Planting Trees From Private Jets: Establishing Metrics in Celebrity Green Marketing

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Determining the impact of varied environmental ("green") campaign strategies could distinguish between averting damage rendering the Earth eventually uninhabitable and salvaging the planet's biodiversity. Although politicians and activists have successfully broadcasted the message of climate deterioration, the planet still requires more action through the form of pressure on large legislative bodies, near-ubiquitous lifestyle changes, and/or the cooperation of large polluting conglomerates. Accepting the heightened difficulty in quantifying motivation and practicality behind the other options, this delve into green campaigning focuses on altering individuals' own lifestyles to adopt more green practices. Incorporating "The effectiveness of celebrities in conservation marketing", written by Elizabeth Duthie, Diego Veríssimo, Aidan Keane, and Andrew T. Knight, we hope to illuminate the scale at which celebrities convincing others to live greener lives may negate celebrities' own disproportionately high emission rates in an attempt to determine if their usage in environmental campaigns is fundamentally hypocritical.

Method

Although Duthie et al. concluded that respondents to their survey exhibited more interest in celebrity environmental advertisements rather than a similar advertisement from an unknown real-life expert, questions still remain over celebrities' utility in contrast to their destructive lifestyles. We would like to estimate the amount of damage an average celebrity accrues on the environment relative to an average person, as well as the approximate benefit of a celebrity attaching their image to a green campaign relative to an average person. In addition, by calculating the amount of impact necessary for a celebrity green campaign to outweigh their environmental cost, we would gain an insight into the realism (or lack thereof) of such a pursuit.

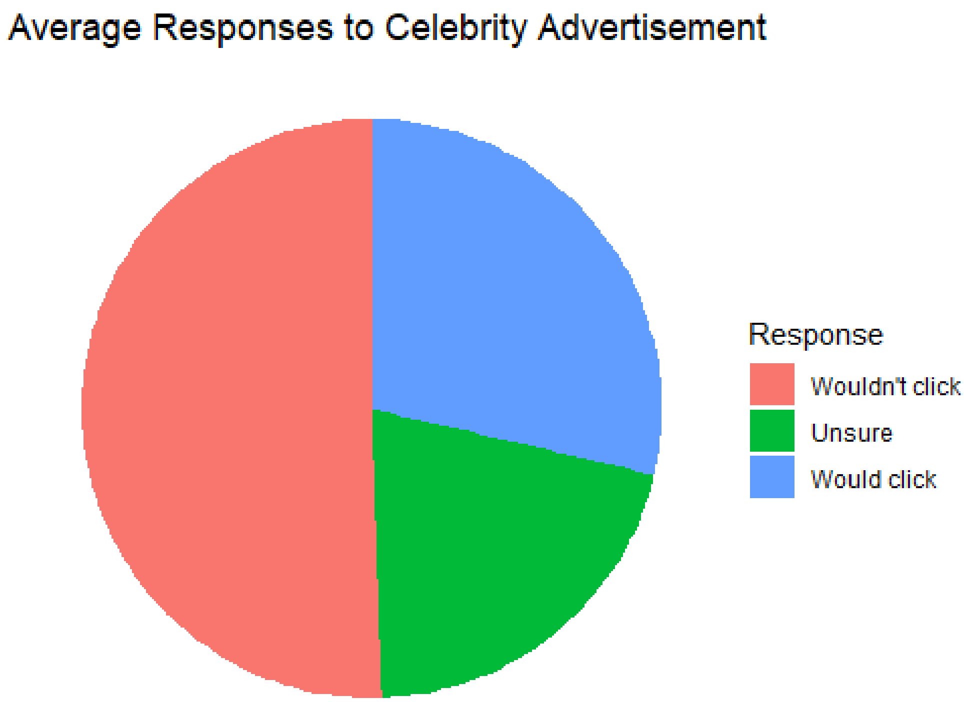
Firstly, we must address the inherent ambiguity behind referring to an "average" celebrity's carbon dioxide emissions. Due to privacy concerns we do not possess intimate access to personal emissions data, so we narrow our focus to more freely available private jet data. From the CelebrityJets Twitter page, the typical featured celebrity emitted 3376.64 tons of CO_2 from private jet usage alone from January to July of 2022 (Yard, 2022). Assuming a similar rate across the entire year, we obtain 5788.53 tons for a celebrity's annual private jet emissions. Naturally, this approach greatly simplifies a large field of individuals and neglects the emissions generated by celebrity estates, but it at least represents a starting point in celebrity emission analysis.

