standard deviation. The conventional coefficient variance, denoted with the subscript “c,” is taken from the regression results. I estimated that 60 percent of clusters were a size of one person, 20 percent of clusters were a size of two people, and 20 percent of clusters were a size of three people; that yields an average cluster size of 1.6. The variance of the cluster group size, denoted with the subscript “g,” is then 0.64. The intra-cluster correlation of the treatment, ρ_x , is equal to 1 since treatment is assigned at the cluster level. The intra-cluster correlation of the error term, ρ_e , ranges between 0 and 1; the adjusted standard deviation would be between 1 and 1.41 times larger than the unadjusted standard deviation were it not transformed to a robust standard error, depending on the assumed value of ρ_e . The results still were not statistically significant in a sensitivity analysis with ρ_e made to vary from 0 to 1.

Ethical concern for human subjects

The information provided in the leaflets comes entirely from reliable sources, ensuring that the impact on human subjects is derived from them learning truths about which they were not previously aware or reinforcing their existing knowledge. The subjects were treated with kindness, respect, and tolerance. Because a reduction in the consumption of animal products is associated with a reduction in the risk of disease, a successful leaflet could have a positive impact on the treatment group’s health by promoting a healthy diet. One potential issue is that because leaflet recipients were made aware of factual information concerning topics such as the intelligence of farm animals, it could have inadvertently provoked feelings of diet-related guilt. However, the leaflet emphasized a positive message that does not place blame on the consumer, and the information was educationally useful. All subjects were aged 18 or over so a certain level of emotional maturity was likely widespread in the sample.

Results

Descriptive statistics of interest

Attrition was a larger problem than anticipated; while 694 people completed the baseline survey, only 327 people completed the follow-up survey; 367 people, or 53 percent of the participants, dropped out. Of the 327 follow-up participants, 157 were in the two treatment groups and 170 were in the control group. Of the 157 follow-up participants in the treatment groups, 79 received leaflet 1 and 78 received leaflet 2. Fortunately, after regressing a dummy variable for attrition on a dummy variable that takes on a value of one for individuals who received a leaflet, I conclude that there were no statistically significant issues with an unbalanced rate of attrition when comparing the combined treatment group to the control group; the regression coefficient of 0.029 was insignificant with $p = 0.440$. This conclusion bodes well for the quality of the experiment, because neither group was more likely to leave the study and thereby distort the data; instead, it seems that people simply did not want to fill out another survey because the cost to their time was too great compared to the gift card incentive.

Similarly, regressing each baseline control variable on treatment status individually revealed that the treatment group was similar to the control group in terms of age, sex, race, university affiliation, education completed, continent of origin, baseline meat consumption, baseline dairy consumption, and baseline egg consumption. Table 2 below reflects the balance in these variables of interest when comparing the treatment group to the control group at the baseline. Assignment to the treatment group corresponded to a participant being two percentage points less likely to have been born in Europe and seven percentage points more likely to identify their race as Asian, but this could be due to chance and no other characteristics were significant at the 95 percent confidence level. Note that the means and standard deviations for the baseline consumption of meat, dairy, and eggs in the overall sample would be highly useful for future power calculations. The mean age of the total sample at baseline was 22.0, which is somewhat representative for the mean age of people walking across a college quad. At the University of Illinois at Urbana-Champaign, the mean ages of undergraduate students, professional students, and graduate students are roughly 20.5, 25.6, and 27.66 respectively; the overall mean student age is roughly 22.3 (University of Illinois at Urbana-Champaign, 2015).

Table 2. Balance between treatment group and control group at baseline

Participant characteristic	Combined treatment group	Control group	Difference	Total sample	Observations
	(1)	(2)	(3)	(4)	(5)
<i>Demographics</i>					
Age	21.69 (7.80)	22.32 (7.47)	-0.64 (0.58)	22.00 (7.63)	694
Female	0.51 (0.50)	0.55 (0.50)	-0.05 (0.04)	0.53 (0.50)	694
<i>University status</i>					
Undergraduate	0.87 (0.33)	0.84 (0.36)	0.03 (0.03)	0.86 (0.35)	694
Grad student	0.06 (0.24)	0.05 (0.23)	0.01 (0.02)	0.06 (0.23)	694
Faculty or staff	0.03 (0.17)	0.04 (0.19)	-0.01 (0.01)	0.03 (0.18)	694
Unaffiliated	0.04 (0.19)	0.07 (0.25)	-0.03 (0.02)	0.05 (0.22)	694
<i>Education completed</i>					
No diploma	0.01 (0.09)	0.01 (0.08)	0.00 (0.01)	0.01 (0.08)	694
High school	0.76 (0.43)	0.70 (0.46)	0.06 (0.03)	0.73 (0.45)	694
2-year degree	0.05 (0.22)	0.08 (0.28)	-0.03 (0.02)	0.07 (0.25)	694
4-year degree	0.15 (0.35)	0.15 (0.36)	0.00 (0.03)	0.15 (0.35)	694
Grad degree	0.04 (0.19)	0.07 (0.25)	-0.03 (0.02)	0.05 (0.22)	694

Table 2 (cont.)

Participant characteristic	Combined treatment group	Control group	Difference	Total sample	Observations
	(1)	(2)	(3)	(4)	(5)
<i>Continent of origin</i>					
Africa	0.02 (0.13)	0.03 (0.16)	-0.01 (0.01)	0.02 (0.15)	694
Asia	0.18 (0.39)	0.16 (0.37)	0.02 (0.03)	0.17 (0.38)	694
Australia	0.00 (0.05)	0.00 (0.00)	0.00 (0.00)	0.00 (0.04)	694
Europe	0.01 (0.11)	0.03 (0.18)	-0.02 (0.01)**	0.02 (0.15)	694
North America	0.78 (0.41)	0.76 (0.43)	0.02 (0.03)	0.77 (0.42)	694
South America	0.00 (0.05)	0.02 (0.13)	-0.01 (0.01)	0.01 (0.10)	694
<i>Race</i>					
Asian	0.24 (0.43)	0.17 (0.37)	0.07 (0.03)**	0.20 (0.40)	694
Black	0.09 (0.29)	0.11 (0.32)	-0.05 (0.06)	0.10 (0.30)	694
Latino or Hispanic	0.09 (0.29)	0.12 (0.32)	-0.02 (0.02)	0.11 (0.31)	694
Middle Eastern	0.03 (0.18)	0.02 (0.15)	0.01 (0.01)	0.03 (0.17)	694
Multiracial	0.03 (0.17)	0.03 (0.17)	0.00 (0.01)	0.03 (0.17)	694
South Asian	0.15 (0.36)	0.13 (0.33)	0.03 (0.03)	0.14 (0.35)	694

Table 2 (cont.)

