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## **Consumer Response to Negative Information on Meat Consumption in Germany**

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### **Abstract**

Evidence from several studies suggests that the growing demand for meat consumption has negative effects on the sustainability of the environment and the health and psychological welfare of individuals. This study investigates whether media coverage of certain negative attributes of meat consumption can potentially affect demand for meat in a western European country. Using Germany as a case study, 690 survey participants were each given one of four different fictitious “newspaper articles” describing negative effects of meat consumption – either in terms of adverse effects on human health, on climate change, on animal welfare or on personal image. The analyses show that animal welfare and health arguments have the strongest effects at reducing meat consumption in both men and women. Based on the results, we discuss implications of our findings for the meat industry in Germany.

**Keywords:** meat consumption, information, gender

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## Introduction

Meat and meat products are an important component in the daily diet of a large proportion of society, especially in industrialized countries. However, in most of these countries, meat consumption exceeds the amount recommended by health institutions like the World Cancer Research Fund (WCRF/AICR 2007). Much of the environmental- and health-related literature has argued that the growing demand for and production of meat have negative implications for the individual and society. In light of these adverse consequences, scientists (e.g., Dagevos & Voordouw 2013, Reisch et al. 2013) as well as government institutions (e.g., in Germany: Scientific Advisory Board for Agricultural Policy at the German Federal Ministry of Food, Agriculture and Consumer Protection, WBA 2012) are advocating for policies aimed at motivating consumers to reduce their meat intake. This requires the detailed understanding of the underlying motives for meat consumption. The present empirical study aims to determine the effect of information on the negative attributes of meat consumption on demand for meat in Germany, with the focus on four particular attributes: animal welfare, human health, personal image and climate change. For the meat industry, knowledge about consumer reactions to negative information about meat consumption, which may be presented in the media, is relevant from a strategic marketing perspective in order to be able to develop appropriate strategies regarding e.g. product policy or public relations.

In the following, we describe the possible adverse consequences of meat consumption in more detail and focus on important motives for eating meat. Furthermore, gender is discussed as an important socio-demographic determinant of meat consumption and related attitudes. We identify consumer information as an appropriate political instrument to reduce meat consumption, forming the basis for the framing experiment with fictional “newspaper articles” on meat consumption. After presenting and discussing our empirical results, we finally derive recommendations for the meat industry.

## Background

### *Negative Consequences of Meat Consumption*

From a nutritional perspective, meat can be regarded as a valuable food that provides important vitamins and minerals in the diet and constitutes the major protein source in the Western diet. However, a diet rich in meat also has potential negative effects due to, e.g., its high content of cholesterol and saturated fatty acids (Rohrmann et al. 2013; Singh et al. 2003; WCRF/AICR 2007). In recent decades, the demand for meat has increased significantly in industrialized countries, including Germany (DGE 2012; Rohrmann et al. 2013). Therefore, the per capita consumption of meat exceeds the recommendations of health and nutritional organizations. Because of the lack of general recommendations, the suggested consumption amounts differ between institutions (e.g., DGE 2011; WCRF/AICR 2007). For instance, the World Cancer Research Fund recommends consuming less than 500 g red meat per week and minimizing the consumption of processed meat (WCRF/AICR 2007, 382), whilst the German Nutrition Society recommends a maximum of 300 to 600 g of meat and sausages per week, regardless of the type of meat (DGE 2011). In contrast, the results of the German National Nutrition Survey II (MRI

2008, 44) show that women consume on average 581g and men 1120g meat (including sausages and meat-based products) per week, which is nearly twice as much as the recommended allowance.

Regarding adverse health consequences, the consumption of red and processed meat is, in comparison to white meat, especially problematic (Micha et al. 2010; McAfee et al. 2010). Empirical studies have shown an association between increased consumption of (processed and/or red) meat and a higher risk of developing coronary heart diseases (Micha et al. 2010; Pan et al. 2012; Rohrmann et al. 2013), type 2 diabetes (Aune et al. 2009; Micha et al. 2010) and different types of cancer (Chao et al. 2005; Pan et al. 2012; Rohrmann et al. 2013). Furthermore, empirical results show a positive association between the degree of obesity and the amount of meat consumed independent of dietary patterns, total energy intake, physical activity, smoking, sex, education and other potential confounders (Verghnaud et al. 2010; Wang & Beydoun 2009). Overall the authors of two comprehensive cohort studies conducted in Europe (Rohrmann et al. 2013) and in the U.S. (Pan et al. 2012) conclude that individuals with a high consumption of red (Pan et al. 2012) or processed (Rohrmann et al. 2013) meat carry an increased risk of early death, adjusted for smoking, alcohol consumption, obesity, physical activity and other potential confounders. For the German population, meat consumption has been shown to be positively correlated with the consumption of many other “unhealthy” food products, i.e., when meat consumption increases, the consumption of beer, soft drinks, sweets, butter, oil, sauces, bread and other food products, as well as overall calorie intake, also increases (Cordts et al. 2014). The fact that meat dishes in Germany are often served with fatty sauces or fried potatoes and are additionally energy-dense due to the preparation methods of the meat component (e.g., frying or roasting in fat), suggests that a reduction of meat consumption leads to an overall reduced energy intake, which is consistent with results obtained by Carvalho et al. (2012) and Wang and Beydoun (2009).

