Social Structural Influences on Meat Consumption

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Abstract

Meat production is a major hidden cause of many critical environmental problems, indicating that individual dietary habits are a form of environmentally significant consumption (ESC). We build upon the growing literature on ESC by analyzing the effects of social structural factors on the total meat and beef consumption of individuals. Our purpose here is to further our understanding of the factors that contribute to individual consumption patterns of environmentally significant commodities. Gender, race, ethnicity, location of residence (region and urban vs. non-urban), and social class all appear to affect dietary habits even when controlling for physiological variables such as body weight and age. We argue that social structural factors in combination with macro-economic structure and psychological factors provide a rich explanation of the consumption patterns of individuals.

Keywords: *vegetarian diet, environmentally significant consumption*

Introduction

"Patterns of food production and consumption are at the core of all human ecology" (Dietz, Kalof and Frisch 1996, 181). Dietary habits and the food production processes that support them clearly have dramatic consequences for the global environment and economy (Goodland 1997). Nearly 37% of the land surface of the Earth is used for agricultural production, including both cropland and grazing land (Harrison and Pearce 2000). Due to the environmental implications of food production and consumption, it is important to understand both the factors that influence the human diet and the aspects of food production that are most harmful to the environment. Here we focus on meat consumption because of its particularly serious effects on the global environment. There is a substantial and growing social science literature that examines meat consumption and the vegetarian diet (Dietz, Kalof and Frisch 1996). However, this literature lacks cohesion, and much of it does not address the environmental and social consequences of the current human diet (Dietz, Kalof and Frisch 1996).

Largely independent of the literature examining the human diet is an emerging body of research that examines *environmentally significant consumption* (ESC), a broad term used to encompass consumption practices that have particularly serious environmental consequences (for examples of this research see Stern et al. 1997a). As Stern et al. (1997b) argue, it is important to identify and empirically analyze human activities that have substantial effects on the environment. Stern (1997, 20) notes that "[consumption] is not solely a social or economic activity but a human-environment transaction. Its causes (driving forces) are largely economic and social, at least in advanced societies, but its effects are biophysical."

Here we draw on both the human diet literature and the ESC literature to analyze the meat consumption habits of individuals. As Stern et al. (1997b) argue, consumption can only be properly understood through the analysis of multiple factors: social, economic, technological, political, and psychological. While researchers have studied the influence of social psychological factors on meat consumption (e.g., Dietz et al. 1995; Kalof et al. 1999), social structural factors have not been as extensively examined. Here we provide an exploratory analysis of the effect of social structural factors on meat consumption. We expand the existing body of research by examining meat-eating behavior — the quantity of meat people consume — rather than focusing on whether people identify as vegetarian. We discuss the environmental significance of meat production and the social significance of

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meat consumption. Our purpose here is to explore the social structural factors that influence individual consumption patterns of environmentally significant commodities in general and meat-eating behavior in specific. The relationship between social structural factors and consumption practices has not been fully developed in the ESC literature nor has the topic received adequate treatment by those who study meat consumption and vegetarianism.

The Environmental Significance of Meat Production and Consumption

The environmental literature identifies industrial meat production as a leading cause of many ecological problems (Durning and Brough 1991; Ehrlich, Ehrlich and Daily 1995; Goodland 1997; Pimentel and Pimentel 1996; Rifkin 1992; Subak 1999). Modern, intensive meat production places a burden on ecosystems since it requires the use of large quantities of natural resources — particularly land, energy, and water used to produce feed grain (Durning and Brough 1991; Dutilh and Kramer 2000; Fiddes 1991). Relative to the production of grain and other vegetable matter for human consumption, meat production is extremely resource inefficient — several times more people can subsist on a vegetarian diet than can on a meat centered diet (Durning and Brough 1991; Dutilh and Kramer 2000; Ehrlich, Ehrlich and Daily 1995; Lappé 1991; Rifkin 1992).