Participant characteristic	Combined treatment group	Control group	Difference	Total sample	Observations
	(1)	(2)	(3)	(4)	(5)
White	0.35 (0.48)	0.41 (0.49)	-0.06 (0.04)	0.38 (0.49)	694
Other	0.00 (0.05)	0.01 (0.09)	-0.01 (0.01)	0.01 (0.08)	694
<i>Weekly consumption</i>					
Meat	4.98 (2.17)	4.89 (2.27)	0.09 (0.17)	4.93 (2.22)	694
Dairy	4.66 (2.07)	4.57 (2.19)	0.09 (0.16)	4.62 (2.13)	694
Eggs	2.99 (2.02)	2.83 (2.09)	0.17 (0.16)	2.91 (2.06)	694

Notes: This table presents estimated differences between the combined treatment group (participants who received either leaflet 1 or leaflet 2) and the control group at the baseline. Columns 1, 2, and 4 present means. Column 3 presents estimated coefficients for regressing the characteristic on a dummy variable that takes on a value of 1 if an individual is in the treatment group. Estimated standard deviations are reported in parentheses.

** Significant at the five percent level

Following is figure 1, which reflects the distribution of meat consumption in the baseline. Because advocacy organizations may be interested in tailoring the amount of dietary change requested in their leaflets based on the quantity of meat currently consumed, this figure and the two similar ones following it are especially relevant for practical purposes. Further, it is clear that many people in this setting already go vegetarian at least one day per week whether intentionally or not, which reinforces the idea that a university campus is an ideal location for vegan advocacy. Note that participants were asked the following: “On about how many days in the past seven days did you consume meat? Include chicken, beef, pork, fish, seafood, etc.” Over 250 participants reported consuming meat seven days per week.

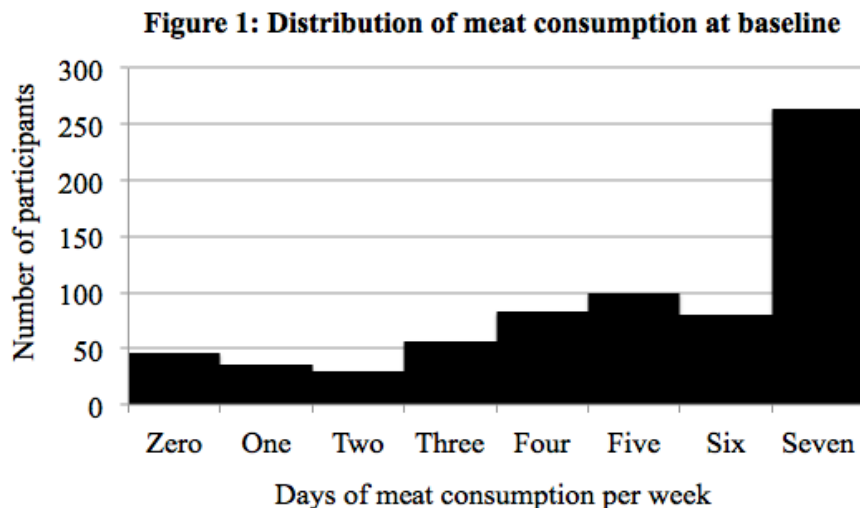


Figure 2 below reflects the distribution of dairy consumption in the baseline. The figure shows many people in this setting already go at least one day per week without consuming dairy. Note that participants were asked the following: “On about how many days in the past seven days did you consume dairy products? Only include milk that you drank, ice cream that you ate, cheese that you ate, and yogurt that you ate. Do not include items where you can’t always see the dairy part (like a sandwich with a little butter and a cookie made with milk) or items made only from plant sources (such as almond milk).” The restrictive nature of the question was intended to enhance the participants’ ability to accurately estimate their dairy consumption. Over 200 participants reported consuming dairy seven days per week.

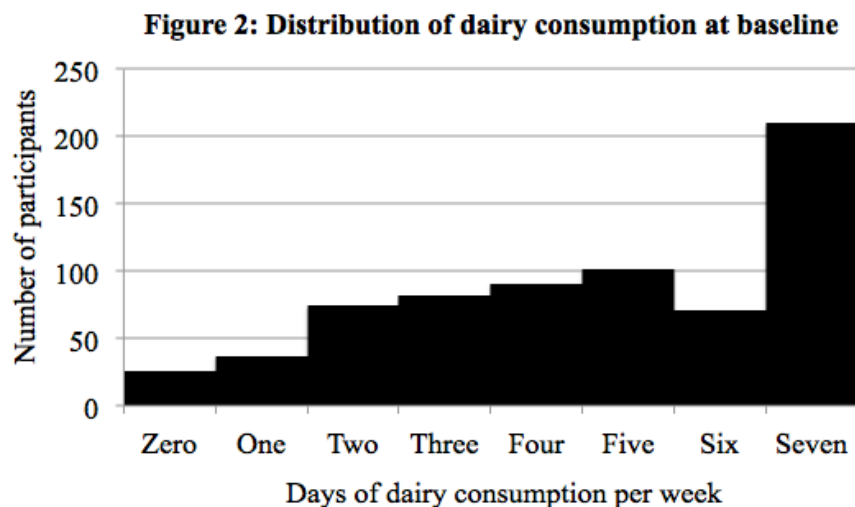
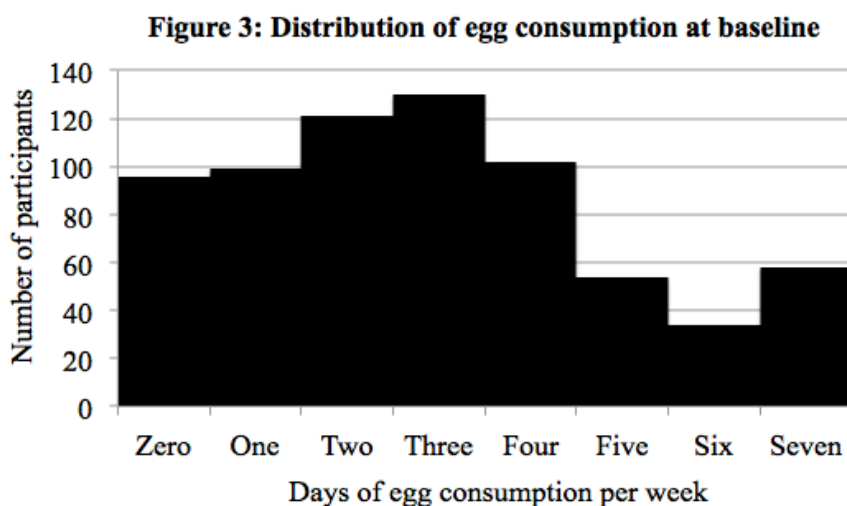


Figure 3 reflects the distribution of egg consumption in the baseline. The figure shows that most people in this setting go at least one day per week without consuming eggs. Note that

participants were asked the following: “On about how many days in the past seven days did you consume eggs? Include scrambled eggs, hard-boiled eggs, egg sandwiches, egg salads, and other items where you could see the eggs. Do not include protein shakes that contain eggs, baked goods that contain eggs (like cookies and muffins), or other items where you couldn't see the eggs.” Like the dairy question, the restrictive nature of this question was intended to enhance the participants’ ability to accurately estimate their egg consumption. Over 50 participants reported consuming eggs seven days per week.