Meat consumption behavior can also affect the image of a person. Whereas in the first half of the 20<sup>th</sup> century vegetarians suffered from a distinctly negative image (Ruby 2012), nowadays the popular perception of meat eating has changed in many Western societies. There is increasing evidence from consumer surveys that a large proportion of consumers from different countries (e.g., Canada, USA, Netherlands, Norway) are reducing their meat consumption (Ruby 2012; Dagevos & Voordouw 2013). Although meat still has a dominant position in most contemporary food cultures (Dagevos & Voordouw 2013), it is now broadly accepted that meat no longer represents a symbol of wealth in today’s industrial societies. This is supported by the inverse relationship between meat consumption and social class now observed in many industrial countries (Ruby 2012), including Germany and the U.S. (MRI 2008, 61; Gossard & York 2003). Going into more detail, Gossard and York (2003) found education and occupational status being negative predictors of the amount of meat consumed in the U.S., while income had no effect on total meat consumption. In the representative German National Nutrition Survey II, people from the upper social class (captured as an aggregate index variable including education, occupational status and income (MRI 2008, 9)) eat significantly less meat compared to the other groups (MRI 2008). On an individual level, meat consumption can affect the perceived attractiveness of a person, as some studies about the influence of meat consumption on body odor suggest (Potts & Parry 2010; Havlicek & Lenochova 2006). According to Havlicek and Lenochova (2010), the body odor of male university students was rated to be significantly more attractive and pleasant

after a two-week period of a non-meat diet compared to a diet rich in red meat over the same period.

Alongside the above-mentioned, considerable individual consequences of high meat consumption, there are also social and global consequences. Various studies have found that consumption behavior can contribute to climate change. High levels of consumption of animal products are associated with a clear negative effect on an individual's carbon footprint. Due to energy losses along the food chain, animal products cause more greenhouse gas emissions than the equivalent calories provided by plant products (McMichael et al. 2007), and beef is particularly problematic in this respect (Carlsson-Knyama & González 2009). Hence, it has been suggested that a diet lower in animal products is better for the climate and additionally has a less negative effect on the environment as a whole (McMichael et al. 2007).

The intense competition and productivity drive in the meat sector in industrial countries has contributed to the fact that various animal welfare aspects have been neglected in favor of economic considerations (Lusk & Norwood 2011). Modern animal production systems are economically optimized, but increasing societal demands for animal welfare and ethical animal husbandry methods are, partly due to financial pressures, insufficiently met. The availability of inexpensive and safe meat is now no longer sufficient for some consumers (Deimel et al. 2010). This has developed against a background of increasing alienation of the public from farming practices, whereby livestock are increasingly perceived as equivalent to pets (Kayser et al. 2012). In addition, studies from the field of animal ethology have shown considerable emotional and cognitive competencies of livestock species, emphasizing the importance of animal welfare aspects (Franz et al. 2012).

#### *Non-economic Determinants of Meat Consumption*

To understand consumer behavior concerning meat, we need to take a closer look at the underlying motives for consumption or avoidance of meat. Besides ethical, psychological, economic, cultural and ecological aspects, medical and nutritional factors can play an important role (Richardson et al. 1994). Because of their importance in this empirical study, four motives will be explained more in detail: (1) health consciousness, (2) animal welfare considerations, (3) awareness of climate effects and (3) perceived effects on personal image.

Increasing awareness of potential negative health consequences associated with meat consumption has been shown to lead to a reduction in the consumed amount of meat, according to the results of multiple linear regression analyses on the determinants of meat consumption (e.g., Guenther et al. 2005; Lea & Worsley 2001).

Furthermore, the knowledge about negative consequences of the production of meat on animal welfare influences attitudes towards meat. As Grunert (2006) showed, animal welfare considerations can be seen as a lifestyle-trend with substantial impact on meat consumption. Consumers concerned with environmental sustainability prefer meat from animal friendly production (Harper & Henson 2001), and critical attitudes towards animal welfare are associated with a reduction of meat consumption (de Boer et al. 2007).

In terms of climate and environment, empirical studies indicate a negative association between environmental awareness or, more generally, universal values (e.g., the beliefs that people should protect the environment and care for social justice) and meat consumption (Cordts et al. 2014; de Boer et al. 2007). Wandel and Bugge (1997) also showed the influence of environmental and climate-related attitudes on meat consumption. However, McCarthy et al. (2004) found no effect of environmental concerns on attitudes toward meat, therefore it seems the empirical findings are inconsistent in this area.

So far, there has been a lack of empirical results concerning associations between meat consumption and personal image. However, meat is no longer a symbol of welfare in industrialized countries. Instead, meat consumption is inversely associated with the level of education, as was shown e.g. for the population of 10 European countries (Vergnaud et al. 2010) and overall social class (MRI 2008).

### *Gender-Specific Aspects of Meat Consumption*

Besides other socio-demographic aspects like income and ethnicity, gender has an important influence on meat consumption (Beardsworth & Bryman 2004; Gossard & York 2003; Guenther et al. 2005). In general, females show a higher degree of health consciousness than males (Fagerli & Wandel 1999). Furthermore, women are characterized by a healthier lifestyle (von Bothmer & Fridlund 2005), which can be seen in different areas, e.g. nutrition. Thus, females eat more “healthy” food, like fruit and vegetables (Wardle et al. 2004).

Regarding meat consumption, women are more often vegetarians (Kalof et al. 1999) and men overall consume a greater amount of meat than women (Vergnaud et al. 2010; de Boer et al. 2007; Gossard & York 2003; Guenther et al. 2005; Leahy et al. 2011; MRI 2008; Praettaelae et al. 2007). Moreover, women prefer white meat, whereas men eat more red and processed meat, which is associated with negative health consequences (Cosgrove et al. 2005; Kubberød et al. 2002).

Beyond this, empirical studies show gender-specific patterns concerning the motives for meat consumption. In women, difficulties and health concerns associated with vegetarianism (e.g., lack of iron) were the most important positive predictors, and universal values were negative determinants of meat consumption, whereas for meat consumption in men the number of vegetarian friends was the most important predictor (Lea & Worsley 2001). Women also report a higher environmental benefit of a more plant-based diet (Tobler et al. 2011). In general, a gender-specific approach appears necessary when undertaking attempts to influence individual meat consumption (cf. Lea & Worsley 2001).