Beef production is particularly resource intensive, having an even greater impact on the environment than is suggested by the amount of grain — and the resources that go into producing grain — that it requires (Subak 1999). Livestock grazing contributes to many environmental problems including soil erosion, desertification, water pollution, and loss of biological diversity (Durning and Brough 1991; Ehrlich, Ehrlich and Daily 1995; Pimentel and Pimentel 1996; Rifkin 1992). For example, millions of acres of tropical forest in Latin America have been cleared for cattle grazing (Durning and Brough 1991; Harrison and Pearce 2000; Myers 1981). Additionally, due to their digestive physiology, cattle also emit a large quantity of methane, a greenhouse gas, and their manure expels gaseous ammonia into the air, contributing to acid rain (Durning and Brough 1991; Harrison and Pearce 2000; Subak 1999).

The Social Significance of Meat Consumption

Although vegetarianism is on the rise in Western societies (Amato and Partridge 1989; Beardsworth and Keil 1997; Dietz et al. 1995), meat consumption is still a central part of the U.S. diet (Beardsworth and Keil 1997). Yet there is substantial evidence that meat is not only unnecessary for a healthy diet, it is a leading contributor to many health problems (ADA 1999; Amato and Partridge 1989; Lappé 1991; Marcus 1998; Melina et al. 1995; Robbins 1987). Given that widespread meat-eating behavior in affluent societies cannot be readily explained by biological necessity, other factors must play a major role in determining individual dietary habits.

A critical macro-level approach suggests that the production of meat cannot simply be explained as a direct response to consumer demand, since production is affected by government subsidies and industry groups, such as the beef and pork councils. Political economists argue that the economic elite control consumer preferences through means of social, psychological, and cultural manipulation — for example, by the use of advertising (Schnaiberg 1980; Schnaiberg and Gould 1994). Therefore, production may generate consumption because producers, processors, and marketers have cultural hegemony, that is, control over the values and beliefs of a culture. Consequently, from this perspective, the structural power of the meat industry is expected to be a major determinant of levels of meat consumption. Cronon's (1991) analysis of how the U.S. meat industry grew throughout the 19th Century by transforming American agriculture provides clear support for the argument that consumer habits are greatly influenced by powerful corporate interests. However, although this perspective may explain aggregate levels of production and consumption in a society, it does not explain variation of consumer behavior among individuals within a shared political economic context.

A micro-level approach to understanding consumer patterns focuses on the social psychological factors that lead to meat consumption. Dietz et al. (1995) and Kalof et al. (1999) argue that social psychological factors, such as values and beliefs, have a substantial influence on consumer demand for various food types. The results of their analyses suggest that values and beliefs have a greater influence on the choice of a vegetarian diet than do demographic factors. Consistent with these results, other researchers have found that social psychological factors have a greater influence on consumer demand than do demographic and economic factors (Breidenstein 1988; Guseman et al. 1987; Sapp and Harrod 1989). However, social structural factors form the context in which psychological factors operate. Social structural position (for example race, class, and gender) likely plays an important role in shaping each individual's socialization, life experiences, and psychological attributes. Recognizing the intertwined importance of social structure and psychology is necessary to understand behavior.

Both the critical macro-level perspective and the social psychological perspective have made important contributions to our understanding of ESC in general and meat consumption in particular. We argue that social structural factors play an important role in mediating between macro-structural factors (e.g., political economic system) and psychological conditions, having the potential to contribute to a fuller explanation of consumer behavior. As Stern et al. (1997b) argue, in order to properly understand ESC it is necessary to identify which types of individuals are engaging in particular activities. Therefore, connecting the social structural position of individuals with their behavior is essential for a deeper understanding of ESC. Social structural factors are likely to be important for explaining meat consumption. According to McCracken (1988), the creation of social distinctions, such as class, race, and occupation, is supported and authenticated through material objects. Therefore, variation in consumptive patterns may be expected among individuals in different social categories. Differences in food consumption patterns may distinguish one social group from another - e.g., the upper class may eat grilled portabello mushrooms on a bed of arugula while the lower class eats pot roast and potatoes - and these consumption patterns may reproduce social differentiation (Bourdieu 1984).

Our study adds to the existing literature on meat consumption in two ways. First, we provide an analysis of the influence of social structural factors on dietary habits based on a large and representative sample of individuals. Dietz et al. (1995) note that demographic factors (which are social structural) have not been carefully studied in relation to their influence on diet, and the studies that have been done are typically based on non-representative samples. Just as Dietz et al. (1995) and Kalof et al. (1999) have begun to explore the importance of social psychological factors for understanding meat consumption, we provide an exploratory analysis of the importance of social structural factors. We recognize, however, that since we do not take into account psychological factors in our analysis (they are not available in our dataset), associations between structural factors and meat consumption may be due in part to variation in psychological conditions between social groups.