As the earlier study concentrated uniquely on the United Kingdom, we will attempt to quantify the field of potential consumers of a celebrity green campaign from the lens of a hypothetical British-only effort. The UK most recently estimated its population at 67.6 million ("Population estimates", 2024). Speaking practically, it is unlikely to expect successful contact with every single UK resident. Additionally, we must accept that a potential green campaign reaching millions would require extensive funding. For the time being, we ignore this concern in favor of simply searching for the amount of people reached and genuine lifestyle conversions required for a celebrity to have justified their appearance in a green campaign.

Evidently, mere exposure to an advertisement does not imply the purchase of a product or investment in the promoted philosophy. We must establish an anticipated "conversion rate", the term applied in marketing to the number of consumers who took an action due to an advertisement divided by the total number exposed to this advertisement. This rate varies greatly depending on industry and advert location, but we will adopt Merseyside-based Ruler Analytics average estimation of 2.9% as a preliminary conversion rate (Holmes, 2023). Thus, once we determine how many green actions by consumers exposed to our celebrity green campaign we require, this figure will be 2.9% of our estimated total of consumers necessary to reach in the campaign.

In order for a celebrity to somehow level their estimated 5788.53 tons of annual CO2 emissions to something resembling the human average of 4.7 tons (Cozzi et al., 2023), they need to offset approximately 5783.83 tons. In the context of our examination, these offsets would occur through small increments; lifestyle adjustments from average consumers to lower their own emissions. To quantify the average small increment acquired from a conversion, we indulge in slight speculation with the CoolClimate calculator. According to the calculator, a motivated individual who opts to ride their bike more regularly than drive a car, rigorously turns off lights, avoids drying clothes electrically, and reduces material waste saves around 1.5 tons more than someone who does none of these things. This seems a reasonable expectation for how someone genuinely and effectively impacted a green campaign might react, without resorting to unrealistic scenarios. Through these admittedly imperfect estimates and our estimated conversion rate, we can calculate the amount of consumers the campaign needs to reach as $n = (5783.33/1.5) / .029 = 132950.1$ consumers. This, clearly, is only a rudimentary calculation and does not remove the need for further analysis.

To answer our query about the utility of celebrity marketing in green campaigning, we focus on willingness to engage (WTE) from Duthie et al.. This does not devalue the importance of informing the public of climate change, but means instead that we acknowledge the heightened importance of engagement that gives rise to action rather than information alone. In the experiment from Duthie et al., we observed the ordinal proportions .707, .17, and .123 for "would not click", "unsure", and "would click", respectively in the control group. For the celebrity advertisements, we note average proportions of .5057, .208, and .2867 by averaging the results from the three different celebrity advertisements tested. We are assuming that higher rates of WTE correspond directly to higher propensity for green lifestyle change, under the impression that informational transfer, and recall, may occur even if lacking after the initial engagement.