### *Consumer Information as an Instrument to Reduce Meat Consumption*

Given the negative consequences that are linked to high levels of meat consumption, there are increasing calls for state interventions to reduce meat consumption and to promote the consumption of meat of higher quality in industrialized countries (e.g., in Germany: Scientific Advisory Board for Agricultural Policy at the German Federal Ministry of Food, Agriculture and Consumer Protection, WBA 2011, 2012). State interventions to reduce meat consumption can be

implemented at different levels. We can distinguish between consumer information (information/social marketing), financial incentives (taxes) and regulatory measures (prohibitions, requirements) (see Figure 1, Tänzler et al. 2005) with an increasing depth of intervention in market processes from consumer information to regulatory measures.

The present study focuses on consumer information as a political instrument to reduce meat consumption that is characterized by a low depth of intervention in market processes (Ahlheim 2011). We concentrate on consumer information because given the political climate in Germany, it is more likely that the German government would implement consumer information policies rather than consumption taxes on meat (Ahlheim 2011; Dagevos & Voordow 2013), especially after the withdrawal of the Danish fat tax (Alemanno & Carreno 2013; Jensen & Smed 2013). Furthermore, the implementation of such policies, including e.g., awareness-raising campaigns about the diverse negative effects of meat consumption, is considered as an important precondition for building consumer acceptance of more invasive measures (Dagevos & Voordow 2013).

Consumer Information		Financial Incentives	Regulatory Measures	
Information / Social Marketing	Labeling	Taxes	Requirements	Prohibitions
<ul style="list-style-type: none"> <li>▪ Information campaigns</li> <li>▪ Programs for behavior modification</li> </ul>	<ul style="list-style-type: none"> <li>▪ Climate label</li> <li>▪ Warning labels</li> </ul>	<ul style="list-style-type: none"> <li>▪ "Fat tax"</li> <li>▪ Meat tax</li> <li>▪ Subsidies for meat substitutes</li> </ul>	<ul style="list-style-type: none"> <li>▪ Obligatory veggie-days in public catering</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ceilings for meat portions</li> </ul>
<b>Increasing depth of interventions in market processes →</b>				

**Figure 1.** Overview: Demand Management Policy Measures and Examples (adapted from Cordts et al. 2013a).

However, there have as yet been no studies on how information about negative attributes of meat consumption would affect demand for meat. Furthermore, the importance of gender has largely been neglected. Against this background, the present study analyzes the effect of information pertaining to the negative attributes of meat consumption on meat demand using a gender-specific approach. Focusing on four types of information regarding the negative effects of meat consumption on human health, climate, personal image or animal welfare, we investigate which kind of information has the largest effect on male and female consumers in Germany.

## Methods

### *Sample Description and Survey*

This study is based on data collected in a quantitative online survey carried out in January 2013. A sample of 590 consumers was recruited through a professional panel provider using a standardized questionnaire. The aim was to obtain a representative sample of the German population regarding basic socio-demographic characteristics. For sex, income, and region of residence the obtained sample is well matched to official statistics of the German population, with differences from the

overall population data amounting to less than four per cent. In contrast, for age and education, there are substantial deviations from official statistics on the population in Germany, with middle-aged people between 40 and 59 years being overrepresented and people aged 60 and above being underrepresented. Regarding school education, participants with a university entrance qualification are overrepresented and the share of less educated people is lower than in the overall population. With regard to household size, the most obvious deviation from the German population as a whole is the relatively small number of single households (see Table 1). These discrepancies might be due to the fact that older people, who more often possess lower school leaving certificates and more often live in single households compared to the overall German population (Statistisches Bundesamt 2012, 52, 78), tend to be underrepresented in online panels.

**Table 1.** Socio-demographic Characteristics of Respondents (n = 590) Compared to the Population in Germany as a Whole (Overall Population Data from 2010 and 2011).

<b>Variable</b>	<b>Respondents (%)</b>	<b>Population in Germany (%)</b>
<b>Sex</b>		
Female	48.1	49.1
Male	51.9	50.9
<b>Age (years)<sup>1</sup></b>		
18-24	5.3	9.8
25-39	26.1	21.6
40-59	52.3	37.2
60 +	16.3	31.4
<b>Net household income (USD/month)</b>		
0 - 1,212	12.2	13.1
1,213 - 2,020	22.8	23.6
2,021 - 3,503	32.2	32.4
3,504 - 6,065	26.6	23.0
6,066 and above	6.1	7.9
<b>Education</b>		
Advanced school-leaving certificate <sup>3</sup>	47.1	29.0
Intermediate school-leaving certificate <sup>4</sup>	38.4	31.3
Lower secondary school-leaving certificate <sup>5</sup>	13.3	39.5
<b>Household size</b>		
1 person	27.6	40
2 persons	39.6	34
3 persons or more	32.8	25
<b>Region</b>		
North	15.6	16.1
South	30.3	28.6
East	17.5	19.9
West	36.3	35.4

**Source.** Statistisches Bundesamt 2012, p. 26 (sex), p. 31 (age), p 51 (household size), p 78 (education); Statistisches Bundesamt 2011, p. 47 (income); Statistische Ämter des Bundes und der Länder 2011 (region). <sup>1</sup>For age groups, the percentages in the Statistical Yearbook were given for ages beginning from under one year; since our sample does not include children we converted the percentages of the age groups from the Statistical Yearbook assigning 100 % to the population aged 18 or older. <sup>2</sup>The original data was given in Euros per month, which was converted into USD per month using the conversion factor 1.00 EUR = 1.34821 USD. <sup>3</sup>(Fach-)Abitur. <sup>4</sup>Realschulabschluss/Polytechnische Oberschule or similar. <sup>5</sup>Volks-/Hauptschulabschluss.