Of the 151 treated individuals who responded to the follow-up question about which cover matched the leaflet they received, 41 responded correctly while 87 reported not receiving a leaflet (most likely they received it but did not read it) and 23 reported being unsure about whether they received a leaflet; not one single person picked the fake leaflet cover, so that is a positive indicator that the participants did not lie in pretending to have received a fake leaflet. Graduate students and members of the university staff or faculty were more likely than unaffiliated individuals to answer this question correctly, and white students were relatively likely to answer correctly. Of the 151 treated individuals who responded to the picture recall question, 20 answered correctly, 0 answered incorrectly, 29 reported that they received a flyer but did not remember (not an option in the fact recall question), 16 reported being unsure about whether they received a flyer, and 86 reported that they did not receive a flyer; graduate students were relatively likely to answer correctly. Of the 151 treated individuals who responded to the fact recall question, 30 answered correctly while 22 answered incorrectly, 20 reported being unsure about whether they received a flyer, and 79 reported that they did not receive a flyer; this

is a surprising finding, in that it seems roughly 20 percent of respondents actually remembered a technical fact weeks after receiving the leaflet, while only 13 percent remembered a picture.

Again, graduate students were relatively likely to answer correctly.

In the follow-up, among all individuals who answered the relevant questions, 90 percent of participants agreed that cows feel both pain and pleasure while 93 percent agreed it is important to treat cows humanely. Conversely, only 80 percent reported they knew where to find a vegetarian meal if they wanted one.

Causal relationships

Using both the corrected standard deviations and the uncorrected standard deviations, the results are most similar to the findings of The Humane League (2015a) in that the impact on diet was statistically insignificant and slightly more people went vegetarian in the control group than in the leaflet group. For each of the ten outcome variables in both equations, I fail to reject the null hypothesis; there is not sufficient evidence that the leaflets had an impact on dietary choices or attitudes. That is to say, the leaflets seemed to have little to no impact on meat consumption, dairy consumption, egg consumption, the combined consumption of all three animal products, belief in animal sentience, belief in the importance of treating animals humanely, knowledge about where to find vegetarian meals, or whether the participant would say they are less likely to go vegetarian.

The original number of vegetarians in the baseline sample was 46, including seven vegans; this group made up only 6.6 percent of the sample. Such a low observed population share may be below the true average because vegetarians may be more likely to decline free cupcakes and cookies that they perceive to be unhealthy or contain eggs and dairy; however, what is more important is to track the change in vegetarian population size.

10 people reported becoming vegetarian, which is inferred by a participant reportedly going from consuming meat at least once per week to consuming meat zero times per week. Two of those 10 were in the treatment group (one for each leaflet version), and eight were in the control group. Due to the small sample size, any spillover effect where a control group participant received a leaflet from a friend in the treatment group could have a detrimental effect to the data analysis; moreover, this difference may capture the week-to-week fluctuations in meat

consumption, as some students may simply eat meat one week and go without it the next. All eight participants in the control group who reported no meat consumption in the follow-up only reported consuming meat for one to three days per week at the baseline, so it is possible they did not become vegetarian but rather went for one week without meat as part of the natural fluctuation in their diet. However, for the two participants in the treatment group who reported no meat consumption in the follow-up, one reported eating meat once per week at the baseline and one reported eating meat five times per week at the baseline; the latter could be considered a greater behavioral change and may be more likely to reflect a person going vegetarian.

Another critical finding is that of the 157 treated individuals who completed the follow-up survey, two stated that participating made them less likely to go vegetarian, while that number was zero for the 170 control group participants. This figure is particularly important when evaluating the net impact of leafleting; if the present study created one new vegetarian but made two people less likely to go vegetarian, the leafleting endeavor as a whole may have been incredibly counterproductive in terms of inspiring recipients to go vegetarian. It would be even more useful to know the number of people who will never go vegetarian because of something in the leaflet, but that might be impractical to measure without tracking individuals over their entire lifespans. Table 3 below reflects the individual impact of leaflet 1 (the why-oriented leaflet) and leaflet 2 (the how-oriented leaflet), as well as the mean value for outcome variables by treatment status.

Table 3. Individual impact of leaflet 1 and leaflet 2 on outcomes in EQ1 at follow-up

Outcome variable	Treatment group 1	Treatment group 2	Control group	Difference	Confidence interval	Observations
	(1)	(2)	(3)	(4)	(5)	(6)
Meat2	4.86	5.01	4.85	0.07	(-0.54, 0.68)	320
	(2.15)	(2.19)	(2.37)	(0.31, 0.22)		
				0.07	(-0.52, 0.67)	
				(0.30, 0.21)		
MeatYest.	0.82	0.78	0.80	0.05	(-0.09, 0.20)	318
	(0.39)	(0.41)	(0.40)	(0.07, 0.05)		
				-0.02	(-0.16, 0.11)	

Table 3 (cont.)

Outcome variable	Treatment group 1	Treatment group 2	Control group	Difference	Confidence interval	Observations
	(1)	(2)	(3)	(4)	(5)	(6)
				(0.07, 0.05)		
Dairy2	4.46 (2.04)	4.99 (1.94)	4.46 (2.11)	-0.30 (0.36, 0.26)	(-1.01, 0.41)	320
				0.37 (0.41, 0.29)	(-0.43, 1.17)	
Eggs2	2.90 (2.10)	4.99 (1.94)	2.34 (1.91)	0.30 (0.35, 0.25)	(-0.38, 0.99)	320
				0.21 (0.39, 0.27)	(-0.54, 0.97)	
Total	12.22 (4.25)	12.65 (3.92)	11.64 (4.14)	0.07 (0.65, 0.46)	(-1.20, 1.35)	320
				0.66 (0.70, 0.49)	(-0.71, 2.02)	
Sentience	0.91 (0.29)	0.92 (0.27)	0.88 (0.32)	0.04 (0.06, 0.05)	(-0.09, 0.16)	319
				0.05 (0.07, 0.05)	(-0.09, 0.18)	
Humane	0.96 (0.19)	0.91 (0.29)	0.93 (0.25)	0.03 (0.05, 0.03)	(-0.07, 0.12)	319
				-0.01 (0.06, 0.05)	(-0.14, 0.12)	
Find	0.82 (0.38)	0.80 (0.41)	0.78 (0.41)	0.00 (0.10, 0.07)	(-0.20, 0.20)	265
				0.03 (0.11, 0.08)	(-0.19, 0.25)	
App	0.42 (0.50)	0.45 (0.50)	0.29 (0.46)	0.04 (0.09, 0.06)	(-0.13, 0.22)	319

Table 3 (cont.)

