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# The Effects That Family Form and Medical Practices Have on the Willingness of Consumers to Adopt Entomophagous Practices

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THE EFFECTS THAT FAMILY FORM & MEDICAL PRACTICES HAVE ON THE  
WILLINGNESS OF CONSUMERS TO ADOPT ENTOMOPHAGOUS PRACTICES

by

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Submitted in partial fulfillment of the requirements  
for graduation with Honors

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## Abstract

To help reduce amounts of destructive methane produced by livestock, climate activists are advocating for the inclusion of entomophagy in the mindset and culinary choices of Western society. Entomophagy, customary in most regions of the world, is seen as a deviant and disgusting food practice by most Westerners. In order to challenge this perception, producers of insect-based products are changing the appearance and marketability of their commodities. To successfully target markets, they need to determine the ideal household for entomophagy acceptance. My research tests the hypothesis that family form and medical practices affect the willingness of consumers to adopt these environmentally conscious eating habits.

I distributed a survey to understand the varying levels of acceptance of both whole-body and hidden-body insect products. Within family form types, married households without children or dependents yielded the most positive data in favor of entomophagy. In all tests, they ranked the most likely to incorporate entomophagy into their household. The second variable, medical practices, was far more ambiguous in its data results. The only solid evidence it provided was that when paired with married, no children/dependents, the group with fewer doctor visits resulted in slightly higher willingness in all categories. While there were certainly aspects of the survey that could be changed to yield a more accurate result, the overall conclusion of the data points to the “model” household including married individuals with no children or dependents, and few doctor’s visits per year. Combining this information with future census data will yield cities or regions within the United States where insect-based product producers can target consumers with a higher level of potential success.

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## Introduction/Literature Review

As the global population continues to increase, food production has to follow suit. This increased demand for food is leading to issues that concern both a lack of habitable space and increasing levels of pollution. The concerns of many, including Dennis Oonincx and his team at Wageningen University, more specifically deal with the vast resource need and negative environmental impacts of large-scale meat production. To be produced, livestock takes up a massive expanse of space. It is important to note that livestock are not environmentally friendly as they produce detrimental amounts of carbon dioxide. While the overall CO<sub>2</sub> output per body mass average is slightly higher for insects compared to mammals, CO<sub>2</sub> production per mass gained (through the life cycle) was far lower for all the insect species studied compared with both pigs and beef cattle (Oonincx et al., 2010). Due to carbon dioxide's harmful effects on the ozone layer, which over time have furthered the severity of global warming, it is vital humanity looks to find more sustainable solutions to feeding the planet's 7.7 billion people.

This has prompted the economic and environmental question of whether or not there will be an increase in "minilivestock." This term describes the production and sale of insects for human consumption (Looy, Dunkel & Wood, 2013). Insect consumption, while an extremely effective means to feed a growing global population in a more environmentally conscious way, has been met with backlash from Western society. Even though there are over 1,417 known species of edible insects, entomophagy, which is *the practice of eating insects*, has a negative reputation within the United States and other western cultures. The practice has long been part of cultures throughout the world, yet Western society is the last cultural region halting entomophagy from having a truly global presence (Ramos-Elorduy, 1998).

Some nations and peoples are far more open to the idea of incorporating insects into their diet. Traditionally, countries in the regions of South and Southeast Asia, Sub-Saharan Africa, and Latin America have all taken part in the common practice of entomophagy. Many of these regions are close to the equator and have warmer, more tropical climates. This has helped many species of insects evolve and thrive, giving the peoples of these regions more options and opportunities to consume insects. Mexico for example, consumes over 100 different species of insects, a practice that was also common by American Indians in the United States in the pre-colonial era (“An acquired taste”, 1992). Since then, entomophagy has relatively died out in the United States after being a historical part of American Indians’ diet, yet many ask why do these culinary practices persist in Mexico even though they also faced colonization? Is variety the answer, or did other factors uphold the cultural tradition of entomophagy in Mexico? (Ramos-Elorduy, 2009)

