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Evaluation of an Interactive Health Communication Trans Fat Website

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EVALUATION OF AN INTERACTIVE HEALTH COMMUNICATION TRANS FAT WEBSITE

by

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ABSTRACT

Evaluation of an Interactive Health Communication Trans Fat Website

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In order to evaluate the short-term educational and behavioral impact of the American Heart Association's "Face the Fats" web application had upon college students, a study involving 116 Utah State University undergraduate students was conducted. A one-group pre-posttest design was utilized to answer eight research questions focusing on: health risks associated with *trans* fat, general *trans* fat knowledge, ability to identify foods containing *trans* and saturated fats, food label information, healthy alternatives to *trans* fat, and readiness to change *trans* fat intake. Participants completed an online pretest survey and then viewed the "Face the Fats" website at their own pace. After viewing the website, participants completed an online posttest survey. Data were analyzed using Microsoft Excel. Statistical analysis of a paired sample *t* test revealed that "Face the Fats" was successful in changing the general *trans* fat knowledge of participants ($p = < 0.00$). Results also showed participants increasing their knowledge of health risks associated with different types of fat ($p = < 0.00$). Knowledge of *trans* fat

nutritional information on food labels also significantly increased ($p = < 0.00$) and participants were more able to name foods containing *trans* fat, although some confusion remained among foods that contained both saturated and *trans* fat. Using a chi-square test, it was found that participants were more likely to state they were seriously considering reducing *trans* fat intake within the next 30 days after viewing "Face the Fats" ($p = < 0.00$). Results of a paired sample *t* test also showed an increase in the impact that *trans* fat information had on participants' decision to purchase and consume food ($p = < 0.00$).

(131 pages)

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I also want my sweet children to know they can do anything they set their mind to, so reach for the stars. Never say can't!

And last, but certainly not least, I have to thank my committee. Especially Dr. Waite, who went above and beyond the call of duty in helping me complete this thesis remotely, enduring sometimes 20 emails a day in order to get it done. Thanks also to Dr. Gast and Dr. Doty who offered great insights during the revision process. I also have to add a huge thank you to Kaylynn Shakespear, who was my feet on the ground in Logan during the data collection process. I couldn't have done it without her.

Tara Banks

CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Zero. The amount of *trans* fat deemed safe by the National Academy of Sciences Institute of Medicine (2005). *Trans* fat has no known nutritional benefits (Willett & Ascherio, 1994), is not an essential part of the diet (Institute of Medicine [IOM], 2005), raises the risk of developing coronary heart disease, and is linked by research to numerous other adverse health effects (Mozaffarain, Katan, Ascherio, Stampfer, & Willett, 2006).

Trans fat raises level of "bad" LDL-cholesterol in the body and lowers levels of "good" HDL-cholesterol. The LDL/HDL cholesterol ratio is a powerful predictor of coronary heart disease (CHD) (Katan, 1998). Studies show that *trans* fat can also be a contributor to myocardial infarction (Clifton, Keogh, & Noakes, 2004), fertility problems (Chavarro, Rich-Edwards, Rosner, & Willett, 2007), prostate cancer (Chavarro et al., 2006) and diabetes (Lefevre et al., 2005; Salmeron et al., 2001).

Although health organizations such as the Institute of Medicine (IOM), U.S. Department of Health and Human Services (USDHHS), World Health Organization (WHO), and the American Heart Association (AHA) recommend limiting *trans* fat intake to < 1% of energy (AHA, 2007a; WHO, 2003) or keeping consumption as low as possible (U.S. Department of Health and Human Services [USDHHS], 2005; IOM, 2005), Americans are still consuming too much *trans* fat. The average U.S. diet provides 2.6% of energy from *trans* fat — more than double the recommended amount (Allison et al., 1999).

Trans fat is the solid vegetable fat primarily produced in the industrial partial hydrogenation process and it is found in such foods as: margarine, shortening, fried fast food, crackers, baked goods, snack food, and other processed foods (Food & Drug Administration [FDA], 2003a). The food industry produces partially hydrogenated vegetable oils, and prefers them to other, healthier fats because of their long shelf life, semi-solid state, and stability during deep frying. They are also cheaper to manufacture when compared to other natural fats (Mozaffarain et al., 2006).