Outcome variable	Treatment group 1	Treatment group 2	Control group	Difference	Confidence interval	Observations
	(1)	(2)	(3)	(4)	(5)	(6)
				0.11	(-0.09, 0.31)	
				(0.10, 0.07)		
Unlikely	0.01	0.01	0.00	0.02	(-0.03, 0.07)	319
	(0.11)	(0.12)	(0.00)	(0.02, 0.02)		
				0.01	(-0.03, 0.05)	
				(0.02, 0.01)		

Notes: This table presents estimated differences between the treatment groups and the control group at the follow-up. Treatment group 1 refers to individuals who received leaflet 1 (the why-oriented leaflet), while treatment group 2 contains individuals who received leaflet 2 (the how-oriented leaflet.) Columns 1-3 present means. Column 4 presents estimated coefficients for EQ1. Estimated standard deviations are reported in parentheses, and for column 4, they appear in the format of β_1 (*adjusted standard deviation, unadjusted standard deviation*) followed by β_2 (*adjusted standard deviation, unadjusted standard deviation*). Adjusted confidence intervals appear in column 5 with the format (*lower limit for β_1 , upper limit for β_1*) followed by (*lower limit for β_2 , upper limit for β_2*). Adjusted standard deviations and adjusted confidence intervals are calculated with ρ_e set at 1.

** Significant at the five percent level

The first key outcome variable, Meat2, reflects the days with meat consumption per week at the follow-up. The estimated impact of being treated with leaflet 1 is an increase of 0.07 days with meat consumption relative to the control group follow-up mean of 4.85 days, but this effect is not statistically significant at a 95 percent confidence level. The adjusted 95 percent confidence interval suggests I cannot rule out an impact anywhere between a reduction of 0.54 days or an increase of 0.68 days. The adjusted confidence interval suggests that the uncertainty about the effect size is greater than it is for the unadjusted confidence interval (-0.36, 0.51) because the adjusted interval is wider but still contains zero. Similarly, the estimated impact of being treated with leaflet 2 is an increase of 0.07 days with meat consumption, but again this effect is not statistically significant; the adjusted confidence interval suggests I cannot rule out an impact anywhere between a reduction of 0.52 days to an increase of 0.67 days. The adjusted confidence interval suggests the uncertainty about the effect size of leaflet 2 is greater than that of the unadjusted interval (-0.35, 0.49).

The second key outcome variable, MeatYesterday, takes on a value of 1 if the respondent reports eating meat the day before the day they complete the follow-up survey, which is approximately three weeks after the treatment group received a leaflet. The estimated effect of being treated with leaflet 1 on the probability of meat consumption on a day approximately three weeks later is an increase of five percentage points relative to the control group's follow-up mean probability of 80 percent, which would imply that the leaflet increased the probability of meat consumption, but the effect is not statistically significant. The 95 percent confidence interval suggests that I cannot rule out that leaflet 1 led to somewhere between a nine percentage point decrease and a 20 percentage point increase in the probability of meat consumption on that particular day. The adjusted confidence interval suggests that the uncertainty about the effect size is greater when compared to the unadjusted interval (-0.05, 0.16). On the other hand, the estimated impact of being treated with leaflet 2 is a reduction of two percentage points in the probability for meat consumption, but again this finding is statistically insignificant. The adjusted 95 percent confidence interval suggests that the impact could be anywhere from a reduction of 16 percentage points to an increase of 11, which is wider than the unadjusted interval of (-0.12, 0.07).

Table 4 below reflects the combined impact of leaflet 1 and leaflet 2, as well as the mean value for outcome variables by treatment status. In contrast to table 3, table 4 also includes the regression with no control variables, which simply regressed the Meat2 variable on a dummy variable that takes on a value of 1 for anyone who received a leaflet.

Table 4. Combined impact of leaflet 1 and leaflet 2 on outcomes in EQ2 at follow-up

Outcome variable	Treatment groups	Control group	Difference	Confidence interval	Observations
	(1)	(2)	(3)	(4)	(5)
Meat2	4.93 (2.17)	4.85 (2.37)	0.07 (0.24, 0.17)	(-0.40, 0.55)	320
Meat2 (no controls)	4.93 (2.17)	4.85 (2.37)	0.09 (0.36, 0.25)	(-0.61, 0.79)	320
MeatYesterday	0.80 (0.40)	0.80 (0.40)	0.02 (0.06, 0.04)	(-0.10, 0.13)	318

Table 4 (cont.)

Outcome variable	Treatment groups	Control group	Difference	Confidence interval	Observations
	(1)	(2)	(3)	(4)	(5)
Dairy2	4.72 (2.00)	4.46 (2.11)	0.02 (0.31, 0.22)	(-0.59, 0.64)	320
Eggs2	2.78 (2.06)	2.34 (1.91)	0.26 (0.30, 0.21)	(-0.33, 0.85)	320
Total	12.43 (4.09)	11.64 (4.14)	0.35 (0.55, 0.39)	(-0.73, 1.44)	320
Sentience	0.91 (0.28)	0.88 (0.32)	0.04 (0.05, 0.04)	(-0.06, 0.15)	319
Humane	0.93 (0.25)	0.93 (0.25)	0.01 (0.05, 0.03)	(-0.08, 0.10)	319
Find	0.81 (0.39)	0.78 (0.41)	0.01 (0.09, 0.06)	(-0.15, 0.18)	265
App	0.43 (0.50)	0.29 (0.46)	0.08 (0.08, 0.05)	(-0.07, 0.22)	319
Unlikely	0.01 (0.11)	0.00 (0.00)	0.02 (0.02, 0.01)	(-0.02, 0.05)	319

Notes: This table presents estimated differences between the combined treatment groups (anyone who received a leaflet) and the control group at the follow-up. Columns 1 and 2 present means. Column 3 presents estimated coefficients for EQ2. Estimated standard deviations are reported in parentheses, and for column 3, they appear in the format of β_1 (*adjusted standard deviation, unadjusted standard deviation*). Adjusted confidence intervals appear in column 5 with the format (*lower limit for β_1 , upper limit for β_1*). Adjusted standard deviations and adjusted confidence intervals are calculated with ρ_e set at 1.

** Significant at the five percent level

Once more, the data does not show with certainty that the leaflets had a significant impact on any outcomes. When considering anyone who received a leaflet of either version, the estimated effect of being treated is an increase of 0.07 days with meat consumption per week relative to the control group's follow-up level of 4.85 days, but this effect is not significant at the conventional level. The adjusted 95 percent confidence interval suggests that I cannot rule out

any impact between a reduction of 0.40 days to an increase of 0.55 days with meat consumption. The adjusted confidence interval suggests that the uncertainty about the effect size is greater than that of the unadjusted interval (-0.27, 0.41). Because this implies the maximum impact of leafleting is a ratio of (one leaflet / one person reducing their meat consumption by 0.40 days per week), the most optimistic theoretical scenario in this setting is that every 12.33 leaflets distributed would create a vegetarian equivalent where a person goes from the baseline average of 4.93 days with meat consumption per week to zero days, calculated as (12.33 leaflets * 0.40 fewer days with meat consumption per week per leaflet = 4.93 fewer days with meat consumption).

For the MeatYesterday variable, the estimated effect of leafleting is to increase the probability of meat consumption on that day by two percentage points relative to a mean probability of 80 percent, but this impact is statistically insignificant. The adjusted confidence interval suggests I cannot rule out the possibility that the true impact is anywhere from a reduction of 10 percentage points to an increase of 13 percentage points, which presents greater uncertainty than does the unadjusted confidence interval of (-0.06, 0.10).