In Western society, Europe is leading the way in terms of insect consumption, as Belgium and the Netherlands have already made great strides towards incorporating entomophagy into their society. These nations have already conducted extensive testing to conclude entomophagy can work in their countries (Caparros Megido et al., 2014). However, the United States is still very hesitant to consume insects due to food taboo based social constructs. Food taboos are visible in almost all known societies, and in the United States entomophagy is strongly opposed (Meyer-Rochow, 2009). This is an issue because the United States is the world’s largest Western society and consumers are extremely hesitant to incorporate the practice of entomophagy. Therefore, these socially constructed fears are causing the United States to fall behind on culinary trends that will help sustain the planet by lowering carbon dioxide emissions.

Food taboos originate from several different thought and social processes. Food neophobia and disgust are the two most relevant for this study. Food neophobia is defined as an individual trait that involves the rejection of unfamiliar or novel food. Disgust is more of an emotional trait and a subset of distaste, as noted by Deroy (2015). In terms of entomophagy, we most often associate insects with broader items of disgust including contamination and toxins (La Barbera, Verneau, Amato, & Grunert, n.d.). These two ideas have been combined to paint a negative image within Western society, creating a strong hesitance to engage in entomophagy. My research will address both topics but focus most attention on the topic of disgust and how it is present in different types of households.

The importance of understanding the term “disgust” can be seen in both my topics of interest; family form and medical practices. There is research on changes in levels of disgust, with specific emphasis on how pregnant women reacted to disgust while in different trimesters, specifically third, during pregnancy (Fessler, 2003). Fessler concluded little from his study on the impact of disgust on different parts of the pregnancy cycle. He hoped to find a correlation between level of disgust and trimester phases. While Fessler centered his research on specifically one type of family form, pregnant women, I will expand the understand of disgust based on several different family form types.

On family form, Deroy (2015) writes that, “Disgust would seem to have evolved to help the organism or group to minimize the risk of infection and contamination” (47). With my research, I look to test that theory by studying the separation of the words: organism, or individual, and group. Leaders of groups make decisions in favor of members’ safety. We may infer that head(s) of households, or an individual who is responsible for feeding the family, with spouses or children will act more tentatively about a food item they understand to be



“disgusting” compared to an individual acting alone. I, thus, hypothesize households that have a single member will have a much different, and higher, acceptance and tolerance for entomophagy compared to data for multi-person households.

For my second topic, medical practices, I will be using disgust to find correlations between individuals’ fear of diseases and entomophagy. I want to test the theory that if someone has less fear of illness or a higher trust in their own body to protect itself from sickness, they will have a lower level of disgust for entomophagy. My focus will be on individuals and families who go to the doctor often compared to individuals and families that prefer at-home remedies or battling sickness through doing nothing. It can also be noted that insects have been part of global medicine for hundreds of years in China, India, and Korea, as well as various other nations (Park, Kim, & Kusuma, 2019). This correlation between disgust and taboo is similar when relating insects to both food and medicine in Western society. While many Asian, African, and Latin societies have historically used insects as part of medical remedies, Western societies have shied away from these practices. This leads to the overarching question of whether family form, medical practices, both, or neither will show any change in willingness from United States consumers to adopt entomophagy.

What I hope to accomplish through this research is to generate a partial “model” for the ideal United States household where entomophagy would be most accepted. Using the data collected based on family form and medical practices, the model can be compared with census results and other geographic data. This will help producers pinpoint which cities or regions would be considered target markets for insect-based products. If data indicates high acceptance rates, these cities or regions could then become pioneers for the entomophagy movement in the United States. This would allow marketers and distributors of the products to have a better

understanding of possible consumers in this young and competitive market space (Rusconi & Romani, 2018). The insect market in the United States is currently classified as a growing niche market, but increasing producer understanding of who is willing to eat insect-based products could push the market into a more stable position (Bartrim, 2017). This would help to alleviate neophobia and disgust for insect-based products by transitioning the practice from a deviant taboo to a normative practice. Furthermore, the purpose of my research is to help understand this United States food taboo in order to help erase the negative stigma