Besides socio-demographic characteristics, questions on topics including health behavior and consumption of meat and other food products were posed and attitudes were recorded using a 5-point Likert scale. Related to meat consumption, respondents were asked if they generally consume meat and if so, how frequently. Furthermore, meat consumers were asked about their beliefs about their own meat consumption in future (“Do you believe that you will in the future eat more, less or approximately the same amount of meat?”).

In a subsequent experimental framing design, each respondent was randomly given one of four different fictional results (on animal welfare, human health, personal image and climate change) of a scientific investigation, reporting the negative effects of meat consumption. The reports were structured as newspaper articles and identical apart from the argumentation (framing) used (see Appendix).

After the presentation of the information, the respondents were asked to rate on a 5-point scale (1 = “I don’t agree at all” to 5 = “I completely agree”) to what extent they found the study results concerning and how credible they find such media reports. Those respondents who had stated that they consume meat were also asked if, and to what extent, they base their eating behavior on such results. The question related to meat consumption in the future was then posed again.

### *Data Analysis*

To obtain a general overview about the differences between men and women regarding meat consumption, health-related lifestyle choices and attitudes towards food, independent samples t-tests were conducted using SPSS 21.

Taking average mean values of the variables related to the content of the four different “newspaper articles”, respondents’ overall reaction was analyzed for the whole sample and, additionally, differences between men and women were tested with independent samples t-tests. To analyze differences in the respondents’ answers as a reaction to the contents of the frames, chi-square statistics and as post-hoc multiple mean comparison tests were carried out (Bonferroni when homogeneity of variance could not be assumed according to the results of Levene tests, and Games-Howell in the case of homogenous variances, cf. Field 2009, 347ff.).<sup>1</sup> The analyses were conducted for the whole sample and separately for men and women. To check whether potential differences in respondents’ reaction to the “newspaper articles” might be due to differences in the socio-demographic structures of the four subgroups, we compared the percentages of men and women, average age, income group, education level and region of residence as stated in Table 1 using mean comparisons and Chi-squared tests. Since no significant differences were found, with error probabilities being in most cases far above the 10 % level (the lowest error probability was 18 % for sex), we can assume that the results

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<sup>1</sup>Additionally, we conducted a multiple linear regression with the “level of concern” (“I find the results of the study worrying”) as dependent variable and the “newspaper articles” (as dummy variables that were coded with 0 for “read” and 1 for “not read”) and socio-demographic characteristics as independent variables. Since this did not lead to additional information (e.g., the socio-demographic variables were not significant), we have not documented the results in this paper.

concerning the reactions of the four subgroups of respondents to each of the four articles are not influenced by differences in the socio-demographic structure of the sample subgroups.

## Results

The vast majority of the study participants eat meat (95.8 % of the female and 96.1 % of the male respondents). Further analysis of meat consumption habits and related attitudes reveals substantial differences between men and women. Although men on average state a higher frequency of meat and sausage consumption in the last seven days, women more often believe that they eat more meat and sausages compared to other persons of the same sex. The gender specific results for questions related to health aspects show a similar pattern, with a slightly higher BMI in men and, at the same time, women being less satisfied with their body weight. However, no differences between the sexes can be observed in the rating of the state of overall personal health (see Table 2).

**Table 2.** Meat Consumption and Health-related Aspects in Men and Women

Variable	All Responders			t-test <sup>6</sup>
	(n = 590)	Men (n =306)	Women (n = 284)	
	Arithmetic Mean (s.d.)			
Meat consumption frequency <sup>1***</sup>	9.41 (5.21)	10.30 (4.96)	8.46 (5.32)	t(564) = 4.25
Perceived amount of meat consumption compared to other persons <sup>2***</sup>	2.82 (1.00)	3.06 (0.89)	2.57 (1.04)	t(525.77) = 5.94
Body mass index (kg/m <sup>2</sup> ) <sup>3*</sup>	26.47 (5.42)	26.93 (5.49)	25.95 (5.31)	t(505) = 2.04
Subjective perception of body weight <sup>4**</sup>	6.16 (1.47)	5.98 (1.47)	6.35 (1.44)	t(572) = -3.10
Subjective perception of health state <sup>5ns</sup>	2.32 (0.82)	2.37 (0.86)	2.27 (0.77)	t(575.82) = 1.47

<sup>1</sup>Index ranged from 0 to 21 times in which meat was consumed within the last seven days, based on three questions answered by 294 men (m) and 272 women (w) who stated before to generally eat meat: “How often did you eat meat or sausages within the last seven days for breakfast?”/ “...lunch?”/ “...evening meal”. Only meat consumers were asked the following question: “Comparing yourself to other people of the same sex, would you say you eat the same amount, less or more meat and sausages than other people?”, scale from 1 = “very much more” to 5= “very much less”, n = 288 m and 267 w. <sup>3</sup>n = 265 m and 242 w. <sup>4</sup>“I find my body weight...”, scale from 1 = “much too low” to 9 = “much too high”, n = 297 m and 277 w. <sup>5</sup>“My general state of health is...”, scale from 1 = very good to 5 = very bad, n = 302 m and 276 w. <sup>6</sup>The independent samples t-test was used to test significant differences between men and women; \* p ≤ .05, \*\* p ≤ .01, \*\*\* p ≤ .001, <sup>ns</sup> p > .05

Besides consumption behavior, attitudes related to meat consumption also differ between men and women, with men questioning the production and consumption of meat to a lesser extent than women. Overall, women perceive possible motivations for reducing meat consumption (positive effects for animal welfare, environment and personal health) as more important than men, whereas men attach a higher importance to possible barriers (meat consumption as habitualized behavior, meat as an indispensable element of a balanced nutrition and a negative image of vegetarianism) to a reduction of meat consumption compared to women.