Secondly, we use as our dependent variables the *quantity* of meat (both beef and total meat) individuals consume, instead of a binary dependent variable representing whether or not individuals identify as vegetarian (as used in the analyses of Dietz et al. 1995 and Kalof et al. 1999). Those who identify as vegetarian may eat some meat and some of those who do not identify as vegetarian may only eat small quantities of meat (Beardsworth and Keil 1991, 1992, 1993). Therefore, vegetarian identity is only a rough measure of meat consumption. The actual quantity of meat consumed is the relevant factor to the environment. This study is a necessary step toward a more complete understanding of the influence of social structural factors on meat consumption.

Data and Methods

We use data from the 1996 Continuing Survey of Food Intakes by Individuals (CSFII) conducted by the U.S. Department of Agriculture, Agricultural Research Services (1998). A stratified, multistage area probability sample was collected of United States residents, using estimates of the U.S. population in 1990 as the sampling frame. The data for the CSFII were collected over two-nonconsecutive days through in-person interviews with individuals using 24-hour recall of the previous day's food intake. Day-1 and day-2 intake questionnaires included three passes by the interviewer to assist in recall, and the interviewer obtained detailed descriptions of each item. Thus, the data provide a reasonable estimate of how much meat each respondent consumed in a typical day. The response rate for the day-1 intake survey was 80% and for the day-2 intake survey 76%, both consistent with conventional standards (Dillman 2000).

A total of 15,028 people provided the necessary information about their food consumption. Our sample includes all cases for which there is necessary data for all variables of interest. This subset of the total survey includes 8,876 respondents. We have examined cases excluded from the analysis due to missing data to assess whether they differ from included cases on variables for which data are available. We have not found a substantive difference between excluded and included cases and assume that data are missing effectively at random.

We use ordinary-least-squares (OLS) regression to assess the effects of social structural factors on meat consumption. We use two dependent variables. First, we examine the total amount of meat — including beef, pork, poultry, seafood, and processed meats — individuals consumed. Second, we specifically examine the amount of beef consumed, since beef production has a particularly large impact on the environment. Due to the structure of the data set, this measure of beef does not include beef that is in highly processed meat products, such as lunchmeat and sausages, nor beef that was consumed in a meat mixture. We use the average of the quantity of meat consumed by individual respondents, measured in grams, during the two days for which data were collected. The mean amount of total meat consumption per day is 215 grams, with a standard deviation of 198. The mean amount of beef consumption per day is 26 grams, with a standard deviation of 60.

Table 1. Description of independent variables.

Independent Variable	Description
Income (logged)	Annual household income in dollars (in original units a value of 100,000 indicates 100,000+)
Education	Education in years > 12 (a value of 5 indicates 5+)
Occupation/Work status	Set of dummy variables (labor is the omitted category)
Professional occupation	Professional and technical; manager, officer or proprietor
Service occupation	Clerical or sales worker; service worker or other similar job
Laborer occupation**	Farmer; craftsman or foreman; operative
Not working	Not working
Age	Two variables: age in years and age in years, centered by subtracting the mean, squared
Race	Dummy variables (white,** black, Asian, Native American, other)
Hispanic	Dummy variable (1 = Hispanic, 0 = non-Hispanic)
Sex	Dummy variable (1 = female, 0 = male)
Urban	Dummy variable (1 = urban, 0 = non-urban)
Region	Set of dummy variables (Midwest is the omitted category)
Northeast	Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont
Midwest**	Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin
South	Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia
West	Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming
Weight	Weight of respondent in pounds

**Indicates reference category in the regression models.

Table 2. Summary statistics for continuous independent variables (n=8876).

Variable	Mean	Standard Deviation	Minimum	Maximum
Income (in dollars)*	40,300	28,200	0	100,000
Education (years >12)	1.5	1.9	0	5
Age	47	17	18	90
Weight	169	39	86	350

* Note that the summary statistics for income are for the variable in original units, not the transformation used in the regression model. Note also that a value of 100,000 for income indicates an annual income of $100,000 or more and a value of 5 for education indicates 5 or more years of education beyond high school.