### Research Methods

My research relied on both survey questions and visual stimuli in order to gather information from consumers. I used Columbus, Ohio, as well as surrounding communities in Franklin and Delaware counties to gather my data sample. I specifically hoped to target men and women from the ages of 22-45. This specific age range was chosen because these individuals are old enough to have completed formal schooling and are living on their own, but not too old to have all their children out of the home (in the average household). This age range was created based on United States average age at birth for mothers of approximately 27 years old (“National Center for”, 2017). This range was meant to create a pool of people not living with their parents, either single, with a partner, and/or with children/dependents. Secondly, the selected age range does not account for older individuals (60 and above), who have in past studies, tested very negatively towards the ideas of entomophagy. Most also saw the practice as incompatible with their own cultural beliefs and heritage (Myers & Pettigrew, 2018). For those reasons, to keep the data concentrated on individuals who could have willingness to adhere to entomophagy, older individuals were not sought out in the age parameters. Concerning medical practices, the age

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range selected also targets a population who are capable of making informed decisions concerning their health.

My first research question is, “Does family form play a role in the willingness of a consumer to incorporate entomophagy into their home?” I believe individuals living alone, will be more willing to incorporate entomophagy due to the “risk” solely to self. To clarify, if an individual is only putting risk on themselves with a decision, they will be more likely to take the risk. The survey I created prefaced the topic with demographic questions concerning age, spousal situation, number of children, etc. The questions were then followed by visual stimuli. For my survey, prior research photos from Jensen and Lieberoth’s study acted as examples of edible insects prepared in common dishes, using both whole-body insect products and hidden-body insect products. The distinction being made between whole-body and hidden-body is the appearance of the food to the consumer. Hidden-body products would be items such as flours or powders that mask the appearance of insects entirely. Whole-body products have the insect in a natural shape or form. It is important to test both types of products because hidden-body products could be helpful in disguised or masked insects to be more palatable to western consumers. It is also important to test with both to give the consumer an accurate picture of what the edible insect market produces and sells.

Continuing to my second question: “Do medical practices affect willingness to incorporate entomophagy in the home?” The basis of this question deals with disgust, which in entomophagy appears to be driven by a fear of contamination and disease (Jensen & Lieberoth, 2019). What I will be extrapolating is if there is a correlation between use of medical care and acceptance of entomophagy. My prediction is that individuals who rely less on medical aid for themselves and their families will be more likely to adopt practices of entomophagy because of

less inherent fear of disease and contamination. I asked questions concerning number of trips to the doctor each year in order to gauge the level of medical reliance of the surveyed. Severe illnesses that requires frequent medical visits were not controlled for in the survey. Therefore, while not an exact measure, this will help hypothesize the level of personal threat associated with disgust and contamination. This portion of the survey also came before the introduction of the visual stimuli.

The visual stimuli were broken into three sections: No Insect, Hidden Insect and Whole Insect. In order to fully expose the survey respondents to the market for insect-based products, I had a whole-body product (dried meal worms) and a hidden-body product (cricket flour and protein powder) as examples for the individuals to consider. I also included a product with no insects to help remove data bias to the insect consumption (i.e. if an individual reacted negatively biased to a visual based solely on prior experience with the food item, not the presence of insects). An example would be if somebody did not like spring rolls, therefore they would answer “NO” regardless to whether they would be willing to eat insects in the spring rolls or not. I presented images of finished products (food items constructed from each raw product) and asked the respondents if they would serve that food in their home. “What is still unclear are consumers preferences for specific insect-based products having different features in a non-hypothetical market” (Lombardi et al, 2019). Indistinctness in appeal is the main reason for using both types of products and will hopefully procure more accurate answers from respondents to represent the entire market for insect-based products. Furthermore, sensory and visual characteristics, along with information on origin and safety are important factors in consumer appeal and willingness to incorporate entomophagy in the future (Mishyna, Chen, & Benjamin, 2020).