In 2006, the Food and Drug Administration began enforcing a new labeling policy requiring *trans* fat to be listed under saturated fat on the nutrition panel of foods. The FDA estimated that in 3 years *trans* fat labeling will prevent from 600 -1,200 cases of CHD and 250 - 500 deaths each year (FDA, 2003b).

A reduction like this would be important but inadequate given that a study from the Harvard School of Public Health estimates that > 30,000 Coronary Heart Disease (CHD) deaths and an even higher number of nonfatal CHD incidents can be attributed to partially hydrogenated oils (Willett & Ascherio, 1994). Given the mounting health evidence that *trans* fat increases CHD risk (Oh, Hu, Mason, Stampfer, & Willett 2005) and lowers HDL cholesterol levels (Ascherio & Willett, 1997), it is critical that consumers be aware of the negative health effects of *trans* fat, which foods to avoid, and healthy alternatives. To date, there have been few studies that investigated consumer knowledge of *trans* fat (AHA, 2006; Harris Interactive, 2006a; International Food Information Council [IFIC], 2007).

One way in which some health organizations and health professionals are trying to educate and improve consumer knowledge of *trans* fat is through the use of interactive health communication (IHC). IHC can be defined as the interaction of an individual with an electronic device to access health information (Science Panel on Interactive Communication & Health [SPICH], 1999). The internet is one important medium for IHC. Harris Interactive (2006b) estimated that 80% of U.S. adults have gone online to search for health-related information. As the internet is a widely used tool to disseminate health information it is important to evaluate online IHC applications for effectiveness in increasing knowledge and changing behaviors among users.

One such educational program is "Face the Fats," an online application and website (www.facethefats.org) launched in April 2007 and created by the American Heart Association. "Face the Fats" is the first widely available *trans* fat IHC application. The AHA designed this campaign to educate consumers on different types of fats, specifically the "bad fats," saturated fat and *trans* fat. To date, this online campaign has yet to be evaluated for effectiveness. Evaluation of "Face the Fats" will provide useful information which can be used in any redesign or new development efforts aimed at increasing effectiveness of web-based IHC applications.

Purpose of the Study

The purpose of this study was to evaluate the short-term educational and behavioral impact of a one-time intervention, AHA's "Face the Fats" web campaign upon

college students at Utah State University. College students represent an important target population for IHC applications, especially since young adulthood (18-25 years old) is a time when individuals establish stable health behaviors that may be important in the prevention or development of chronic disease (McCraken, Jiles, & Blanck, 2007).

Research Questions

The following questions will be addressed by this study:

1. Does participants' ability to identify health risks associated with *trans* fat and saturated fat change as a result of the completion of the "Face the Fats" web application?
2. Does participants' ability to identify foods containing *trans* fat and saturated fat change as a result of the completion of the "Face the Fats" web application?
3. Is the AHAs "Face the Fats" website effective in changing participants' basic knowledge of general *trans* fat facts?
4. Are participants more ready to make dietary changes after viewing "Face the Fats"?
5. Does participants' knowledge of *trans* fat nutritional information on food labels change as a result of the completion of the "Face the Fat" web application?
6. Does *trans* fat nutrition information impact participants' decision to purchase/consume food?
7. Is there a relationship between the amount of time spent viewing the website and knowledge level change?

8. Does participants' ability to identify healthy alternatives to *trans* fat change as a result of the completion of the "Face the Fats" web application?

Limitations

The limitations of this study are as follows:

1. Participants will navigate the website on their own. This limits the amount of control the researcher have on how thoroughly participants will view the website. As a result, data may not be representative of the amount of knowledge that can be attained by viewing the website.
2. The study will use self-reported data. This may produce biased responses and not accurately reflect participant behaviors.
3. The study will use the same questions in the pretest and posttest. This may cause improvements in scores that would not normally appear because participants are familiar with questions and could seek out answers to these questions while viewing the website.
4. Pre- and posttesting will occur on the same day, therefore, the design of the study will not address the long-term impact of the intervention.

Delimitations

The delimitations of this study are as follows:

1. The study will involve only Utah State University college students with access to a computer and the internet.
2. The sample represents conveniently selected volunteers.

Assumptions

Assumptions made in this study include:

1. The instruments utilized in the study will accurately measure what they are intended to measure.
2. All questions on the pretest and posttest will be answered honestly
3. The instrumentation is valid and reliable.

