



Ninety Minutes to Reduce One's Intention to Eat Meat: A Preliminary Experimental Investigation on the Effect of Watching the Cowspiracy Documentary on Intention to Reduce Meat Consumption

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OPEN ACCESS

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Specialty section:

This article was submitted to
Science and Environmental
Communication,
a section of the journal
Frontiers in Communication

Received: 29 October 2019

Accepted: 28 July 2020

Published: 28 August 2020

Citation:

Pabian S, Hudders L, Poels K,
Stoffelen F and De Backer CJS (2020)
Ninety Minutes to Reduce One's
Intention to Eat Meat: A Preliminary
Experimental Investigation on the
Effect of Watching the Cowspiracy
Documentary on Intention to Reduce
Meat Consumption.
Front. Commun. 5:69.
doi: 10.3389/fcomm.2020.00069

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Whereas, past research has shown that using environmental arguments to reduce meat intake are unsuccessful in awareness campaigns, popular documentaries might have the potential to successfully change the public awareness of the environmental implications of meat consumption today. This preliminary study aimed to provide first empirical evidence of the potential effects of watching a popular documentary on a less-known environmental topic among a population that are habitual performers of the behavior under discussion. More precisely, the effects of watching “Cowspiracy: The Sustainability Secret” on the awareness of the environmental implications of meat consumption, the attitude toward eating less meat, and the intention to eat less meat in young adults who consume meat on an (almost) daily basis was studied. The potential impact of Cowspiracy was investigated from the Integrated Change Model perspective. Paper-and-pencil questionnaires were administered to $N = 47$ participants aged between 19 and 32 before and after watching either Cowspiracy (experimental group, $n = 26$) or Planet Earth (control group, $n = 21$). Controlling for the influence of predisposing factors (sociodemographic characteristics gender, age, and socioeconomic status), the results show that watching a popular documentary about the environmental impact of meat production (Cowspiracy) can have a significant effect on the awareness of the environmental consequences of meat consumption, the attitude toward eating less meat, and the intention to reduce meat consumption of young (almost) daily meat eaters. However, results should be interpreted with caution, given the preliminary nature of our study.

Keywords: Cowspiracy, documentary, meat reduction, environmental impact, awareness, knowledge, intention

INTRODUCTION

In recent years, the entertainment business and popular documentaries such as *Cowspiracy*, *Forks Over Knives*, and *What the Health* have played a central role in the public awareness of the environmental implications of meat consumption (Harrington et al., 2019). This seems to contradict with past and current research that has shown that using environmental arguments to eat less meat do not make campaigns for meat reduction successful (Cordts et al., 2014; Austgulen et al., 2018). These authors have suggested that using arguments related to one's personal health or the wellbeing of animals are more effective (Cordts et al., 2014). Yet studies investigating ways to increase knowledge and awareness of environmental consequences of meat consumption have so far mainly focused on the use of text-based messages. There is, however, evidence that video-information is more powerful to change knowledge and attitudes compared to text-based arguments (Ahmad et al., 2015; Shen et al., 2015). Several studies provided evidence for the effects of exposure to an environmental documentary. For instance, Nolan (2010) showed an effect of watching *An Inconvenient Truth*, a documentary on global warming, on knowledge about global warming and global warming anxiety among an American adult sample (aged 18–75). Moreover, Jacobsen (2011) illustrated that after the release of *An Inconvenient Truth*, the sale of CO₂-compensation increased with 50% in the American States in which the documentary was released. Recently, Harrington et al. (2019) suggested that productions of the entertainment industry may have similar effects on the public awareness of the environmental implications of meat consumption, however they did not scientifically investigate this.

The present study aims to empirically investigate the potential causal effect of the popular Netflix documentary *Cowspiracy* among a population of Netflix' largest group of consumers: young adults (aged 19–32). The present study might have some societal implications. The reduction of our meat intake sits high on the research- and policy making agenda. Researchers have suggested that it is timely and necessary to increase young adults' awareness about the environmental impact of meat consumption (Graham and Abrahamse, 2017). Whereas meat can be part of a healthy and sustainable diet (Willett et al., 2019), research indicates that an overconsumption of meat is detrimental for our environment (Walker et al., 2019) and our health (Nakagawa and Hart, 2019).