## Data Analysis

The total number of respondents to my survey was 48, which constitutes a large sample size. This data was subsequently broken down to determine which characteristics of both family form and medical practices were most vital for understanding possible pioneer regions/cities in the United States based on creating the ideal household “model.” Some categories only have enough responses to be considered small sample sizes, which may have an overall effect on the data presented. Additionally, many of the respondents (83.33%) were not within the ideal age range for the study, which in the future will require more funding to ensure a larger sample size is collected for analysis.

The data collected on family form shows very distinct differences between categories of respondents, with condensed data available in Table #1. While numerically the largest group surveyed, those individuals who identified as married without children or dependents were far more likely to respond with a “YES” when asked if they would serve foods with insect products. For Figure #1, the Asian spring rolls, 63.16% said they would serve the dish while the cumulative percentage was 51.15%. Similarly, in Figure #2, the vanilla yogurt parfait, 66.67% of those married without children or dependents were a “YES” while the average was 52.38%. These numbers illustrated hidden-body insect products. For whole-body insect products the results were equally as offsetting. In Figure #1, the married without children or dependents group was 21.05% “YES” to the average of 11.62%, and in Figure #2 was 11.00% to 4.76%.

Other important insights could also be gathered from the data. Unmarried with children/dependents on had two respondents, which will negatively affect the accuracy of the data. However, in all categories but one, those without children/dependents were more likely to say “YES” than those with children/dependents. This was regardless of marital status. Another

insight showed that in all categories but one, married individuals were more likely to answer “YES” than unmarried individuals. This can be analyzed by discussing the nature of society today and the “coupled” culture that is widely prevalent in Western society.

Medical practices yielded far fewer robust results as visible in Table #2, which may be the result of vagueness in the survey material. Long-term medical illnesses were not screened for, as mentioned previously, as well as failure to specify an option for “zero” visits. The lowest category was 0-2, therefore the majority of respondents were in that category (~80%). There could be additional differences between individuals just within that 0-2 category that were not captured due to the questions asked. What the data does show is that those who visit the doctor 3-5 times per year are more likely to try hidden-body products. Individuals who make 0-2 visits per year are more likely to try whole-body insect products.

The final portion of the survey consisted of measuring and categorizing statements into the respondent’s level of agreement or disagreement. The questions asked were based on both Figure #1 and Figure #2 images separately and could be ranked anywhere from 1-5, 1 being strongly disagree and 5 being strongly agree. Respondents were asked the following: 1) “Is it disgusting to use insects in [FOOD] in this way” 2) “Is it inappropriate to use insects in [FOOD] in this way” 3) “Is it unsafe to us insects in [FOOD] in this way” 4) “The food with insects will taste worse than the [FOOD] without insects”. Net averages for questions 2 & 3 were 1.845 and 1.789 respectively, which means consumers slightly disagreed with statements saying insects are inappropriate and unsafe in food. These responses are slightly more insect positive compared to questions 1 & 4, which received average responses of 2.700 and 2.667 respectively. All value averages are represented in Table #3. This shows that based on disgust and taste, respondents are

more negatively minded, yet still have opinions better than a neutral perspective which is a value of 3.

### Conclusion

Based on my analysis of the survey data, several conclusions can be made about the possibility of expanding the practice of entomophagy into the United States and other Western societies. First, individuals in two-person households, married without children or dependents, are far more inclined to try incorporating entomophagy into their diet. This is true for both whole-body and hidden-body product types and was consistent across all household types and survey images. Secondly, medical practices were not a conclusive indicator of consumers' willingness to adopt entomophagy. However, I note that 86.36% of married respondents without children or dependents fell into the 0-2 visits per year category. Based on the information represented in Table #4, I recognize that respondents specifically in the 0-2 visits category scored a higher "YES" percentage on all four tests when compared to all visit frequencies combined for married without children or dependent respondents.