Table 3. Summary statistics for categorical independent variables (n=8876).

Variable	Frequencies				
Occupation/ Work Status	Professional	Service	Laborer	Not working	
	27.4%	19.9%	14.6%	38.1%	
Region	Northeast	Midwest	South	West	
	17.7%	24.1%	35.8%	22.4%	
Race	White	Black	Asian	Indian	Other
	80.0%	11.9%	2.6%	0.6%	5.0%
Hispanic	Hispanic	Non-Hispanic			
	8.5%	91.5%			
Sex	Male	Female			
	52.7%	47.3%			
Urban	Urban	Non-urban			
	73.8%	26.2%			

A complete description of each independent variable and its respective coding is presented in Tables 1, 2, and 3. Income, education, and occupation are used as basic indicators of social class position. We use the natural logarithm of income because we expect that any effects income has on meat consumption will diminish as income rises. The education variable is the number of years of education in excess of twelve, since we do not anticipate substantial effects from increasing education on meat consumption until a minimum threshold is reached.[3] Occupation is divided into four dummy coded categories: professional, service worker, laborer, and not working.[4]

Gender, race and ethnicity (Hispanic/non-Hispanic) variables have been included in the analysis, since they are frequently recognized as important factors for understanding a variety of behaviors, including those that relate to the environment (Dietz et al. 1995; Kalof et al. 1999; Dietz, Kalof and Stern 2002). Since there is the potential that gender may interact with race and ethnicity, we present additional models that include interaction terms. Following standard practice, the interaction terms are the gender variable multiplied by each of the dummy-coded race variables and the ethnicity variable.

Variables for region of residence (dummy coded into four categories: Northeast, South, Midwest, and West) and urban vs. non-urban residence are included to control for cultural and resource availability differences. To control for physiological differences we include measures of body weight (pounds) and age.[5] For age, we include both age in years and the quadratic of age in years (centered by subtracting the mean before squaring to reduce problems with collinearity) to allow for a non-linear relationship between age and meat/beef consumption. For the beef analysis alone we include the variable of total meat consumption minus beef consumption to control for tradeoffs among types of meat.

Table 4. OLS regression coefficients and standard errors (in parentheses) for both the total meat consumption and beef consumption models (the dependent variables are measured in grams per day).

Independent Variable	Model 1: Total Meat	Model 2: Total Meat	Model 3: Beef	Model 4: Beef
Education	- 3.683** (1.231)	- 3.618** (1.231)	- .911* (.375)	- .912* (.374)
Income (logged)	.379 (2.164)	.350 (2.165)	1.753** (.658)	1.784** (.658)
Urban	4.969 (4.826)	5.179 (4.830)	- 3.568* (1.468)	- 3.508* (1.469)
Weight	.438*** (.059)	.436*** (.059)	.066*** (.018)	.063*** (.018)
Age	- .977*** (.133)	- .960*** (.133)	- .235*** (.040)	- .235*** (.041)
$(Age-mean)^2$	- .003 (.007)	- .004 (.007)	- .004* (.002)	-.004* (.002)
Female	- 74.299*** (4.707)	- 74.821*** (5.274)	- 17.405*** (1.445)	- 19.057*** (1.614)
Hispanic	7.237 (9.771)	- 9.169 (13.842)	9.392** (2.972)	11.556** (4.209)
Race[a]				
Black	41.088*** (6.589)	33.818*** (9.634)	6.202** (2.008)	.443 (2.931)
Asian	56.550*** (13.090)	81.585*** (18.176)	- 1.158 (3.986)	- .042 (5.532)
Native American	24.267 (27.651)	44.554 (35.123)	4.041 (8.411)	- 18.747 (10.680)
Other	- 3.767 (12.245)	18.414 (17.454)	- 5.451 (3.725)	- 9.346 (5.307)
Interaction effects				
Black*Female		12.824 (12.749)		10.436** (3.876)
Asian*Female		- 50.787* (25.588)		- 2.281 (7.781)
Native Am*Female		- 49.164 (56.034)		58.378*** (17.038)
Other*Female		- 42.511 (24.306)		7.397 (7.391)
Hispanic*Female		31.207 (19.081)		- 3.531 (5.802)
Region of residence[b]				
Northeast	- 19.739** (6.442)	- 19.507** (6.442)	- 7.395*** (1.960)	- 7.516*** (1.959)
South	- 20.722*** (5.419)	- 20.452*** (5.420)	- 4.395** (1.649)	- 4.478** (1.649)
West	- 12.271* (6.230)	- 12.155 (6.233)	- 6.989*** (1.895)	- 7.216*** (1.895)
Occupation[c]				
Professional	- 36.448*** (7.277)	- 37.243*** (7.290)	- 10.813*** (2.215)	- 10.851*** (2.218)
Service	- 29.340*** (7.359)	- 29.488*** (7.359)	- 7.970*** (2.240)	- 7.935*** (2.238)
Not working	- 36.055*** (7.097)	- 36.099*** (7.127)	- 7.502*** (2.161)	- 7.370*** (2.169)
Total meat minus beef			- .059*** (.003)	- .059*** (.003)
Constant	257.145*** (26.433)	257.393*** (26.455)	43.272*** (8.073)	44.262*** (8.075)
R^2	.084	.085	.068	.070
Adjusted R^2	.082	.083	.067	.068
n	8876	8876	8876	8876
Mean VIF, Highest VIF	1.57, 2.92	2.09, 3.65	1.54, 2.92	2.05, 3.65