To this aim, the potential impact of the documentary "*Cowspiracy: The Sustainability Secret*" (2014) will be explored. Central in this documentary is the impact of animal agriculture on the environment. The potential impact of *Cowspiracy* will be investigated from the Integrated Change Model (I-Change Model) perspective (de Vries et al., 2005). The I-Change Model integrates ideas of different theories to predict (changes) in behavior, such as The Theory of Planned Behavior (Ajzen, 1991), the Social Cognitive Theory (Bandura, 1988), and Implementation and Goal setting theories [e.g., Locke and Lathan (1990)]. The I-Change Model has been (partly) used to explain a variety of types of health behavior (changes), including condom use, smoking cessation, fruit consumption,

and physical activity (Gomez Quiñonez et al., 2016). According to the model, behavior is determined by a person's intention to carry out a specific behavior, but also the ability and barriers to perform that behavior. Intention is determined by motivational factors (e.g., attitudes toward the specific behavior, social influences, and efficacy). In turn, motivation factors are determined by awareness factors (e.g., knowledge, cues to action, and risk perception) and affected by predisposing factors (e.g., sociodemographic characteristics). According to the model, predisposing factors can also affect awareness factors and behavior. Finally, information factors (e.g., exposure to a mediated message) determine awareness factors. Information factors can be affected by predisposing factors.

Based on the I-Change Model (de Vries et al., 2005), the present study will investigate the influence of exposure to the documentary *Cowspiracy* (information factor) on the awareness factor "knowledge," which in turn is expected to predict the motivation factor "attitude." Finally, attitude is expected to predict "intention to reduce meat consumption." These associations will be investigated while controlling for the predisposing factors "gender," "age," and "socioeconomic status."

METHODS

Design, Procedure, Stimulus Materials, and Participants

A Randomized Control-Group Pretest Posttest Design was used to measure the impact of watching a video-documentary about the environmental impact of meat production, *Cowspiracy* (based on Nolan, 2010). This study followed APA Ethical Guidelines for research with human subjects. Data gathering took place in March 2019 in a secondary school building on two evenings (one evening for each condition). First, all participants, independent of the experimental condition in which they were in, filled in a pre-survey (paper-and-pencil questionnaire). After administering the pre-questionnaire, participants were randomly assigned to watch one of the two documentaries. The control condition watched the nature documentary, "*Planet Earth*" (2006) about environmental change, where no reference to meat consumption was made (96 min in total). The experimental condition watched the documentary "*Cowspiracy: The Sustainability Secret*" (2014; 90 min in total) about the environmental impact of modern (red) meat production and consumption. Each condition watched the documentary in group. After the screening of the documentary, a paper-and-pencil post-survey was administered (the same post-survey for each experimental condition). The sample was a convenience sample recruited *via* flyers, social media, and e-mail targeting young adults (aged between 18 and 35) who consumed meat on an (almost) daily basis. During recruitment, participants were told that they would participate to an experiment that consists of three parts: filling in a survey (30 min), watching a documentary (90 min), and filling in a second survey (10 min). In total, 47 young adults ($n = 25$ women; $M_{\text{age}} = 24.83$, $SD_{\text{age}} = 2.62$, range age = 19–32) participated. The experimental group consisted of 26 participants.

Measures

The pre-questionnaire consisted of questions regarding sociodemographic characteristics (gender, age, and socioeconomic status), knowledge on the environmental consequences of meat consumption, attitude toward meat reduction, and intention to eat less meat. After the screening of the documentaries, a post-questionnaire was administered to measure post-knowledge, post-attitude, and post-intention. These variables were measured with the same instruments as used in the pre-questionnaire. **Appendix A** presents the items that measured knowledge, attitude, and intention.

Knowledge on the Environmental Consequences of Meat Consumption

A self-construed index with 10 true/false questions measured knowledge (pre and post). These questions are related to the content of the documentary Cowspiracy and were based on scientific verified statements (Steinfeld et al., 2006; IPCC, 2014; FAO, 2018) A correct answer was coded as “1,” a false “0.” A sum score was calculated for each respondent ($M_{pre} = 4.09$, $SD_{pre} = 1.73$; $M_{post} = 5.55$, $SD_{post} = 1.98$), as well as a change score (post score minus pre score; $M_{change} = 1.47$, $SD_{change} = 2.28$).