Despite these differences, there are also similarities regarding the relative importance of the different aspects: Whereas image-related considerations (“Eating meat is unfashionable”) are of comparatively low importance for both sexes (9.7 % of the male respondents and 11.8 % of the

female respondents “agree” or “fully agree” to this statement), a large proportion of participants are worried about health-related issues (68.9 % of men and 76.4 % of women “agree” or “fully agree” to the statement that “Antibiotics in meat are a threat to my health”). With regard to animal welfare, 37.1 % of male respondents and 48.9 % of female respondents say they feel sorry for the farm animals, and 29.6 % of male respondents and 36.5 % of female respondents also “agree” or “fully agree” that animal husbandry and the production of animal products place a large pressure on the environment (cf. Table 3).

**Table 3.** Barriers to and Motivations for Reducing Meat Consumption in Men and Women

Item	All Responders (n = 590)	Men (n = 306)	Women (n = 284)	t-test <sup>2</sup>
	Arithmetic mean (s.d.)			
“I see no need to eat (even) less meat.” <sup>1***</sup>	3.36 (1.23)	3.55 (1.13)	3.14 (1.30)	t(561) = 3.95
“To me, a proper meal requires meat.” <sup>1***</sup>	2.87 (1.19)	3.14 (1.11)	2.58 (1.20)	t(572.78) = 5.82
“Eating meat is unfashionable.” <sup>1**</sup>	2.08 (1.10)	1.94 (1.08)	2.22 (1.10)	t(578) = -3.08
“My friends would look at me strangely if I would eat a vegetarian meal.” <sup>1***</sup>	2.27 (1.26)	2.55 (1.31)	1.96 (1.13)	t(584.19) = 5.90
“Farm animals experience fear and suffering.” <sup>1***</sup>	3.34 (1.15)	3.17 (1.14)	3.52 (1.14)	t(587) = -3.73
“I feel sorry for farm animals.” <sup>1***</sup>	3.39 (1.16)	3.16 (1.18)	3.63 (1.09)	t(584) = -4.92
“Meat is indispensable for a balanced diet.” <sup>1***</sup>	3.31 (1.09)	3.52 (1.03)	3.08 (1.11)	t(588) = 5.02
“Antibiotics in meat are a threat to my health.” <sup>1***</sup>	4.02 (1.01)	3.87 (1.02)	4.17 (0.98)	t(584) = -3.62
“Farming animals and producing animal products (e.g., milk or meat) has a considerable negative environmental impact.” <sup>1**</sup>	3.07 (1.12)	2.95 (1.12)	3.19 (1.11)	t(584) = -2.58
“A vegetarian diet is more environmentally friendly than a diet including meat.” <sup>1*</sup>	3.10 (1.21)	2.98 (1.21)	3.23 (1.19)	t(588) = -2.54

n = 293 men and 270 women for the item with the smallest number of respondents. <sup>1</sup>Scale from 1 = “do not agree at all” to 5 = “fully agree”. <sup>2</sup>The independent samples t-test was used to test significant differences between men and women; \* p ≤ .05, \*\* p ≤ .01, \*\*\* p ≤ .001

Bearing in mind the general characteristics of men and women related to meat consumption, we now focus on the gender-specific and overall impact of the fictional “newspaper articles” as an element of possible information campaigns – in the first instance disregarding potential differences due to the four different themes of the articles (Table 4). Overall, the level of concern after having read the “newspaper articles” reaches mean values around three (= “neutral”), with

women expressing slightly higher levels of concern than men. Accordingly, statements about skepticism regarding a change in individual meat consumption (“I don’t make my eating habits dependent on the results of some study” and “I don’t think that my eating habits will really change”) have mean values around 3.7 (men) and 3.5/3.4 (women) and range between the answering categories “neutral” and “agree” with a tendency towards “agree” in male participants. The overall degree of mistrust related to the given information from the “newspaper articles” also had neutral levels of agreement, around 3 for men and slightly above for women.

A distinct difference between men and women occurred in response to the statement “I am trying to reduce my meat consumption anyway” indicating again the higher skepticism towards meat consumption by women, shown in Table 3.

**Table 4.** General Impact of the Fictional “Newspaper Articles” about Negative Consequences of Meat Consumption

Item	All Responders			t-test <sup>2</sup>
	(n = 590)	Men (n = 306)	Women (n = 284)	
	Arithmetic mean (s.d.)			
“I find the results of the study worrying.” <sup>1**</sup>	3.15 (1.27)	3.05 (1.27)	3.26 (1.26)	t(588) = -2.04
“I don’t make my eating habits dependent on the results of some study.” <sup>1**</sup>	3.64 (1.08)	3.74 (1.04)	3.53 (1.11)	t(589) = 2.44
“I am trying to reduce my meat consumption anyway.” <sup>1***</sup>	3.06 (1.21)	2.79 (1.22)	3.35 (1.14)	t(565) = -5.70
“I don’t think that my eating habits will really change.” <sup>1**</sup>	3.55 (1.09)	3.68 (1.04)	3.42 (1.13)	t(560) = 2.84
“Media reports are often unreliable. I don’t trust the findings.” <sup>1**</sup>	3.17 (1.01)	3.29 (1.02)	3.05 (0.98)	t(585,51) = 2.88

n = 291 men and 271 women for the item with the smallest number of respondents. <sup>1</sup>Scale from 1 = “do not agree at all” to 5 = “fully agree”. <sup>2</sup>The independent samples t-test was used to test significant differences between men and women; \* p ≤ .05, \*\* p ≤ .01, \*\*\* p ≤ .001

Additionally to the mean comparisons displayed in Table 4 using the aggregate data from the combined results from the four “newspaper articles”, independent samples t-tests comparing men and women were also conducted separately for each of the four different topics. Surprisingly, most of the means did not differ when measured on a significance level of  $p \leq .05$ <sup>2</sup>. A reason for this could be the reduced number of cases in the four groups, since each article was only randomly given to a quarter of the participating men and women. Therefore, in the following section we concentrate on the analysis of the overall sample population, combining men and women. Whereas the overall effectiveness of the “newspaper articles” at first glance seems limited due to