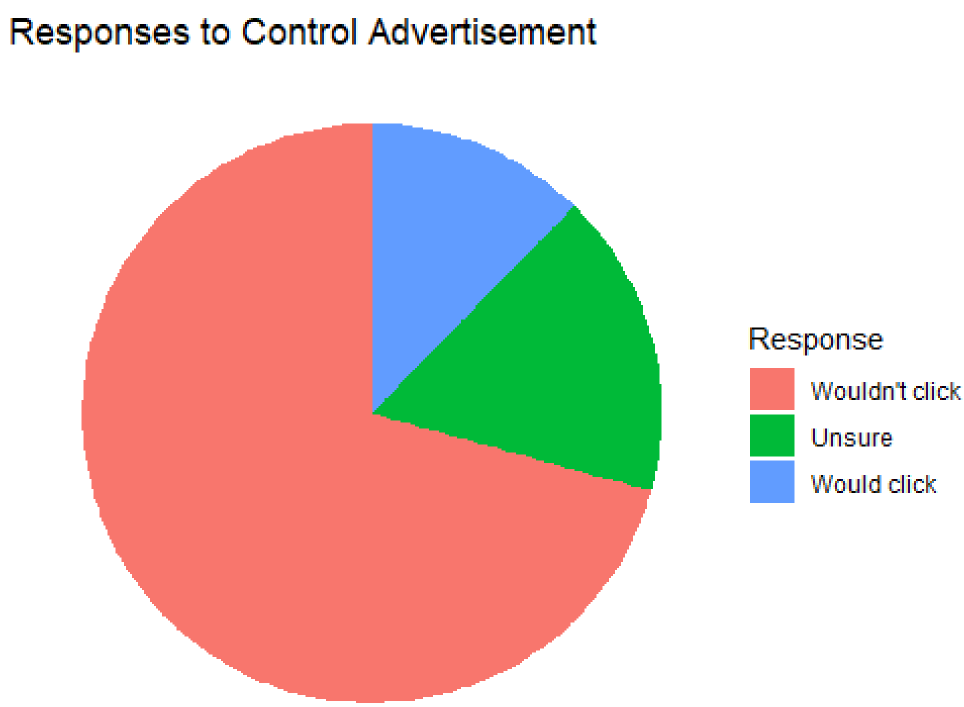


Figure 1: The observed proportions from Duthie et al.. Category 1 is "would not click", Category 2 is "unsure", and Category 3 is "would click".

Given the necessary data, we could attempt to employ these observed proportions of WTE by each classification as prior distributions to fit a new Bayesian multinomial logit model. This would further explore celebrity impact, similarly to the initial process depicted in the source study (Duthie et al., 2017). However, we do not possess the same specific classifiers and input of initial survey respondents, and thus thoroughly manipulate results to reflect a larger population. In an attempt to simulate a larger sample that reflects upon the large number of people that a celebrity green campaign would appeal to, we employ a large-scale Markov chain Monte Carlo (MCMC) simulation in an attempt to gauge the expected difference between a celebrity and non-celebrity campaign when exposed to a larger population.

Here, we apply the Metropolis-Hastings algorithm in R to simulate samples exposed to a celebrity campaign and samples exposed to a control campaign. The study from Duthie et al. provides the initial distribution of proportions for both cases. We set a proposed standard deviation of .05 to reflect our subjective perspective of the initial data as informative with some flexibility. We then normalized each iteration's found proportions in order to effectively simulate the entire sample space (in other words, that each set of proportions added to 1). We ran 10000 iterations.

In MCMC, we approach the simulation process as a Markov chain in which the current iteration informs the next one. We seek to perform this in such a way that an infinite Markov chain would mirror our target probability distribution function. Here, evidently, we do not possess a function of the attitudes of the larger population outside of the sample of several hundred surveyed. To generate the next value in the chain, the Metropolis-Hastings algorithm procures a candidate point, some x^*, based on the current status of the chain. Here, we choose a Normal distribution clustered around our observed proportions of responses based around WTE to celebrity advertisements and the control. This random value at each iteration is denoted u.