Attitude Toward Meat Reduction

The attitude toward meat reduction was measured with four semantic differentials (shortened version based on Berndsen and van der Pligt, 2004) that were rated on a seven-point scale. The Cronbach's Alpha showed internal consistency ($\alpha_{pre} = 0.86$, $\alpha_{post} = 0.85$). Correlations between the items varied between 0.60 and 0.76 for the pre-measurement and between 0.34 and 0.78 for the post-measurement. Exploratory factor analyses showed that the factor loadings of the items ranged between 0.71 and 0.84 for the pre-measurement and between 0.47 and 0.84 for the post-measurement. A mean score was measured for each participant ($M_{pre} = 4.05$, $SD_{pre} = 1.11$; $M_{post} = 4.59$, $SD_{post} = 0.96$), as well as a change score (post-score minus pre-score; $M_{change} = 0.54$, $SD_{change} = 0.78$).

Intention to Eat Less Meat

The intention to reduce meat consumption was measured with a 3-item scale [shortened version based on Graça et al. (2015)]. Each item was rated on a 7-point Likert scale ranging from 0 (*totally disagree*) to 6 (*totally agree*). Cronbach's alpha provided evidence for internal consistency ($\alpha_{pre} = 0.82$, $\alpha_{post} = 0.88$). Correlations between the items varied between 0.48 and 0.74 for the pre-measurement and between 0.49 and 0.85 for the post-measurement. Exploratory factor analyses showed that the factor loadings of the items ranged between 0.79 and 0.92 for the pre-measurement and between 0.82 and 0.96 for the post-measurement. A mean score was calculated for each participant ($M_{pre} = 2.82$, $SD_{pre} = 1.31$; $M_{post} = 3.51$, $SD_{post} = 1.31$), as well as a change score (post-score minus pre-score; $M_{change} = 0.69$, $SD_{change} = 0.91$).

Data Analysis

In a first step, repeated measures analyses were used to investigate changes in knowledge, attitude toward meat reduction, and intention to reduce meat. In a second step, a path model was calculated in Mplus 8.2 (Muthén and Muthén, 2018) with Maximum Likelihood estimation to predict more rigorously the change in knowledge, change in attitude toward eating less meat, and change in intention to reduce meat.

RESULTS

Repeated Measures analyses controlling for demographics revealed a significant change in knowledge predicted by the type of documentary they saw: $F_{(1, 41)} = 32.24$, $p < 0.001$, $\eta^2 = 0.440$). The average knowledge score did not change in the group that watched Planet Earth ($M_{pre} = 4.43$ $SD_{pre} = 1.89$; $M_{post} = 4.24$, $SD_{post} = 1.76$; MIN = 0 MAX = 10), but increased in the group that watched Cowspiracy ($M_{pre} = 3.81$ $SD_{pre} = 1.58$; $M_{post} = 5.55$, $SD_{post} = 1.98$). It should be noted that the pre-knowledge seems somewhat higher in the control group compared to the pre-knowledge of the experimental condition, however no significant difference was found [$t_{(38,99)} = 1.21$, $p = 0.235$]. Second, a significant change in attitude to reduce meat consumption was predicted by the type of documentary they saw: $F_{(1, 41)} = 19.09$, $p < 0.001$, $\eta^2 = 0.318$. The average attitude score did not change in the group that watched Planet Earth ($M_{pre} = 4.39$ $SD_{post} = 0.97$; $M_{post} = 4.39$, $SD_{post} = 1.06$; MIN = 0 MAX = 6), but increased in the group that watched Cowspiracy ($M_{pre} = 3.78$ $SD_{post} = 1.15$; $M_{post} = 4.75$, $SD_{post} = 0.86$). Finally, intention to reduce meat was predicted by the type of documentary they saw [$F_{(1, 41)} = 13.88$, $p < 0.01$, $\eta^2 = 0.253$]. Intention to eat less meat did not change in the group that watched Planet Earth ($M_{pre} = 2.86$ $SD_{post} = 1.32$; $M_{post} = 3.06$, $SD_{post} = 1.29$; MIN = 0 MAX = 6), but increased in the group that watched Cowspiracy ($M_{pre} = 2.80$ $SD_{post} = 1.32$; $M_{post} = 3.37$, $SD_{post} = 1.23$).