<sup>2</sup>Consistent with the results displayed in Table 4, the level of concern in most cases reached slightly higher, but not significant means for women compared to men, and for the items expressing mistrust or skepticism towards the given information or individual behavior change, the opposite was observed. Significant differences were found in the following statements: “I am trying to reduce my meat consumption anyway” with higher level of approval in women for each one of the four contents and, “I don’t think that my eating habits will really change” for the climate content (men: mean = 3.70, SD = 0.94; women: mean = 3.25, SD = 1.11).

relatively low levels of approval, a detailed analysis of the respondents' reactions to the different content of the articles reveals clear differences. Respondents who read the animal welfare article, detailing the suffering of animals on modern farms, showed by far the highest level of concern compared to those who read the other articles. The readers of the health and climate-related articles hold an intermediate position, and the readers of the image-related article express a low level of concern. Consistent with this, the inverse can be observed regarding the level of mistrust in the media reports and the given information, which is most pronounced for the image-related article and least clearly pronounced for the animal welfare article. The skepticism towards a reduction in individual meat consumption in response to the different articles does not differ between the animal welfare, health and climate content, but is significantly higher after having received the image-related article. Interestingly, after having read the image article fewer respondents stated "I am trying to reduce my meat consumption anyway" (Table 5).

**Table 5.** Impact of the Different Topics of the Fictional "Newspaper Articles" about Negative Consequences of Meat Consumption (Whole Sample)

Item	Animal welfare (n = 161)	Health (n = 141)	Climate (n = 134)	Image (n = 154)	F (df)	Post hoc test
<b>Arithmetic mean (s.d.)</b>						
"I find the results of the study worrying." <sup>1***</sup>	3.91 <sup>HCI</sup> (1.05)	3.01 <sup>AI</sup> (1.26)	3.27 <sup>AI</sup> (1.04)	2.40 <sup>AHC</sup> (1.19)	F(3, 586) = 47.04	G-H
"I don't make my eating habits dependent on the results of some study." <sup>1***</sup>	3.29 <sup>HI</sup> (1.05)	3.62 <sup>AI</sup> (1.10)	3.59 <sup>I</sup> (0.97)	4.06 <sup>AHC</sup> (1.01)	F(3, 586) = 14.82	B
"I am trying to reduce my meat consumption anyway." <sup>1***</sup>	3.28 <sup>I</sup> (1.23)	3.10 <sup>I</sup> (1.21)	3.13 <sup>I</sup> (1.13)	2.73 <sup>AHC</sup> (1.21)	F(3, 562) = 5.75	B
"I don't think that my eating habits will really change." <sup>1***</sup>	3.29 <sup>I</sup> (1.09)	3.59 (1.16)	3.50 (1.04)	3.84 <sup>A</sup> (0.99)	F(3, 557) = 6.71	B
"Media reports are often unreliable. I don't trust the findings." <sup>1***</sup>	2.80 <sup>HCI</sup> (1.08)	3.24 <sup>AI</sup> (0.94)	3.15 <sup>AI</sup> (0.90)	3.53 <sup>AHC</sup> (0.94)	F(3, 583) = 14.85	G-H

n = 561 for the item with the smallest number of respondents. <sup>1</sup>Scale from 1 = "do not agree at all" to 5 = "fully agree"; \* p ≤ .05, \*\* p ≤ .01, \*\*\* p ≤ .001, significant differences to... <sup>A</sup> animal welfare, <sup>H</sup> health, <sup>C</sup> climate, <sup>I</sup> image according to Bonferroni's test (B) when variances are equal and Games-Howell procedure (G-H) when variances are unequal.

In addition to the analysis of the respondents' reactions to the different "newspaper articles" measured by the ratings of the above described attitudinal statements, we also measured the number of respondents who stated their belief to reduce meat consumption in future, before and after having read one out of the four articles (Table 6). In general, after having read an article, the percentage of respondents intending to reduce future meat consumption increased, suggesting that the provision of information about negative consequences of meat consumption in newspaper articles could be an effective instrument for campaigns to reduce meat consumption. Going into more detail, a gender-specific analysis reveals that the content of the "newspaper

articles” is relevant for the percentage of male respondents who state their intentions to reduce meat consumption. Whereas the animal welfare and the health articles motivate an above average number of male participants to decrease meat consumption, the image-related article does not seem to effectively contribute to a reduced meat consumption since the share of respondents stating to reduce future meat consumption even reduced compared to before having read the article. The climate change article also seems to have a limited effect on men. For women, the specific content of the articles appears to be less relevant than for men, since no significant differences were found between the four articles. As a tendency, the image content seems to be the least promising, but, in contrast to the male participants, the percentage of women willing to reduce meat consumption is still greater than before having read the article.

**Table 6.** Percentage of respondents believing to reduce meat consumption in future before and after having read one out of the four “newspaper articles”

	<b>Without newspaper article</b> (n = 556 with 290 men and 266 women)	<b>Average of the four articles</b> (n = 564 with 272 men and 292 women)	<b>Animal welfare</b> (n = 150 with 68 men and 82 women)	<b>Health</b> (n = 136 with 75 men and 61 women)	<b>Climate</b> (n = 128 with 71 men and 57 women)	<b>Image</b> (n = 149 with 78 men and 71 women)
<b>All Responders</b>	12.8	20.7	28.0	23.5	18.8	12.1
<b>Men**</b>	11.4	18.2	27.9	24.0	15.5	6.4
<b>Women<sup>ns</sup></b>	14.3	23.5	28.0	23.0	22.8	18.3

\*p ≤ .05, \*\* p ≤ .01, \*\*\* p ≤ .001, <sup>ns</sup> p > .05, related to differences after having read one out of the four “newspaper articles”. The differences between “Without newspaper article” and “Average of the four articles” are significant at least with p ≤ .05 for men, women and the whole sample.