Written mathematically, here is the logic behind selecting the next point in the Markov chain:

$x_{n+1} = x^*$ if $u \leq A(x_n \rightarrow x^*)$ $x_{n+1} = x^n$ otherwise

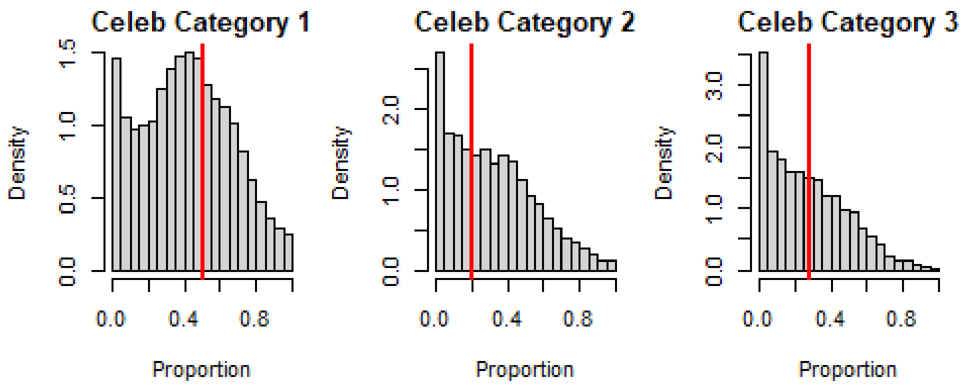
In this context, our Markov chain is represented by $x_1, \ldots, x_n, x_{n+1}, \ldots$. u represents a randomly generated number between 0 and 1 selected uniformly, and the term $A(x_n \rightarrow x^*)$ is the acceptance probability of the candidate point.

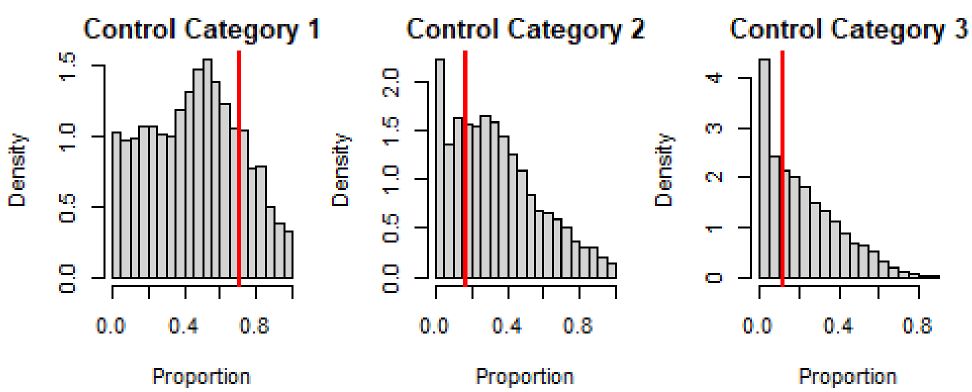
Here is the specific calculation of the acceptance probability:

$A(x_n \rightarrow x^*) = min(1, \frac{p(x^*)}{p(x_n)} * \frac{q(x_n)|x^*}{q(x^*)|x_n}).$

In this context, we represent the proposal distribution with q and the stationary distribution of our Markov chain with p.

We extract the median point estimates of Category 3, or "would click", given here as 0.2470785 for the control group and 0.2800551 for the celebrity group. There is a difference of 0.0329766, or approximately 3.298%. We can interpret the difference in simulation estimated medians by noting that consumers in our two simulations are this amount more likely to click on a celebrity-helmed environmental advertisement than a non-celebrity one. We obtained the median point estimates by splitting our MCMC observations into quantiles, and calculating the data's midpoint. It should also be noted that our 95% confidence intervals display a high amount of variability, putting any results we adopt under question.



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## Confidence intervals for celebrity observed proportions:

## Category 1 :
##   95% Confidence Interval: 0 - 0.9060414
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##   Median (Point Estimate): 0.4135465
## Category 2 :
##   95% Confidence Interval: 0 - 0.8308036
##   Median (Point Estimate): 0.2849606
## Category 3 :
##   95% Confidence Interval: 0 - 0.7253797
##   Median (Point Estimate): 0.2359353

##
## Confidence intervals for control observed proportions:

## Category 1 :
##   95% Confidence Interval: 0.005620106 - 0.9255707
##   Median (Point Estimate): 0.4658293
## Category 2 :
##   95% Confidence Interval: 0 - 0.8663001
##   Median (Point Estimate): 0.2995515
## Category 3 :
##   95% Confidence Interval: 0 - 0.6259265
##   Median (Point Estimate): 0.175416
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Figures 2 and 3: The results from the MCMC process, and the 95% confidence intervals and point estimates. The category labels are the same as in Figure 1.