Some of these results are less surprising than others. For example, it was unsurprising to see no impact on dairy consumption or egg consumption, as the leaflets mostly discuss the benefits of adopting a vegetarian diet; however, they do also include the word “vegan,” partly to clarify that a well-planned vegan diet is healthy as well. Therefore, it was still possible that the leaflets would have an impact on dairy or egg consumption. Only one control variable besides baseline meat consumption yielded statistically significant results in the Meat2 regression for EQ2: at the follow-up, females reported 0.45 fewer days with meat consumption per week compared to similar non-females ($p = 0.031$). However, the absence of an impact on meat consumption is very surprising. Given that neither leaflet was shown to be effective in terms of reducing the consumption of animal products or altering attitudes towards animals, it is not clear which leaflet performed better. Examining the impact of baseline control variables on Meat2, I found that only Meat1 and Sex had a statistically significant impact; as one might expect, a higher level of meat consumption at baseline is associated with a higher level of meat consumption at the follow-up, and being female is associated with a lower level.

The absence of a detectable impact by the leaflet motivated me to verify the results using an alternative regression for EQ2, where the outcome variable Meat2 is replaced with a variable

for change in meat consumption called ChangeMeat. ChangeMeat is constructed as Meat2 – Meat1, and I constructed similar variables for Dairy2 and Eggs2. Using ChangeMeat as the outcome variable in EQ2 with Meat1 excluded as a control variable, I still find no statistically significant impact on meat consumption ($p = 0.653$). Running the equivalent regressions for dairy and eggs, I come to the same result ($p = 0.863$ and $p = 0.443$ respectively).

Implications

It remains difficult to reconcile this inconclusive data with anecdotal evidence, as animal advocacy organizations frequently share stories of leaflet recipients who switched to a plant-based diet because of a leaflet they received. In the present study, while feedback from participants was not requested, one student took the time to write me an email saying, “I like to think of myself as someone who cares for the environment, and was shocked to read on the flyer about the damage meat production causes. Thank you for the information.” The strongest policy recommendation I have is for advocacy organizations to assist a team of professors in conducting an unbiased and academically rigorous evaluation of vegan leaflets with a greater sample size to better determine whether they are effective, and for that team to publish the paper in a peer-reviewed academic journal so other advocacy organizations can trust the results.

Limitations

Measurement error with self-reporting

Measurement error is often a problem in self-reporting, even more so with dietary interventions that train participants on reporting accuracy of food intake (Natarajan, et al., 2010). Unfortunately, the baseline survey in the present study could have impacted the accuracy with which all respondents report their answers in the follow-up round by causing them to pay closer attention to their diet and remember how often they eat animal products, and the leaflet could have held the same impact but only on the treatment group. This I cannot feasibly measure.

Further, the food-frequency questionnaire is indeed difficult to answer. One way I addressed this was by limiting the criteria for what qualifies as egg consumption and dairy consumption; instead of including baked goods that contain dairy and eggs, which the average consumer is often unaware of, I only included obvious products like ice cream and scrambled eggs. While this means I could overestimate a change in the consumption of dairy and eggs, it also means I am more accurate in estimating a change in the consumption of the most obvious dairy and egg products.

The Hawthorne Effect

Although economists frequently use stated responses dependent on recalled information about the composition of household expenditures for income approximation, there is significant skepticism about stated responses for food consumption as revealed preferences are generally more reliable; in future research, it might be better to track changes in sales of various products within a certain location where people received leaflets, such as a single dining hall. In this context, the flaws associated with stated responses are particularly complicated due to the Hawthorne Effect, where the knowledge of being studied affects the subjects' behavior in two main ways.

First, both the treatment group and the control group knew they were being studied, which could have caused both of them to change the way they reported their consumption of animal products. The survey itself could have impacted how people change their diet; according

to another paper, frequently surveying people on reported diarrhea can increase their likelihood to use a water treatment product (Zwane, et al., 2011). Because I believe the survey had a similar impact on both the treatment group and the control group, I ignore this risk.

Second, because the survey enumerators distributed the leaflets, survey respondents knew the leaflet was indirectly tied to the survey and its compensation even though they were only told the rewards were for completing the survey, which may have increased the chance that respondents would provide answers they believe are socially desirable in the eyes of the enumerator. Herbert, Clemow, Pbert, Ockene, and Ockene (1995) report that social desirability bias for a 24-hour diet recall is lower than for a more long-term food frequency questionnaire. And anecdotally, it is not hard to find individuals who fail to remember what they ate for dinner the previous night. These factors make the 24-hour diet recall attractive, but one day may not be representative of the respondent's diet for the whole week, and it would make it more difficult to distinguish a new vegetarian from someone who reduced their meat consumption, so I selected the seven-day recall. To address social desirability bias, the survey design does not reveal the purpose of the study or any connections the study has to animal advocacy (Faunalytics, c. 2015); however, instead of using a Marlowe-Crowne Social Desirability Scale to check whether reported animal product consumption is correlated to a person's likeliness to provide a socially desirable answer based on personality traits, which may only suggest whether the bias exists, I considered employing a list experiment to verify meat consumption frequency as this provides a numerical estimate for the amount of the bias and has been proven effective even with sensitive research topics such as asking an Afghan whether they support the NATO-led mission in Afghanistan (Blair, Imai, & Lyall, 2014). It would have taken too much of the respondents' time to do a list experiment for each animal product, thereby jeopardizing their attention to detail in the questions, so I considered conducting a list experiment for meat alone.

The list experiment would have used the data from the question in the follow-up round in which the respondent was asked to provide the number of statements with which they agreed from a list of statements. Because the respondent did not need to say which statement they agreed with, they were more likely to provide an honest answer; presumably they believed the research team would not know which statements they agreed with. Half of the respondents in each group received a version of the question with four irrelevant statements such as "I have more than one sibling," while the other half received a version with those same four questions

but also the relevant one: “I usually eat meat at least once per week.” To interpret the data, say for example that people agree with two statements on average for the first version of the question; if that is the case, anyone who says they agree with three statements in the second version is probably saying yes to the meat question. From this I would have a new estimate for the frequency of meat consumption, which I could compare to the self-reported frequency. The list experiment can capture two types of reporting errors. First, people might respond dishonestly in saying they reduced their consumption of animal products, but this appears not to have happened because I did not detect a significant effect on reported animal product consumption. Since that first reason was the intended purpose of the list experiment, I decided not to use the data. Second, it might be important for the opposite reason, which is to say people might respond dishonestly by saying they ate more meat simply out of spite; future researchers may benefit by exploring this question. However, the experiment depends on two assumptions: adding the sensitive item should not change the responses to the control items, and respondents must be honest in the list experiment.