Definition of Terms

Trans Fat: *Trans* fatty acids, or *trans* fats, are unsaturated fatty acids that contain at least one non-conjugated double bond in the *trans* configuration. Major sources of *trans* fatty acids include partially hydrogenated vegetable oils that are used to make shortening and commercially prepared baked goods, snack foods, fried foods, and margarine. *Trans* fatty acids also are present in foods that come from ruminant animals including dairy products, beef, and lamb (USDHHS & United States Department of Agriculture [USDA], 2005).

Hydrogenation: The conversion of liquid oils to semi-solid fats by the addition of hydrogen in the presence of a nickel catalyst to the unsaturated double bonds (Oxford English Dictionary, 2000).

Cholesterol: A sterol that is present in all animal tissues. Free cholesterol is a component of cell membranes and serves as a precursor for steroid hormones, including

estrogen, testosterone, and bile acids. Humans are able to synthesize sufficient cholesterol in the liver to meet biologic requirements, and there is no evidence for a dietary requirement for cholesterol. Too much cholesterol can lead to the development of atherosclerotic plaque and coronary artery disease (USDHHS & USDA, 2005).

Serum Cholesterol: Travels in the blood in distinct particles containing both lipids and proteins. Three major classes of lipoproteins are found in the serum of a fasting individual: low-density lipoprotein (LDL), high-density lipoprotein (HDL), and very-low-density lipoprotein (USDHHS & USDA, 2005).

Low-density lipoprotein cholesterol: A lipoprotein that carries cholesterol in the blood; composed of a moderate amount of protein and a large amount of cholesterol. LDL cholesterol is necessary for body functions, but in excessive amounts it tends to build up in artery walls. High levels are associated with increased risk of coronary heart disease and atherosclerosis. It is known as the "bad" cholesterol (The American Heritage Dictionary of the English Language, 2003).

High-density Lipoprotein Cholesterol: A lipoprotein that transports cholesterol in the blood; composed of a high amount of protein and a small amount of cholesterol. It is thought to influence blood cholesterol levels by removing excess cholesterol from plasma and tissues and carrying it back to the liver for excretion. High levels are associated with decreased risk of coronary heart disease and atherosclerosis (The American Heritage Dictionary of the English Language, 2003).

Coronary Heart Disease: A narrowing of the small blood vessels (coronary arteries) that supply blood and oxygen to the heart (USDHHS & USDA, 2005).

Interactive Health Education: The interaction of an individual—consumer, patient, caregiver, or professional—with or through an electronic device or communication technology to access or transmit health information, or to receive or provide guidance and support on some health-related issues (Robinson et al., as cited in SPICH, 1999, p. 8).

Summary

This chapter provided a foundation of information on which to support the premise of this study. More research is needed to determine the *trans* fat knowledge level of college-aged students and to evaluate the effectiveness of IHC applications like "Face the Fats" based on their educational and behavioral impact. Research questions, limitations, delimitation, and assumptions of the study are also included in this chapter. Chapter II will review the current evidence from published research supporting the basis and need for this study and Chapter III will present methodology and data analysis procedures.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The literature review provides a comprehensive overview of current research conducted regarding *trans* fat, and includes: (a) a historical look at partial hydrogenation and introduction of *trans* fat into the food supply, (b) health effects associated with *trans* fat, (c) recommendations of health organizations regarding intake of *trans* fat, and (d) public health efforts and marketing campaigns designed to educate consumers on the harmful effects of *trans* fat.

Partial Hydrogenation

Partial hydrogenation is a chemical process that allows unsaturated vegetable oils to be converted into a more solid state. In order to understand the nature of *trans* fat and the research that follows, a look at the configuration of fat molecules and the process of partial hydrogenation is in order.

Fatty acids are chains of carbon atoms with hydrogen atoms attached to the carbon atoms (Whitney & Rolfes, 2002). In a saturated fatty acid the maximum number of hydrogen atoms is present and all the carbon atoms are attached to each other by a single bond. A single bond is the sharing of one pair of electrons between atoms. Fatty acids that contain one double bond, the sharing of two pairs of electrons between atoms, are called monounsaturated. Polyunsaturated fatty acids have more than one double bond.

Poly and mono fatty acids are known as unsaturated fat because they can take up hydrogen atoms. When hydrogen is added the double bonds are converted to single bonds and the fatty acid is then said to be saturated (Whitney & Rolfes).