A path model was calculated to investigate more rigorously the relations between exposure to Cowspiracy, change in knowledge, change in attitude to reduce meat consumption, and change in intention to eat less meat, while controlling for the sociodemographic characteristics. The order and sequence of the paths are based on the I-Change model. The tested paths are displayed in **Figure 1**. Significant paths are presented by a full arrow, whereas insignificant paths by a dotted arrow. **Table 1** displays the unstandardized and standardized estimates of each path, including the indirect paths. The indirect effects were tested via bootstrap analysis with 10,000 samples, generating a 95% confidence interval of the indirect effect. The fit indicators of the model showed that the model fitted the data: CFI = 1.000; RMSEA = 0.000, 95% C.I.[0.000–0.149]; $\chi^2(6) = 4.02$, $p = 0.67$. The path model indicated that the type of documentary significantly predicted the change in knowledge ($\beta = 0.65$, $p < 0.001$). Change in knowledge did not subsequently predict change in attitude toward meat reduction. The latter was a significant predictor of the change in intention to reduce meat ($\beta = 0.42$, $p < 0.001$). None of the indirect

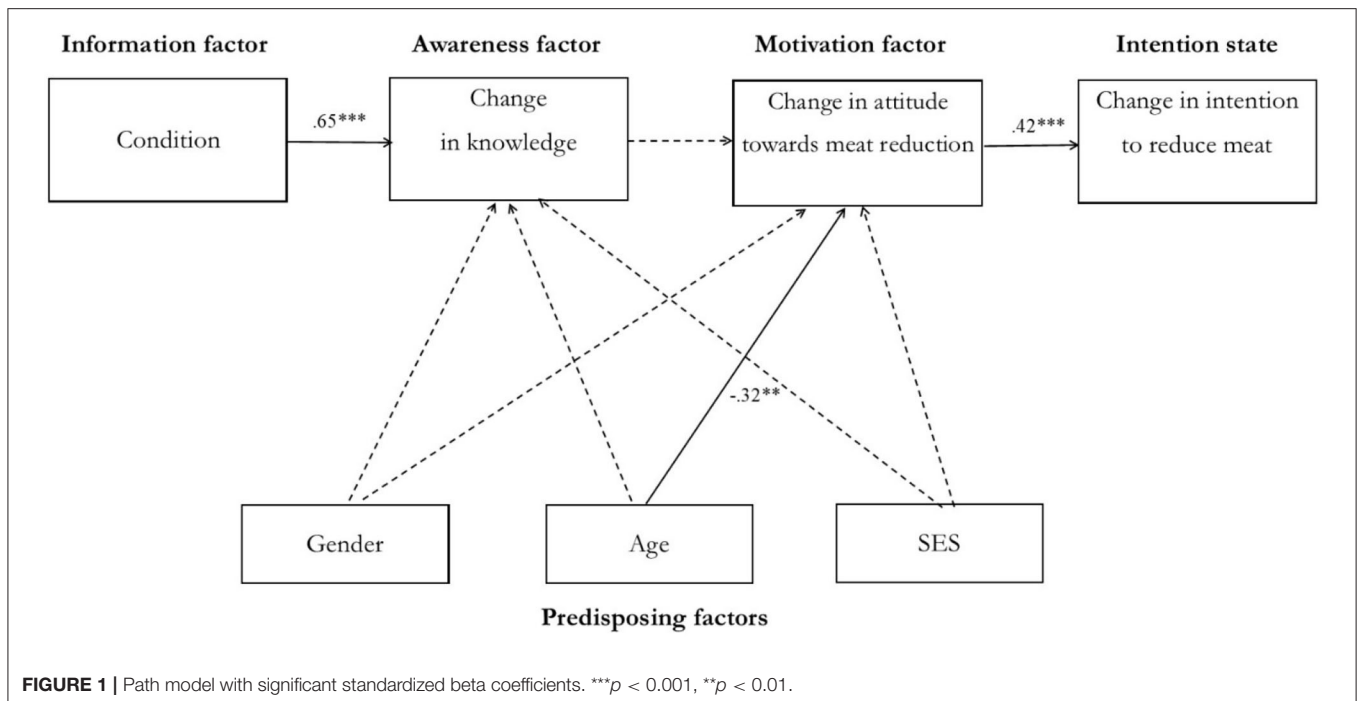


FIGURE 1 | Path model with significant standardized beta coefficients. *** $p < 0.001$, ** $p < 0.01$.

pathways were significant. Finally, the model showed that age is significantly negatively associated with change in attitude toward meat reduction ($\beta = -0.32$, $p < 0.01$): Younger adults had a greater change in attitude toward meat reduction after watching a documentary compared to older adults. The explained variances (R^2) of the change in knowledge, the change in attitude, and the change in intention were respectively 0.459, 0.135, and 0.181.

DISCUSSION

The goal of the present study was to preliminary explore the impact of watching a popular video-documentary about the environmental impact of meat production and consumption, a less-known environmental topic, among a sample of medium and high meat-eaters, relying on the I-Change Model. The present study was conducted among a limited convenience sample and therefore the results should be interpreted with caution.

The main findings indicated a significant change in knowledge on the environmental consequences of meat consumption among those participants who watched Cowspiracy, but not among participants who watched two episodes of Planet Earth. The same was true for a significant change in attitude toward eating less meat and intention to reduce meat consumption. In other words, a video-message about the environmental impact of meat production has the potential to increase viewers' knowledge about the environmental consequences of meat consumption and has the potential to increase their attitude and intention to reduce meat intake. Our results are consistent with earlier research indicating the potential of documentaries to increase knowledge (Nolan, 2010; Kimmerle and Cress, 2013). This might be explained by the idea that viewers are in a