If we take certain components of the earlier calculation for the minimum number of consumers reached by a celebrity campaign to "cancel out" their CO2 emissions, we can now approach the problem through the lens of contrasting celebrity and non-celebrity campaigns. With the given 3.298% difference, we can calculate some new metric from our earlier *n* as 132950.1/0.0329766 = 4031649.71525. We interpret this new figure as the amount of people reached by the campaign before the positive difference a celebrity campaign makes outweighs the average celebrity's high CO2 emissions. It differs from our earlier estimate of *n* by considering the celebrity campaign as a replacement for a pre-existing non-celebrity campaign, and hence requiring a greater amount of conversions to significantly surpass the positive impact from a non-celebrity campaign. We assume that the non-celebrity campaign adheres to an average conversion rate and that each campaign receives the same amount of funding.

Normative Considerations and Analysis

From a purely numbers-based and utilitarian perspective, we have attempted to define thresholds for which the usage of celebrities in green campaigning meets with sufficient success to rationalize a campaign's association with mass polluters. We proffer that a hypothetical "break-even point" can exist where celebrities begin positively impacting the fight against climate change upon promoting a campaign that reaches a certain amount of people. Viewing the second estimate of 4031650 as our target, it seems reasonable that a UK-based advertisement effort could reach this total. From the UK population estimate provided earlier, this constitutes only about 6% of the nation's people. Thus, it appears somewhat feasible to productively implement celebrity marketing purely from this standpoint.

All of this said, I contend that quantitative arguments alone do not fully justify the usage of celebrities as the faces of environmental campaigns, unless the celebrity lives an atypically green life with little carbon footprint. While our analysis would satisfy subscribers to the narrow, entirely utilitarian view of celebrities as catalysts for net good, there are several problems. Firstly, we do not account for the possibility of bias from the initial sample from Duthie et al.'s study. Due to the sample resulting from a voluntary survey of 379 respondents, we could seek to enhance these results with a more random or representative selection process. After all, those more likely to take time to respond to a survey might reasonably be more likely to engage with an advertisement.

Secondly, we are making the overly broad assumption that influencing others to make positive changes equates to making positive changes oneself. This critique of our work results from a refocusing away from the utilitarian perspective evident throughout our methodology. From a virtue ethics viewpoint, for instance, the pursuit of sincerity and consistency renders it difficult to justify a celebrity continuing to fly on a private jet daily and live lavishly. However, our calculation of a "break-even point" implies that this justification could be grounded. The notion that one can commit as many wrongs as can be "equalized" through good deeds gives rise to walking contradictions who live only semi-virtuous lives. While we may shift between virtues, adhering to virtue ethics does not allow for abandoning virtues entirely half of the time. From the perspective of a virtue ethicist concerned with how moral agents should wish to live their entire lives without exception, offering some chance of respite for celebrities regardless of heinous amounts of private jet trips falls short from this normative angle.

Conclusion

With the aid of Duthie et al., we have expanded beyond questioning whether or not celebrity marketing creates more effective results and explored the moral implications of celebrity involvement in environmental advertising. Clearly, the original study provided the initial proportions from which to simulate many observed proportions of WTE, and allowed us to fix concrete estimates of the long-run difference in proportions of WTE in celebrity green campaigns and non-celebrity campaigns. However, any future investigation must proceed with the utmost caution due to the sampling and normative concerns noted in the previous section. Rather than decisively championing or deriding celebrity involvement in green marketing, our work here hopefully represents a logical approach to investigating the matter further either overall or exploring each distinct case.

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