Incentive influence and respondent bias

Asking someone to complete a survey with a food-based incentive and then giving them a leaflet is very different from the traditional method of simply handing out the leaflet, so this study created an artificial setting designed to mimic the traditional method; it is somewhat similar to the paid-per-read model, except here reading the leaflet is not required to receive the reward but completing the surveys is required. One potentially confounding factor is a subject in this experiment may have been more likely to read the leaflet since they received it from a survey enumerator with whom they had brief contact and from whom they received a reward as well, rather than receiving a leaflet from a complete stranger with minimal interaction and no reward. The present study could also be loosely compared to the feed-in approach (Runkle, 2009), where activists distribute highly palatable vegan food in order to show that vegan food can taste good, which is a luxury form of outreach that not all leafleters can afford to do; however, any consequent feeling of indebtedness the subject may experience from receiving free food could be eliminated because the subject is first completing a survey, and we did not label the food as vegan or actively tell subjects that the food was vegan until after the experiment. The

sample self-selected into responding to the survey, which ensures the treatment group is similar to the control group in the baseline while creating only a conventional respondent bias in that individuals who had the time and desire to complete a survey may not be representative of all individuals on campus.

However, students who are open-minded, non-rushed, and pro-vegetarian may have been more likely to complete the follow-up survey, and this trend could be more prevalent in the treatment group so that could have introduced demographic differences between the treatment group and the control group. Fortunately, there is no evidence of this in table 2. But in theory, those who responded to the follow-up survey in the treatment group may be more pro-vegetarian than those who did not respond since the leaflet did not make them lose interest, therefore causing the regression to either overestimate the impact given the open-minded sample or underestimate the impact given the high number of respondents who were already vegetarian and could not reduce meat consumption further. Regressing a dummy variable for sample attrition on a dummy variable for baseline vegetarian status, I find no evidence that vegetarians were more likely to respond to the follow-up. While a scenario where more pro-vegetarian people respond would not be ideal in capturing the impact on a random person, it would mean the results may move closer to representing the impact on actual people who accept conventionally distributed leaflets. Surveying people who accepted a leaflet unrelated to veganism as a second treatment group could capture a different population than people who accepted a vegan leaflet, as the latter may be more pro-vegetarian to begin with, so I chose not to pursue that strategy. The initial baked good incentive from The Dancing Dog can help prevent capturing only an eco-friendly, health-conscious, liberal sample (at the risk of actually missing some health-conscious people who do not want to eat a baked good), while the Sustainable Student Farm gift card for fruits and vegetables in the follow-up does not help with that issue as much.

Unrepresentative sampling and the small sample size

Any significant local events that impacted how respondents read the leaflet could have influenced the leaflets' impact, but fortunately, no such events seem to have occurred. This paper describes the impact of leafleting over the course of five days. Another potentially confounding factor is that a local Campus Organizer for The Humane League and a volunteer for Vegan

Outreach were also active in vegan advocacy during the time period of this study and there is a risk that some changes in behavior are due to their work; however, given the randomized assignment to treatment, it is reasonable to expect their impact would be equal across the treatment group and the control group.

Also, the sample size in the follow-up round was relatively small due to attrition, as people were open to taking the baseline survey in person when the food reward was immediately available but not all of those participants were as motivated to complete the follow-up round via email; the small sample size made detecting a statistically significant impact very difficult. The sample is fairly representative of a leafleting audience at the University of Illinois at Urbana-Champaign but cannot be generalized to the national level, especially because many leafleters target only passersby aged roughly 18-25 years old to maximize the impact while the present study did not have a maximum age, which could have easily reduced the impact; with limited external validity, comparisons to other universities with different characteristics might prove difficult. The sample time was fairly representative, in that it excluded academic exam season as well as other factors like Catholic Lent that may affect short-term dietary patterns. While the baseline survey asked students about their diet for a time period that included three to seven days of spring break, when students may be eating differently away from school, this actually does not matter very much since the randomized model simply compares the follow-up outcomes of the treatment group and the control group.

Difficulty of changing behavior

One meta-analysis showed interventions that inspired greater changes in intention also produced greater changes in behavior, but a medium-to-large change in intention leads to a small-to-medium change in behavior (Webb & Sheeran, 2006). The reason is largely that a person has either limited control over their behavior or a perception that their control is limited; as an example in this context, that could mean that a person cannot afford expensive vegan food or perceives that all vegan food is expensive. The diverse nature of the campus also makes it difficult to tailor certain persuasive devices; for example, the “why love one but eat the other?” picture that shows a picture of a dog next to a pig could be more persuasive for Americans than for students from China or South Korea, and 17 percent of baseline survey respondents were

born in Asia; however, some Asian meat eaters who grew up with pet dogs may still find the question compelling. Assembling enough information onto a double-sided sheet of paper to inspire a significant change in a short amount of time was difficult, and it was largely an independent task. A leaflet designed by a team of professional graphic designers, psychologists, animal advocates, environmental advocates, and health advocates might have a greater impact. Any participant who ate meat at the time of follow-up might go vegetarian after that time, as many people change their diets gradually over time, and any participant who did not eat meat at the time of follow-up might go back to eating meat after that time; this study provides no information about vegetarian retention. Moreover, because both leaflet 1 and leaflet 2 had at least some information on the reasons to go vegetarian as well as some information on how to do so, this study design could not have fully determined the relative importance of each type of information.

Suggestions for future research

For future studies, I suggest that researchers conduct the same experiment as the present study while attempting to better address the aforementioned limitations, namely by increasing the sample size based on power calculations with a relatively small minimum detectable effect within the aforementioned confidence intervals. If possible, it may be useful to consider the relative impact of a short leaflet with only a few pages when compared to a longer leaflet. Another crucial improvement is providing a more persuasive survey incentive such as a \$10 gift card to Amazon. Assuming a better incentive would persuade 60 percent of baseline participants to complete the follow-up survey as opposed to 47 percent in the present study, this requires a minimum of 47,094 participants in the baseline; after approximately 40 percent drop out, that leaves 28,256 people to obtain the treatment group and control group, both containing 14,128 people. At \$2 per baked good incentive for each of the 47,094 individuals (which could be donated but would generate a cost of \$94,188) and \$10 for each of the 28,256 follow-up participants (generating a cost of \$282,560), executing the study properly would be highly expensive but more worthwhile than small-scale studies with limited internal validity and external validity. The cost of leaflets and other materials could be relatively low. If researchers are able to acquire the necessary grant funding, it might be more justifiable to spend it on observed data for the short-term and long-term impact of leafleting, rather than self-reported data.

While I would advise against it in many cases, future researchers using self-reported data may wish to include all dairy and egg consumption, such as products where the average consumer may not know the product contains dairy or eggs. Their studies would depend on participants in the treatment group having a similar level of understanding compared with participants in the control group; for example, if 20 percent of people in both groups did not know there were eggs in their mayonnaise and therefore they underreported how often they consumed eggs in both the baseline period and the follow-up period by the same amount, then their understanding would not impact the analysis as much; randomizing treatment ensures their level of understanding was similar in the baseline, but not that it will be similar in the follow-up after half of the sample is treated. Researchers can test this by including a question in the follow-

up survey to evaluate the respondents' understanding of whether a product contains eggs or dairy.

It may be useful in leafleting studies to have the survey enumerators be different people from the leafleters; this way, the participants will not know that the survey or its incentives are connected to the leaflet, at least in the baseline round. If people feel they are being rewarded for reading the leaflet, it could affect how or whether they read the leaflet. Overall, the most important conclusion is to recognize that we still do not know whether leafleting is effective; there exists a great need for replication studies in this field.