“learning mode” when they watch a documentary and are therefore more able to enhance their knowledge (Kimmerle and Cress, 2013). The present study only measured changes in knowledge on the environmental consequences of meat consumption and attitudes toward eating less meat and therefore we cannot compare our results with knowledge of and attitudes toward other environmental problems and pollution sources. Future research could consider to include those in order to establish whether people rate—after watching Cowspiracy—meat consumption as a much more important problem compared to other environmental problems. Finally, the significant change in intention to reduce meat consumption that was found in the present study is consistent with previous research: Nolan (2010) indicated that, after viewing the documentary An Inconvenient Truth, adults are more inclined to use their car less in order to reduce greenhouse gas. Jacobsen (2011) even found impact of viewing an environmental documentary on actual behavior, namely an increase in the sale of CO₂ compensation. The current study only measured intention to reduce meat consumption. We do not know how long this change in knowledge and intention persists and whether intention actually leads to eating less meat. Future research should therefore examine whether this may also translate into actual behavioral change and look at effects in the long run.

Although previous literature indicates that knowledge is a necessary determinant to perform environmentally responsible behavior [e.g., Austgulen et al. (2018)], in the present study the change in knowledge did not predict the change in attitude toward eating less meat. It seems that the effect of the exposure to Cowspiracy is mediated or can be explained by other variables. Therefore, the applicability of the I-change model to explain the impact of exposure to a video-documentary about the

TABLE 1 | Unstandardized and standardized parameter estimates of the path model.

Path	<i>B</i>	SE	Two-tailed <i>p</i> -value	β	Two-tailed <i>p</i> -value
DIRECT EFFECTS					
Condition to change in knowledge	2.93	0.50	0.000	0.65	0.000
Change in knowledge to change in attitude towards eating less meat	0.00	0.06	0.962	0.01	0.960
Change in attitude to change in intention to reduce meat consumption	0.50	0.18	0.003	0.42	0.000
Gender to change in knowledge	-0.67	0.47	0.151	-0.15	0.155
Age to change in knowledge	0.05	0.10	0.637	0.05	0.595
Socioeconomic status to change in knowledge	0.19	0.4	0.631	0.05	0.620
Gender to change in attitude	-0.33	0.18	0.069	-0.24	0.050
Age to change in attitude	-0.09	0.03	0.007	-0.32	0.002
Socioeconomic status to change in attitude	-0.18	0.14	0.197	-0.15	0.186
INDIRECT EFFECTS					
Condition to change in attitude <i>via</i> change in knowledge	0.01	0.17	0.960	0.01	0.961
Change in knowledge to change in intention <i>via</i> change in attitude	0.00	0.03	0.964	0.00	0.961