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
[a] White is the omitted category
[b] Midwest is the omitted category
[c] Laborer is the omitted category

Results and Discussion

An initial finding of interest is that people in our sample who identify as vegetarian may sometimes eat meat. Self-identified vegetarians, who make up 2.3% of our sample, eat an average of 83.2 grams of total meat and 3.4 grams of beef per day compared to 217.8 and 26.6 grams respectively for non-vegetarians. The fact that some self-identified vegetarians eat meat is not entirely surprising. Beardsworth and Keil (1991, 1992, 1993) have noted that there are different forms of vegetarianism, and definitions of vegetarianism vary among individuals. This finding demonstrates the importance of analyzing the quantity of meat individuals consume, rather than singularly focusing on vegetarian identity.

The OLS regression results are presented in Table 4.[6] Models 1 (total meat) and 3 (beef) do not include the terms for an interaction effect between gender and race and ethnicity. The interaction effect terms are included in models 2 (total meat) and 4 (beef). Each model clearly explains a statistically significant portion of the variation in the dependent variable.[7]

Focusing first on models 1 and 3, gender, race, and ethnicity all appear to influence dietary habits. Since weight and age have been controlled for in these analyses, it appears unlikely that differences in levels of meat consumption along the lines of gender, race, and ethnicity can be explained simply by physiological differences. Gender has a particularly strong influence on meat consumption. We are aware of no physiological reason, other than the average differences in weight, for which we have controlled, that men would require more meat than women. Not only do women consume substantially less total meat than do men (74 grams a day less), they also consume less beef (almost 17 grams a day less) — considered a "powerful" and masculine food (Adams 1990; Bourdieu 1984). Dietz et al. (1995) found that gender differences in vegetarianism could in part be explained by differences between the values of men and women, suggesting that our finding of a substantial gender effect on meat consumption may indicate the effect of gender-related values.

Blacks and Asians eat more total meat than whites, and blacks also eat more beef than whites. The finding that Asians eat more total meat than whites is surprising given that the traditional diet in most Asian nations is not as meat-centric as the Western diet. This may suggest that the cultural meaning and value of meat is influenced by social context, although our data do not allow for an unambiguous conclusion on this matter. The finding that Hispanics eat more beef than non-Hispanics suggests that ethnicity also matters. These findings for race and ethnicity suggest that it is also possible that meat acts as a status marker for groups that have historically been marginalized in U.S. society.

An examination of models 2 and 4, where the gender and race/ethnicity interaction terms are included, does not substantively alter these interpretations, but does suggest further subtlety in how gender and race affect dietary habits. The gender/ethnicity interaction term is not statistically significant, indicating that the effect of gender on meat consumption is not affected by ethnicity — and, conversely, the effect of ethnicity on meat consumption is not affected by gender. However, the effect of race on meat consumption does appear to depend on gender (and vice versa). Since the inclusion of interaction terms makes the interpretation of results more complex, we present in table 5 the estimated differences in meat consumption between racial and gender groups.