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Appendix A: Baseline survey

1. What is your age in years?

- 17 or younger
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- Please enter your age here if you're 25 or older: _____

[Survey command: if 17 or younger is selected, skip to the end of the survey.]

2. What is your status at the University of Illinois at Urbana-Champaign?

- Undergraduate student (including visiting or international students)
- Graduate student (including visiting or international students)
- Faculty or staff
- Unaffiliated with the university
- Other (please write here): _____

3. What is the highest educational level you have completed? Note that if you are currently a college student and you have not yet received a college degree, you should select "High school diploma."

- High school diploma
- 2-year college degree
- 4-year college degree
- Graduate school degree
- I have not received a high school diploma
- Other (please specify here): _____

4. What is your biological sex?

- Female
- Male
- Intersex

5. In what region were you born?

- Africa
- Asia
- Australia
- Europe
- North America
- South America

6. What is your race?

- Asian (including China, Korea, Thailand, etc. but not South Asia)
- Black
- Latino or Hispanic
- Middle Eastern
- Multiracial
- Native American or Alaska Native
- Native Hawaiian or Pacific Islander
- South Asian (including India, Nepal, Pakistan, etc.)
- White
- Other (please write here): _____

7. On about how many days in the past seven days did you consume fruits? Include strawberries, bananas, apples, fruit smoothies, etc.

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

8. On about how many days in the past seven days did you consume vegetables? Include bell peppers, lettuce, carrot juice, etc. Include raw vegetables, cooked vegetables, and vegetables in processed foods like pre-made burritos, but do not include vegetable oil.

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

9. On about how many days in the past seven days did you consume dairy products? Only include milk that you drank, ice cream that you ate, cheese that you ate, and yogurt that you ate. Do not include items where you can't always see the dairy part (like a sandwich with a little butter and a cookie made with milk) or items made only from plant sources (such as almond milk).

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

10. On about how many days in the past seven days did you consume eggs? Include scrambled eggs, hard-boiled eggs, egg sandwiches, egg salads, and other items where you could see the eggs. Do not include protein shakes that contain eggs, baked goods that contain eggs (like cookies and muffins), or other items where you couldn't see the eggs.

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

11. On about how many days in the past seven days did you consume meat? Include chicken, beef, pork, fish, seafood, etc.

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

12. What email address can we use to send you the follow-up survey? We will not sell your email address to anyone, and you'll get a \$10 gift card for more food if you do the follow-up survey.

- Please enter your email address here: _____

13. What phone number can we use to call you with a reminder about the follow-up survey? We'll only call you if we don't receive a survey response, and we'll only call once.

- Please enter your phone number here (optional): _____

14. What is your name? This will only be used to make sure you receive the reward for completing the survey.

- Please enter your full name here: _____

15. Thank you for your participation in our survey! Please show this device to the survey organizer so they can enter your survey code, and then you can collect the reward for your help.

- For survey organizer only: please enter the survey code. _____

Appendix B: Follow-up survey

Background

Although all baseline survey participants received the same survey, there were four versions of the follow-up survey. The primary distinction among follow-up survey versions is that two surveys had questions about the leaflet for the treatment group, while the two surveys for the control group excluded those questions. Within the two surveys for the treatment group, one version had the longer list experiment question and one version had the shorter one; likewise, within the two surveys for the control group, one version had the longer list experiment question and one version had the shorter one. Below is the treatment group survey with the longer list experiment question.

Questions

1. In what region were you born?

- Africa
- Asia
- Australia
- Europe
- North America
- South America

2. On about how many days in the past seven days did you consume fruits? Include strawberries, bananas, apples, fruit smoothies, etc.

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

3. On about how many days in the past seven days did you consume vegetables? Include bell peppers, lettuce, carrot juice, etc. Include raw vegetables, cooked vegetables, and vegetables in processed foods like pre-made burritos, but do not include vegetable oil.

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

4. On about how many days in the past seven days did you consume dairy products? Only include milk that you drank, ice cream that you ate, cheese that you ate, and yogurt that you ate. Do not include items where you can't always see the dairy part (like a sandwich with a little butter and a cookie made with milk) or items made only from plant sources (such as almond milk).

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

5. On about how many days in the past seven days did you consume eggs? Include scrambled eggs, hard-boiled eggs, egg sandwiches, egg salads, and other items where you could see the eggs. Do not include protein shakes that contain eggs, baked goods that contain eggs (like cookies and muffins), or other items where you couldn't see the eggs.

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

6. On about how many days in the past seven days did you consume meat? Include chicken, beef, pork, fish, seafood, etc.

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

7. Did you consume meat yesterday? Include chicken, beef, pork, fish, seafood, etc.

- Yes
- No
- I don't know

8. Please read the following statements. How many statements are true for you?

- I usually ride my bike at least once per week
- I usually eat meat at least once per week
- I usually go to the library at least once per week
- I have more than one sibling
- I saw a movie in theaters in the past seven days
- None of the statements above are true
- One of the statements above is true
- Two of the statements above are true
- Three of the statements above are true
- Four of the statements above are true
- Five of the statements above are true

9. Do you agree or disagree with the following statement?

I believe cows can feel both pain and pleasure.

- Strongly agree
- Somewhat agree
- I'm not sure
- Somewhat disagree
- Strongly disagree

10. Do you agree or disagree with the following statement?

I believe it's important to treat cows humanely.

- Strongly agree
- Somewhat agree
- I'm not sure
- Somewhat disagree
- Strongly disagree

11. Did you receive either one of these flyers at any time in the past four weeks?

- I received this flyer: [Cover picture redacted.]
- I received this flyer: [Cover picture redacted.]
- I didn't receive either one of those flyers
- I'm not sure if I received one of those flyers

12. Which animal was included in a picture in the flyer?

- Cat
- Bird
- Pig
- I received a flyer but I don't remember
- I didn't receive a flyer
- I'm not sure if I received a flyer

13. What did the flyer say about the production of meat and other food from animal sources?

- Producing the meat for one burger takes more water than showering for 1.5 hours
- Meat production is responsible for more job creation in poor countries than rich ones
- Animal products are responsible for more greenhouse gas emissions than cars
- I didn't receive a flyer
- I'm not sure if I received a flyer

14. If you wanted to eat a vegetarian meal, would you know where to go?

- Yes
- Maybe
- No

15. Do you have the UI Dining app on your phone?

- Yes, I downloaded it within the past four weeks
- Yes, I downloaded it over four weeks ago
- No

16. Which statement best describes you now that you've participated in this survey?

- I became more likely to go vegetarian
- I became less likely to go vegetarian
- I didn't change my diet and I was already vegetarian
- I still eat meat and my likelihood of going vegetarian didn't change

Appendix C: Leaflets 1 and 2

Note: the pictures have been redacted, but the actual leaflets with pictures are available upon request.

Leaflet 1: cover panel and two outside panels



Jon Stewart

Maggie Q

Grocery stores like Schnucks, Strawberry Fields, and Common Ground are full of mouthwatering meat alternatives like

Gardein's chicken scallopini, veggie burgers, and fish filet. Check out Beyond Meat for beef crumbles and chicken strips, Field Roast for maple sausage, and Sweet Earth for bacon.