environmental impact of meat production can be questioned. More research is needed to confirm this as the present study only included some of the principles of the I-change model and not the full model. Future research could also consider to investigate the mediating or moderating role of emotions, conform narrative persuasion theories [e.g., Green and Brock (2002)]. Also the moderating role of sociodemographic characteristics could be investigated, as the present study only controlled for these variables but did not investigate how these variables affect the associations.

The present study has shortcomings. An important limitation of the present study is the limited sample size, which has seriously affected the power of our experiment. A second limitation is that knowledge on the environmental impact of meat production was measured with a self-constructed index. Upon our knowledge, no validated measurement instrument is available yet. Our self-constructed index should be further tested and validated among different samples in order to investigate whether the claims are interpreted as intended and are clear to everyone. The same is true for our measurements of the attitude toward meat reduction and intention to eat less meat. These were measured with shortened versions of validated scales, as we wanted to keep the length of our surveys limited. These shortened versions should also be further tested and validated. For instance, in the post-measurement “I intend to eat less red meat” highly correlated with “I intend to eat less processed meat” which might indicate the presence of multicollinearity. However, it is advisable for future research to prefer the full scales as these are already validated and might be more robust. Related to the shortcomings regarding the self-report measurements, it might also be interesting to use multiple methods to understand the potential effects, for instance, by including also qualitative measurements. In a qualitative interview or in an open survey question participants can be asked which elements of the documentary they found convincing and influential and why exactly. Another limitation is that the present study investigated the impact of only one documentary and, therefore, the results cannot be generalized to

similar documentaries. Future research can replicate the present experiment using other video materials. Moreover, a comparison between text-based arguments and audiovisual arguments in a documentary format could enhance the understanding of the most effective way to increase knowledge on the environmental impact of meat production and the intention to adapt behavior.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee for the Social Sciences and Humanities University of Antwerp. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CD and FS designed the experiment, recruited participants, and gathered data. CD, FS, and SP analyzed the data. SP and FS wrote the first draft of the manuscript. SP, LH, KP, and CD wrote sections of the manuscript. SP adjusted the manuscript according to the valuable suggestions of the reviewers and the editor. All authors contributed to the article and approved the submitted version.

FUNDING

This research was funded by Flanders Innovation & Entrepreneurship (VLAIO; InFLOOD project) and Flanders' FOOD. The funding sources have no involvement in the study design; in the collection, analysis, and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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APPENDIX A

Measures Used for Pre- and Post-testing

Knowledge on the Environmental Consequences of Meat Consumption

1. Ruminants, such as cows, produce gases that contribute to global warming.
 2. People worldwide eat more and more meat.
 3. Deforestation is needed to be able to grow the livestock and livestock food that is needed for our current meat production system.
 4. More water is needed for the production of red meat than for the production of white meat.
 5. Ruminants, such as cows, produce methane during their digestion. Methane is more harmful to our atmosphere than CO₂.
 6. The meat sector is responsible for 15% of the greenhouse gases in our atmosphere.
 7. 30% of the available mainland on earth is currently used for meat production.
 8. Dietary patterns that replace ruminant meat with alternatives such as fish or poultry, are associated with favorable environmental effects, namely lower greenhouse gas emissions.
 9. It is necessary to use a more plant-based diet (more plant products) in order to keep global warming below 2°C.
 10. The effects of global warming will only be visible in the future.
-

Attitude Towards Meat Reduction

1. Pleasant—Unpleasant
 2. Useful—Useless
 3. Favorable—Unfavorable
 4. Good—Bad
-

Intentions to Eat Less Meat

1. I intend to eat less white meat.
 2. I intend to eat less red meat.
 3. I intend to eat less processed meat.
-