## Discussion

Large empirical studies indicate that food consumption and general health-related lifestyle aspects (e.g., smoking) constitute a health risk more often in men than in women (e.g., MRI 2008). Concerning nutrition, one substantial difference between men and women is in the amount of meat consumed, with men eating approximately twice as much meat as women, as was observed in the German population (MRI 2008). Similar patterns were found for other European countries (Vergnaud et al. 2010). Additionally, Vergnaud et al. (2010) showed that as consumption of meat increases, so do problems with health relevant behaviors or behavioral outcomes like overall calorie intake and BMI. This is true for both men and women, but for a lesser extent in women.

The present study focused on this challenge, confirming initially the differences between aspects of male and female consumption behavior, with men eating meat more frequently and having a higher a BMI and, at the same time, questioning their behavior less. Accordingly, men perceived barriers for reducing meat consumption (e.g., strongly habitualized consumption patterns, negative opinions of their friends regarding vegetarianism and indispensability of meat as a necessary dietary component) as more important and motivations for reducing meat intake (regarding health effects, animal welfare and environmental benefits) as less important than women.

Regarding respondents' attitudes after having been confronted with one of the fictional "newspaper articles" in a split sample approach, men accordingly expressed lower levels of concern and higher levels of mistrust in the given information. At the same time, their estimated probability that their eating behavior will actually change was lower than that of the women. The analysis of these attitudes, separately for each of the four articles, showed that independent of sex, the animal welfare article provoked the most profound reactions and the highest level of concern, followed by the human health and climate-related articles. In contrast, the image-related article was not attributed with high credibility. In accordance with this, the percentage of respondents stating their intention to reduce future meat consumption reached the highest value in those people who had read the article about animal welfare problems associated with meat production. The article about potential damage to their image due to high meat consumption again motivated only a small number of people, whereas both the health and the climate-related articles affected a moderate number of respondents regarding their stated motivation to reduce future meat consumption. However, the described differences between the articles were much more apparent in men. In the female sample, the same pattern tended to appear, but the differences were not significant.

Interestingly, not health, but animal welfare aspects motivated the largest number of respondents, which might be due to the fact that animal welfare issues are very emotionally discussed and are able to directly cause high levels of concern in many consumers. The ongoing public debate regarding animal welfare and factory farming in Germany (Efken et al. 2013; Franz et al. 2010) might also have contributed to these results. One reason for the comparatively low reaction to the article related to climate change consequences of meat production might be that the wider consequences of meat production are not yet commonly known. This observation is supported by Tobler et al. (2011), who demonstrated that consumers tend to be unaware of the environmental consequences associated with meat production, which seem to be rather abstract and less intuitively comprehended than reports about animal suffering in modern farming practices. Our study also reveals that information about the image-related consequences of meat consumption as presented here does not appear to be effective. Generally, information focusing on animal welfare and human health aspects can reach both sexes equally and most effectively. With respect to the environmental consequences of meat production, general awareness in the population should be promoted, in particular towards men, as indicated in our results.

Overall, we observed that the percentage of respondents willing to reduce meat consumption increased after having read any of the articles – with the exception of the image-related article in men – suggesting that similarly designed newspaper articles in fact could be an effective instrument in awareness-raising campaigns aimed at reducing meat consumption.

Finally, we also need to mention the limitations of our study. Despite our overall comparatively large sample, the number of male and female respondents that were presented with each of the four "newspaper articles" was small, which might have contributed to the fact that some differences in the reaction to the different newspaper articles and between men and women were not significant in our data. The availability of a larger sample might provide greater details regarding the above-mentioned differences. Furthermore, it should be noted that our methodological approach measured respondents' stated reaction to the four different contents immediately after being

confronted with them. We have no information whether the stated behavioral changes would actually be implemented and if so, if they would be maintained in the long term.

Our results should be interpreted as specific for the situation in Germany, where e.g., animal welfare issues are widely discussed in the media, due, among other things, to recent food scandals (e.g., Efken et al. 2013). Our data did not differentiate between the types of meat, or between different income groups of respondents, both of which might be useful distinctions for further research on awareness-raising campaigns. Since research suggests that the group of heavy meat consumers contains a disproportionately large number of men with lower social status (Cordts et al. 2013b), it might be interesting for further research to concentrate on low-income men, when consumer reactions to information about meat consumption are investigated or strategies for reducing meat consumptions are developed. In this context, also the impact of meat prices on consumer behavior would be of interest for further research.

## Implications for the Meat Industry

For the meat sector in industrialized countries, the described sustainability and health problems associated with meat consumption pose challenging strategic questions. Their best customers, men with high meat consumption, are also those with the highest incidence of severe health problems attributable to their meat consumption behavior (cf. Vergnaud et al. 2010).

Since the empirical analysis presented above concerns the population in Germany, the obtained results are particularly relevant for the German meat industry. With 83,000 employees and a sales volume of more than 37 billion Euros in 2012<sup>3</sup> (Gewerkschaft Nahrung-Genuss-Gaststätten 2013), the meat sector has the highest turnover of all the sectors within the German food industry (BVE 2013). Germany is one of the most important meat producers in the EU, alongside France and Spain (DBV 2012, 251).

Our empirical results show that there was a lower level of concern among men in response to the fictional “newspaper articles” compared to women, and male heavy meat consumers are also the ones with low health consciousness and awareness for sustainability and animal welfare issues (Cordts et al. 2013b). It can therefore be concluded that, even with increased media coverage, levels of meat consumption will remain relatively stable in the short term, although in the long term, increasing public awareness of sustainability-related topics may lead to changes in consumption even in high meat consuming groups.