Naturally occurring unsaturated fats contain double bonds in the *cis* configuration. *Cis or trans* configuration refers, in this case, to the orientation of the hydrogen atoms of the fat molecule relative to a reference plane. In a *cis* configuration, the carbon atoms are on the same side of the reference plane in a bent shape that results in a liquid state at room temperature. In a *trans* configuration, the carbon atoms are on opposite sides of the plane and the atoms bond in a straight configuration, thus remaining solid at room temperature (Whitney & Rolfes, 2002).

Partial hydrogenation is a chemical process that allows unsaturated vegetable oils to be converted into a more solid state. Vegetable oils are heated in the presence of a metal catalyst, usually nickel, and exposed to hydrogen gas. This process of adding hydrogen atoms causes some of the double bonds in the unsaturated oils to become saturated, and other bonds to change from a *cis* to a *trans* configuration, thus creating *trans* fat (Whitney & Rolfes, 2002).

The chemistry of the modern hydrogen process is attributed to Paul Sabatier and his student, J. B. Senderens (Nobel Foundation, 1966). Their work with hydrogenation of vapors won Sabatier the Nobel Prize in Chemistry in 1912 (Nobel Foundation). Then, in 1901, German Chemist Wilhelm Normann showed that hydrogenation could also be applied to liquid oils. He patented this process in 1902 (Patterson, 1998). In 1909, Proctor & Gamble, a Cincinnati based corporation, acquired the U.S. patent rights and in 1911

they began making the first partially hydrogenated shortening under the brand name Crisco (Shurtleff & Aoyagi, 2004). Steadily, the production of partially hydrogenated fats increased. In the 1960s in the U.S. and other western countries, the consumption and manufacturing of processed vegetable fats overtook those of animal fat. One factor was financial—hydrogenated oils were cheaper than animal fats. Another factor was health—advocates stated that unsaturated *trans* fat in shortening and margarine was more heart healthy than the saturated fat in butter and lard (Willett & Ascherio, 1994), a claim unsubstantiated by later research. Health effects will discussed in detail later in this literature review.

Before the process of partial hydrogenation was introduced into the food supply, the only considerable sources of *trans* isomers were the meat of ruminants (animals characteristically having a stomach divided into four compartments such as cows, sheep and goats) and also from dairy fat (Asherio & Willett, 1997). Now, partially hydrogenated oils are used in a vast supply of industrially produced foods. The food industry is attracted to partially hydrogenated vegetable oils because of their stability during deep frying, long shelf life, and semi-solid state. Partially hydrogenated oils enhance the palatability of sweets and baked goods that contain them (Mozaffarian et al., 2006).

Trans Fat

Trans unsaturated fatty acids (TFAs), commonly called *trans* fat, and used interchangeably in this literature review, are solid fats produced by partial hydrogenation.

By and large, *trans* fats are commercially produced in very large quantities in order to harden vegetable oils into margarine and shortening (Ascherio & Willett, 1997).

The major sources of *trans* fatty acids in the diet are the partially hydrogenated fats used in the preparation of fast food and in food manufacturing (Katan, 1998), which include such foods as vegetable shortening, some margarines—especially stick margarine, candies, crackers, snack foods, cookies, baked goods, fried foods, salad dressings, and other processed foods (FDA, 2003b). Note that many of these foods, but not all, also contain the other "bad fat," saturated fat (Mozaffarian et al., 2006). *Trans* fat is also naturally occurring at very low levels in ruminant animal meat and dairy products. (Jakobsen et al., 2006). Next, health effect of *trans* fat from both ruminant sources and industrially produced partially hydrogenated oils will be discussed.

Health Effects of *Trans* Fat

Researchers sounded alarm bells to the potential harmful effects of *trans* fat as far back as the 1970s (Enig, Munn, & Keeney, 1978). The bulk of current research focuses on the relationship of *trans* fat and coronary heart disease (CHD), specifically in relation to serum lipoprotein cholesterol levels, which are known to be directly related to risk of developing CHD (Aro, Jauhiainen, Partanen, Salminen, & Mutanen, 1997; Asherio & Willett, 1997; Lichtenstein, Ausman, Jalbert, & Schafer, 1999; Mensink, Zock, Kester, & Katan, 2003; Mozaffarian et al., 2006; Oh et al., 2005). Cardiovascular disease is the leading cause of mortality and morbidity in Americans (AHA, 2006), and similar to saturated fat, there is a positive linear association between intake of *trans* fat and

increased LDL (bad) cholesterol concentrations (Lichtenstein et al.). *Trans* fat also has been shown lower HDL (good) cholesterol. This effect has led to the concern that *trans* fat is more harmful with respect to CHD risk than is saturated fat (Ascherio & Willett).