Table 5. The interactive effects of gender and race on total meat and beef consumption (white male is the reference category; all values are in grams per day).

	Meat		Beef	
Race	**Female**	**Male**	**Female**	**Male**
White	- 74.821	0	- 19.057	0
Black	- 28.179	33.818	- 8.178	.443
Asian	- 44.023	81.585	- 21.38	- .042
Native American	- 79.431	44.554	20.574	- 18.747
Other	- 98.918	18.414	- 21.006	- 9.346

In the total meat model with interaction terms (model 2) the Asian*Female interaction term is significant and negative. This indicates that the difference in meat consumption between Asian males and females is significantly greater than the difference between white males and females — stated one way, Asian females eat less meat than would be expected based on the independent effects of race and gender alone. None of the other gender/race interaction terms are significant, indicating that gender has a similar effect on meat consumption among racial groups other than Asians.

In the total beef model with interaction terms (model 4), the Black*Female and Native American*Female interaction terms are significant and positive. This indicates that the effect of gender on meat consumption in both black and Native American groups is different from that in whites. Whereas white women eat 19.1 grams less beef a day than white men, black women eat only 8.6 grams less beef a day than black men (see table 5). The most striking finding is that, unlike among all other racial groups, among Native Americans, women eat *more* beef than men.

These findings on the effects of race and gender on meat and beef consumption suggest that there is considerable subtlety in how social position affects dietary habits. Furthermore, the results suggest that the social construction of gender differences varies between racial groups. Subsequent research would be required to tease out the specific nature of these differences and how they relate to diet. However, these initial findings are provocative.

The inclusion of the interaction terms in the models does not substantively alter the estimated effects of other factors on meat and beef consumption — i.e., the coefficients for factors other than gender, race, and ethnicity do not vary substantially between model 1 and model 2 or between model 3 and model 4. Therefore, whether one focuses on either the models with interaction terms (models 2 and 4) or the models without interaction terms (models 1 and 3) will not substantively alter the interpretation of the effects of factors other than gender, race, and ethnicity on meat and beef consumption.

Social class appears to have a substantial influence on meat consumption. Those in laborer occupations eat both more beef and total meat than those in either service or professional occupations.[8] Furthermore, education is inversely related to beef and total meat consumption (i.e., people with more education eat less beef and total meat).[9] Interestingly, income does not influence total meat consumption.[10] Beef consumption, however, does appear to rise with income, which may possibly be explained by the price of beef relative to other types of food. Taken together, these findings support the argument that eating habits reflect an individual's class position (see Bourdieu 1984).

The location of residence also appears to have a substantial influence on the meat consumption habits of individuals. Midwesterners eat considerably more beef and total meat than people in other regions,[11] and urbanites eat less beef (but not total meat) than non-urban residents. These differences in meat consumption could simply be explained by the availability and price of meat in different locations, or they could reflect regional cultural differences.

We included age in the models primarily to control for changes in physiology, and therefore dietary requirements, as people age. The coefficients indicate that people eat both less total meat and beef as they grow older. It is possible, however, that this effect is not only, or even primarily, due to physiological changes, but, rather, due to differences in the dietary norms of people from different age cohorts.

Finally, in the beef analysis, the total of other meats consumed has a significant negative effect on beef consumption. This finding suggests that tradeoffs are made among different types of meat — i.e., reducing the consumption of one type of meat may increase the consumption of another type. Since different types of meat require different quantities of resources for their production, the tradeoffs between types of meat may have substantial environmental implications.

Overall, it appears that social structural factors clearly influence meat consumption habits. Therefore, meat consumption is clearly not the outcome of biological necessity, but a practice embedded within a complex of social forces. Meat consumption cannot be largely explained by the argument that material affluence leads individuals to select "superior" food since they can afford it. These results taken as a whole clearly indicate that an individual's social status has a substantial influence on her/his eating habits.

Conclusion

The environmental literature identifies meat production as an ecologically detrimental practice. A substantial reduction in the scale of meat production and consumption would reduce the human impact on the natural environment and may increase global food security. This verity highlights the ecological significance of the dietary habits of individuals. The environmental literature does not, however, adequately address the social factors that elevate meat to a central role in the U.S. diet, nor does it address the persistence of a meat-based diet despite clear alternatives.