Firms could react in different strategic ways to risks from sustainability- and health-related campaigns. The well-known Miles and Snow approach (Miles et al. 1978) distinguishes four types of strategic behavior: prospector, defender, analyzer, and reactor. Prospectors try to find new market opportunities, e.g., artificial meat from algae. Defenders aim to protect the current market via proactive strategies like public relations. Analyzers combine both strategies by moderate innovation

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<sup>3</sup> Regarding the processing and preserving of meat and production of meat products. The number of employees relates only to companies with more than 50 employees. 37 billion Euros equals 49.9 billion USD (at 1.00 EUR = 1.34821 USD).

on a stable basis. Regarding the meat industry in Germany, most companies have long been working like reactors, trying to ignore the human health, animal welfare and sustainability problems associated with meat consumption and production, while concentrating on heavy meat consumers (Franz et al. 2010, 2012).

In the recent past, German meat manufacturers began to use proactive strategies. One example of an animal welfare-related strategy is the recent implementation of a nationwide voluntary animal welfare label, which was developed by scientists in cooperation with leading processors from the meat industry (Vion Food Group and PHW Group/Wiesenhof) and the German Animal Welfare Association (Deutscher Tierschutzbund). The label ensures animal husbandry conditions that go beyond the basic legal animal welfare requirements (BMELV 2013; Efken et al. 2013). Since January 2013, meat products with these labels have been available in various supermarket chains (Efken et al. 2013). Producers, manufacturers and food marketers can take part in this government-supported program and apply for certification to the German Animal Welfare Association (Deutscher Tierschutzbund n.d.). However, so far only a small number of producers have adopted the label (45 producers were certified by May 2013, with further companies currently undergoing the qualification procedure) (Deutscher Tierschutzbund 2013).

Related to health marketing, innovative meat products have been launched on the German market, e.g., minced meat with plant-based protein and reduced fat and cholesterol content (Vion Food Group 2010).

Regarding the different types of meat, the literature indicates that for a health reasons, poultry is clearly preferable to red meat (e.g., McAfee et al. 2010; Micha et al. 2010), and correspondingly, German consumers perceive poultry as significantly healthier than beef or pork (Kayser & Spiller 2012). Therefore, producers and sellers of poultry should be in a strong position when health-related campaigns are conducted. On the other hand, producers of poultry and also pork are disadvantaged in the case of campaigns with an animal welfare focus, since the husbandry conditions of poultry, but also pigs, are perceived as particularly problematic and considerably less animal-friendly than the husbandry conditions of cattle (Kayser et al. 2012; Tonsor & Olynk 2010). Furthermore, beef is perceived as a high quality product and a more appropriate meat for special occasions when compared to poultry and pork (Kayser & Spiller 2012).

In conclusion, the above considerations show that the meat industry is facing important challenges when the consumer-awareness of the negative consequences of meat production and consumption increases.

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## Appendix

### **“Newspaper article” on meat consumption and animal welfare**

*In the following, we present an extract from an article from the Frankfurter Allgemeine Zeitung (“FAZ”: a popular broadsheet newspaper) from the 28<sup>th</sup> September 2012 on the topic of meat consumption. Please read the article first, and then answer the following questions.*

Animals suffer from modern farming methods more than previously thought, according to the findings of a recent scientific study from Harvard University in the US involving more than 35,000 animals. The study reports that 13 % of pigs are conscious during the slaughtering process. In addition, crowded conditions, pens covered in excrement and germs, and the preventative use of antibiotics remains the standard in modern factory farming. Maltreatment, such as the castration of male piglets without anesthetic and the dehorning of cattle or beak-cutting of hens, is also still common.

### **“Newspaper article” on meat consumption and health**

*In the following, we present an extract from an article from the Frankfurter Allgemeine Zeitung (“FAZ”: a popular broadsheet newspaper) from the 28<sup>th</sup> September 2012 on the topic of meat consumption. Please read the article first, and then answer the following questions.*

Those who eat a lot of meat are damaging their health more than previously thought, according to the findings of a recent scientific study from Harvard University in the US involving more than 35,000 participants. The study reports that meat-lovers have a 13 % lower life-expectancy and are more frequently affected by strokes, heart attacks, diabetes and various types of cancer. The mortality rate of study participants increased if they ate meat for one main meal per day, and further increased if they additionally ate sausage, ham or other processed meat.

### **“Newspaper article” on meat consumption and climate**

*In the following, we present an extract from an article from the Frankfurter Allgemeine Zeitung (“FAZ”: a popular broadsheet newspaper) from the 28<sup>th</sup> September 2012 on the topic of meat consumption. Please read the article first, and then answer the following questions.*

Global meat production damages the climate more than previously thought, according to the findings of a recent scientific study from Harvard University in the US involving more than 35,000 participants. The study reports that a person who eats large quantities of beef is responsible for 13 % more greenhouse gas emissions than the average person. This includes all emissions that are directly or indirectly caused by meat production, from the production of chemical fertilizers to grow the feed, through the reduced CO<sub>2</sub> sequestration in areas used to keep animals and produce their feed, to the disposal of the meat packaging.

**“Newspaper article” on meat consumption and personal image**

*In the following, we present an extract from an article from the Frankfurter Allgemeine Zeitung (“FAZ”: a popular broadsheet newspaper) from the 28<sup>th</sup> September 2012 on the topic of meat consumption. Please read the article first, and then answer the following questions.*

People who eat a lot of meat are less popular in both their professional and private lives, according to the findings of a recent scientific study from Harvard University in the US involving more than 35,000 participants. The study reports that meat-lovers have 13 % fewer friends than people who occasionally or never eat meat. The relationships of carnivores are generally shallower and less trusting. At work, people with high meat consumption have greater problems working in a team. The reasons for these phenomenon are not fully understood, however, evidence shows that higher meat consumption contributes to a worse image.