Research has also been conducted to examine the relationship of *trans* fat intake and myocardial infarction (Clifton et al., 2004), fertility (Chavarroet al., 2007), prostate cancer (Chavarro et al., 2006), and diabetes (Lefevre et al., 2005; Salmeron et al., 2001). The health effects of naturally occurring ruminant *trans* fats vs. industrially created *trans* fat has also been studied (Jakobsen et al., 2006).

Trans Fat and CHD Risk

Perhaps the largest cohort study to examine the effects of dietary fat intake and risk of CHD is the Nurses' Health Study (Oh et al., 2005). Initiated in 1976, the Nurses' Health Study mailed a questionnaire to 121,700 female registered nurses aged 30-55 years. The questionnaire included information on lifestyle factors and medical history. The participating nurses filled out follow up questionnaires every two years in order to identify newly diagnosed illnesses and update general information.

In 1980 the researchers added a food frequency questionnaire. For purposes of this study, only those participants who completed the 1980 questionnaire were included in the analysis. Participants who left blank 10 or more food items, whose energy intake was improbable, and those who had a history of cardiovascular disease were not included in the analysis. The researchers analyzed the remaining 78,778 women, initially free of cardiovascular disease, to find associations among specific types of fat and risk of CHD.

During the follow-up period from 1980-2000, researchers documented 1,766 CHD cases (1,241 nonfatal myocardial infarctions and 525 CHD deaths). The women were grouped into quintiles based on the percentage of energy obtained from each type of fat. Relative risk was determined for each type of fat. Results included the finding that participants who had a higher intake of polyunsaturated fat (PUSF) also had decreased CHD risk (RR = 0.75, 95% CI: 0.60, 0.92; $p = 0.004$), and this association was strongest among overweight women (BMI $\geq$ 25 kg/m^2). Also, a higher intake of *trans* fat increased the risk of CHD, independent of other cardiovascular and dietary risk factors (RR = 1.33, 95% CI: 1.07, 1.66; p = 0.01). It was also found that these effects were stronger among women younger than age 65 years. Based on these results the authors suggested that a diet consisting of approximately seven percent of energy from PUSF intake, would help prevent CHD, particularly among younger and overweight women.

Another study to examine the effects of *trans* fat and CHD risk was conducted by Mensink et al. (2003). Mensink and colleagues performed a meta-analysis of 60 selected trials to evaluate the effects of individual fatty acids on the total to high-density lipoprotein (HDL) cholesterol ratio and on serum lipoproteins.

Traditionally, research estimates the effects of dietary fats on the risk of CHD from the effects the fats have on total serum cholesterol. Mensink et al. (2003) asserts there is increasing evidence that increasing concentration of HDL cholesterol will effectively lower CHD risk, so this analysis was focused primarily on HDL, the "good" cholesterol, as opposed to LDL, the "bad" cholesterol.

The ratio of HDL: total cholesterol did not change if participants replaced saturated fatty acids (SFAs) with carbohydrates in the diet, but it decreased if *cis* unsaturated fatty acids (USFA) replaced SFAs. And, when participants replaced diets high in *trans* fatty acids with carbohydrate and *cis* USFA, the effect on total: HDL cholesterol was almost twice as large as that of replacing SFAs alone. The authors conclude that replacing TFAs in the diet with USFA from unhydrogenated oils is the single most effective measure for improving cholesterol ratios (Mensink et al., 2003).

Lichtenstein and colleagues (1999) conducted a study to asses the effects of six different diets on cholesterol levels and CHD risk. The double-blinded study recruited 18 men and 18 women who consumed each of six different diets in random order for a 35-day period. Each diet provided 30% of calories as fat. In each different diet, soybean oil, semi liquid margarine, soft margarine, shortening, or butter contributed two thirds of the total contributing fat.