We find that the social structural position of an individual affects meat consumption. Specifically, gender, race, ethnicity, location of residence (region and urban vs. non-urban), and social class all appear to affect dietary habits even when controlling for physiological variables such as body weight and age. Those who argue that meat consumption should be reduced because it is burdensome to the environment must recognize the social context in which this basic practice takes place, as meanings, customs, and traditions may shape or constrain consumer patterns. While beyond the scope of this study, ESC research could be furthered by including cultural factors, such as the social and cultural significance of various foods to different social groups (see Douglas and Isherwood 1979; Fiddes 1991; Mauer and Sobal 1995). The addition of cultural factors could further illuminate the centrality of meat in the U.S. diet.

Endnotes

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3. To assess the effects of education on meat consumption we have experimented with different transformations of the education variable in our analysis. We note the results below.
4. The structure of the data does not allow for theoretically meaningful disaggregation of the "not working" category. We cannot tell, for example, if the person is a housewife/househusband. We can tell if a person is retired, but this does not give us theoretically meaningful information since we do not know the occupation he/she retired from and, therefore, do not have an indication of social class. The "not working" category, therefore, serves as an undifferentiated group for which we cannot tell social class.
5. We recognize that in addition to indicating physiological conditions, age also indicates the effects of characteristics particular to generational cohorts.
6. Tests for statistical problems associated with multicollinearity suggest that no such problems exist. The highest VIF for any variable out of all four models is 3.65 (equivalent to a tolerance of .27), a value well within conventional standards (Greene 2000). Using a robust regression procedure does not dramatically alter coefficient estimates compared with OLS results, suggesting that our results are not overly influenced by outliers in the residuals. To allow for the potential of a non-linear relationship between the independent variables (in the forms used in the models) and meat/beef consumption, we have also run alternative models. First, we have used the logarithm of the dependent variables (adding a value of 1.0 to eliminate zeros) to estimate the same models presented here. Using this transformation does not dramatically alter our substantive findings, but the models do not fit as well as using the dependent variables in original units, suggesting that the linear specification is appropriate. We have also run the models using multinomial logistic regression, where each dependent variable is divided into three categories (less than one standard deviation below the mean, more than one standard deviation above the mean, and within one standard deviation of the mean). The results from these analyses do not suggest a substantively different interpretation than presented here. However, since such a procedure is less powerful than OLS (since information is "lost" by categorizing the continuous dependent variable), some independent variables

that are significant with OLS are not significant with the logistic model, although the direction of effects for such variables is the same in both OLS and multinomial logistic models.

7. Note that the relatively modest R^2 values are to be expected. As Greene (2000, 241) notes, it is important to realize that what constitutes a "high" R^2 value depends on the type of data used and the type of analysis performed. We expect social structural factors to explain a portion of the variance among individuals in general meat consumption habits (i.e., long-term average behavior), but not the day-to-day variance in meat consumption for any specific individual. Since the estimates of meat consumption for individual cases are based on data for only two days, we have an unbiased (the estimate should be unbiased if we assume that the sample days were selected randomly), but relatively inefficient estimate of long-term average meat consumption (general meat consumption habits). Since the data is for only two days, the variance of the dependent variables includes not only average long-term differences between individuals (which we expect the independent variables to partially explain), but also day to day variability of meat consumption (which we do not expect the independent variables to explain). For this reason the variance of the dependent variable is inflated and the R^2 is fairly low.
8. The differences in total meat and beef consumption among the other occupational categories are not statistically significant.
9. We also estimated the models using two other transformations of education: education in total years (not years after 12 as presented here), and education in years squared. Neither of these alter the coefficients for other factors in the model substantively. However, neither of these transformations of education has a statistically significant coefficient. This suggests that the effects of education are best represented by the specification of education we present here.
10. Obviously, this finding is context dependent. Although income does not appear to have a significant effect on meat consumption in the U.S., an affluent nation, we would expect that, to the extent meat costs more than other foods, the very poor, particularly in less developed nations, would be unable to afford meat.
11. The coefficients for all region variables in all models are statistically significant, except for "West" in model 2. Note, however, that the value of the coefficient for West in model 2 is nearly identical to that in model 1.

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