Therefore, I conclude that the prime demographic categories for insect-based food companies to market their products would be areas with larger percentages of married couples cohabiting without children or dependents. This model can also incorporate past data collected concerning age and condense the model to individuals younger than sixty.

This study was taken up because of the effects of environmental degradation and climate change. I began this study into the possibility of incorporating entomophagy within Western society to address the acceleration the human carbon footprint is having on climate change. This work will fully meet the goals of the research if and when companies begin stronger marketing

and sales campaigns to push for insect-based products in the United States. More research should be done to help determine what other aspects of society can be included in the “model” family form to further specify the target market. Race, ethnicity, economic status, and political views may also have significant impact of entomophagy in the United States. Further tests could fast-track Western society towards a more environmentally conscious culinary perspective. Additions to this research could explore a variety of topics; including where entomophagy fits into the omnivore, vegetarian, vegan spectrum, or if political scientists could make use of this data to meld entomophagy with political movements centered around climate change. All these and many other ideas are all possible future applications of this research.

#### Appendix

Figure #1) [Left] Spring Roll with dried meal worms, [Right] Spring Roll with cricket flour





Figure #2) [Left] Parfait with dried meal worms, [Right] Parfait with cricket protein powder



Table #1) Family Form data showing percent “YES” for willingness to serve insects in home

	Figure 1 Hidden %YES	Figure 1 Whole %YES	Figure 2 Hidden %YES	Figure 2 Whole %YES
Married w/ c,d (7)	42.86%	14.29%	33.33%	0%
Married w/out c,d (22)	63.16%	21.05%	66.67%	11.00%
Unmarried w/ c,d (2)	0%	0%	50.00%	0%
Unmarried w/out c,d (19)	46.67%	0%	43.75%	0%
Total (3 skipped f1, 5 f2)	48.89% (51.15% w/ 45)	11.11% (11.62% w/ 45)	51.16% (52.38% w/ 42)	4.65% (4.76% w/42)

Table #2) Medical Practice data showing percent “YES” for willingness to serve insects in home

Doctor's Visits (# respondents)	Figure 1 Hidden %YES	Figure 1 Whole %YES	Figure 2 Hidden %YES	Figure 2 Whole %YES
0-2 (38)	48.57%	14.29%	48.57%	5.71%
3,4,5 (9)	71.43%	0%	71.43%	0%
5+ (1)	0%	0%	0%	0%
Total (3 skipped f1, 5 f2)	48.89% (51.15% w/ 45)	11.11% (11.62% w/ 45)	51.16% (52.38% w/ 42)	4.65% (4.76% w/42)

Table #3) Qualitative Questionnaire Statement Analysis

1= strongly disagree, 5= strongly agree	f1	f2	net
"It is disgusting to use insects in [FOOD] in this way"	2.733	2.667	2.7
"It is inappropriate to use insects in [FOOD] in this way"	1.889	1.8	1.845
"It is unsafe to use insects in [FOOD] in this way"	1.822	1.756	1.789
"The food with insects will taste worse than [FOOD] without insects"	2.711	2.622	2.667

Table #4) Married with children/dependents Analysis, All medical visits vs. 0-2 visits only

	Figure 1 Hidden %YES	Figure 1 Whole %YES	Figure 2 Hidden %YES	Figure 2 Whole %YES
Married w/c,d & 0-2 visits	64.70%	23.53%	68.75%	12.50%
Married w/c,d & ALL visits	63.16%	21.05%	66.67%	11.00%

On April 27, 2019, this project was given approval for the employment of human subjects in the proposed research by the Otterbein University Institutional Review Board. The status of "Approved" was granted to Corroto & Conlon HS 18/19-49.

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