Vegetarian food is all over the **dining halls** too. Download the UI Dining app and pick the vegetarian filter to find great food!

Like eating at restaurants? Check out The Red Herring, one block from the main quad, or The Dancing Dog in downtown Urbana - both have a tasty, 100% vegetarian menu.

Want to test it out one day per week? By taking the UIUC Meatless Monday Pledge at Illinois.MeatlessMondayPledge.com, you'll get more tips and see how good it feels to start your week off on a positive note.

Serena Williams

Griff Whalen

Liam Hemsworth

Natalie Portman

Al Gore

Ariana Grande

Local groups (meat-eaters are welcome)

Student group: University Vegans

Community group: Vegans in Champaign-Urbana

Change the world...

One bite at a time

Leaflet 1 (cont.): three inside panels

For the environment	For your health	For animals
<p>One reason society's food choices matter is because they have a huge impact on the planet.</p> <p>Producing the meat for one hamburger takes more water than showering for an hour and a half.¹ Plus, livestock systems occupy 70% of global farmland and 30% of the whole planet's land surface.²</p> <p>Luckily, it's never been easier to replace meat in your diet with plant sources of protein like nuts, whole grains, and beans. For a sustainable choice, try Gardein's delicious soy chicken alternative shown in the sandwich on the cover.</p> <p>A vegetarian diet uses less water and land, while fighting climate change as well.^{3,4}</p>	<p>According to the Academy of Nutrition and Dietetics, well-planned vegetarian and vegan diets are healthy and appropriate for individuals of all ages, including athletes.⁵</p> <p>They conclude that a vegetarian diet is associated with:</p> <ul style="list-style-type: none"> - a lower rate of obesity - a lower risk of death from heart disease (the #1 cause of death in the United States⁶) - a lower overall rate of cancer (the #2 cause of death in the United States⁶) <p>For simple recipes, visit</p>	<p>As Charles Darwin wrote in his book <i>The Descent of Man</i>, "Happiness is never better exhibited than by young animals, such as puppies, kittens, lambs, etc., when playing together, like our own children."</p> <p>Sometimes people forget how intelligent other animals are. For example, pigs can recognize the sound of their mother's voice and even learn how to play a simple video game by moving a joystick with their snouts.⁷</p> <p>Fortunately, consumers don't have to support the business of slaughtering such animals for food. You can live a healthy and more ecologically sustainable life on an affordable plant-based diet.</p>

To learn more, watch the documentary *Cowspiracy*

To learn more, watch the documentary *Forks Over Knives*

To learn more, watch the debate *Don't Eat Anything With a Face*

¹ <http://link.springer.com/article/10.1007%2Fs10021-011-9517-8>

² <http://www.fao.org/docrep/010/a0701e/a0701e00.HTM>

³ <http://ajcn.nutrition.org/content/78/3/660S.full>

⁴ <http://journals.ametsoc.org/doi/abs/10.1175/EI167.1>

⁵ <http://www.ncbi.nlm.nih.gov/pubmed/19562864>

⁶ <http://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm>

⁷ http://www.humanesociety.org/animals/pigs/pigs_more.html

Leaflet 2: cover panel and two outside panels

Tips on making the change

When you're on the go, the **Happy Cow app** helps you find nearby vegetarian-friendly spots like Subway, Taco Bell, Azzip Pizza, and Golden Harbor.

For **simple recipes**, visit FindingVegan.com, or check out the cookbooks *Eat Vegan on \$4 a Day* and *Vegan Cooking for Carnivores*.

Your heart will thank you; according to the Academy of Nutrition and Dietetics, well-planned **vegetarian and vegan diets are healthy** and appropriate for people of all ages, including athletes.⁷

Want to test it out one day per week? By taking the UIUC Meatless Monday pledge at **Illinois.MeatlessMondayPledge.com**, you'll get more tips and see how good it feels to start your week off on a positive note.

Local groups (meat-eaters are welcome)

Student group: University Vegans
Community group: Vegans in Champaign-Urbana

⁷ <http://www.ncbi.nlm.nih.gov/pubmed/19562864>

Grocery shopping guide

Local grocery stores are full of mouthwatering meat alternatives. You could even make the same dishes you already love with one simple switch.

Item availability ("sorta" means a similar product is available)

Schnucks	Common Ground	County Market	Strawberry Fields
Yes	Yes	Sorta	Sorta
Sorta	Yes	Sorta	Yes
Sorta	Sorta	Sorta	Yes
Sorta	Yes	Yes	Sorta

Also available: Gardein's chicken scallopini, chicken fingers, meatballs, and fish file; Beyond Meat's chicken strips; and tons of nutrient-dense fresh produce.

Change the world...

One bite at a time

Leaflet 2 (cont.): three inside panels

For the environment	For animals	For the delicious food
<p>One reason society's food choices matter is because they have a huge impact on the planet.</p> <p>Producing the meat for one hamburger takes more water than showering for an hour and a half.¹ Plus, livestock systems occupy 70% of global farmland and 30% of the whole planet's land surface.²</p> <p>Luckily, it's never been easier to replace meat in your diet with plant sources of protein like nuts, whole grains, and beans. For a sustainable choice, try Gardein's delicious soy chicken alternative shown in the sandwich on the cover.</p> <p>A vegetarian diet uses less water and land, while fighting climate change as well.^{3,4}</p>	<p>As Charles Darwin wrote in his book <i>The Descent of Man</i>, "Happiness is never better exhibited than by young animals, such as puppies, kittens, lambs, etc., when playing together, like our own children."</p> <p>Sometimes people forget how intelligent other animals are. For example, pigs can recognize the sound of their mother's voice and even learn how to play a simple video game by moving a joystick with their snouts.⁵</p> <p>Fortunately, consumers don't have to support the business of slaughtering such animals for food. You can live a healthy and more ecologically sustainable life on an affordable plant-based diet.</p>	<p>Vegetarian food is all over the dining halls. Download the UI Dining app and pick the vegetarian filter to find great food! No smartphone? No problem, just go to EatSmart.housing.illinois.edu/NetNutrition.</p> <p>Like eating at restaurants? Good news, your favorite spots already have tons of options.⁶</p>
<p>To learn more, watch the documentary <i>Cowspiracy</i></p>	<p>To learn more, watch the debate <i>Don't Eat Anything With a Face</i></p>	<p>To learn more, visit</p>

¹ <http://link.springer.com/article/10.1007%2Fs10021-011-9517-8>

² <http://www.fao.org/docrep/010/a0701e/a0701e00.HTM>

³ <http://ajcn.nutrition.org/content/78/3/660S.full>

⁴ <http://journals.ametsoc.org/doi/abs/10.1175/E1167.1>

⁵ http://www.humanesociety.org/animals/pigs/pigs_more.html

⁶ Pictured: burrito with sofritas (soy meat) at Chipotle, Japanese Pan Noodles at Noodles & Company, falafel pita at The Red Herring, and the Saturday night deep dish at The Dancing Dog