Researchers used covariance analysis to describe serum total, LDL, and HDL cholesterol. Participants' serum total and LDL cholesterol levels changed in response to the different predominant fats in the diet. Ratios were the most favorable after participants consumed the soybean oil diet and the least favorable after participants consumed the stick margarine diet. Serum total cholesterol levels were 10% lower after the soybean-oil or semi liquid-margarine diet than they were after the butter diet, and LDL cholesterol levels were 11-12% lower. Participants' HDL cholesterol levels, which have been shown to have a protective factor against CHD, lowered by three percent after

the soybean-oil diet and by six percent after participants consumed the stick-margarine diet.

The authors concluded that the use of soybean or semi liquid margarine resulted in the most favorable total and LDL cholesterol levels, and ratios of total cholesterol: HDL cholesterol and made a strong recommendation to the food industry as well as the general public to use vegetable oils in their natural state and after minimal hydrogenation (Lichtenstein et al., 1999).

A similar double-blinded study examined the relationship of stearic acid, *trans* fat, and dairy fat on serum and lipoprotein lipids in healthy subjects (Aro et al., 1997). Eighty healthy participants consumed a baseline dairy fat-based diet for 5 weeks. For another five weeks participants ate an experimental diet that was either high in TFAs or stearic acid. All of the diets provided 32.2-33.9% of energy as fat, 14.6-15.8% as saturated fat plus TFAs, 11.4-12.5% as *cis*-MUSF, 2.9-3.5% as PUSF, and 200-221 mg cholesterol/10 MJ. When compared with the dairy fat diet, the stearic acid and TFAs decreased the serum total cholesterol concentrations in a similar manner, 13% and 12% respectively, $p < .001$. The TFA diet decreased the HDL cholesterol significantly more than the stearic acid. Stearic acid, but not TFA, reduced LDL cholesterol concentrations more than the dairy fat diet did.

It concerned the authors that in mixed diets, when TFAs are cut from the diet they are generally substituted for SFAs instead of liquid oils. They suggested that dietary fats low in both SFA and TFA should be favored even thought results showed that high

amounts of *trans* fat had a more adverse effect of lipoproteins than did the dairy fat diet, which is high is SFA.

As seen in the above research, *trans* fat negatively effects serum lipoprotein ratios, which are directly related to the risk of developing CHD (Aro al.,1997). A positive linear association between *trans* fat intake and increased LDL concentrations (Lichtenstein et al., 299) as well as lower HDL cholesterol concentration has lead to the concern that *trans* fat is more harmful with respect to CHD risk than is saturated fat (Ascherio & Willett, 1997).

Myocardial Infarction

Trans fat intake has also been studied in relation to risk of myocardial infarction, one outcome of CHD. Researchers from the Harvard School of Public Health recruited a total of 239 cases of a first acute myocardial infarction (MI) from six Boston hospitals in order to asses the effect of TFA intake on coronary risk in both women and men (Ascherio et al., 1994). In a case control design using a Food Frequency Questionnaire, researchers interviewed 282 population controls who were specifically asked about the type of margarine they used (tub or stick—as stick margarines have higher amounts of TFA) and types of fat they used in baking and frying.

Intake of TFA was directly related to the risk of MI compared by relative risk (RR) for the highest and lowest quintile (RR = 2.44, 95% CI, 1.42-4.19). The increased risk was almost entirely attributable to TFA derived from hydrogenated vegetable fats, as opposed to animal fats. Participants who consumed more than 2.5 pats of margarine per day also had a higher risk of MI (RR as compared to those consuming less than one pat

per day, 3.22, 95% CI 1.63-6.38). These findings support the authors' hypothesis that the intake of TFA from hydrogenated vegetable fats may contribute to coronary risk (Ascherio et al., 1994).

Another study that examined TFA and MI risk was conducted in Southern Australia by Clifton and colleagues (2004). Using the same design as the Boston study they examined dietary intake of TFAs, adipose tissue levels of TFAs and incidence of first MI. There were 209 cases of first MI between 1995 and 1997 who completed the Food Frequency Questionnaire and 79 of these cases consented to the adipose tissue biopsy. The study drew 179 random controls drawn from the electoral roll and matched with the MI cases for sex, age, and postal code. Of the 179 controls, 167 consented to an adipose tissue biopsy.

Using logistic regression, one finding in this study that differed from the Boston study was that *trans* 18:1(n-11), an isomer found in both animal and vegetable fats, was an independent predictor of a first MI ($p = .03$). The Boston study found no relation between animal fat and MI, only vegetable fat. The authors suggest this could be because in Australia beef tallow is used in baking whereas in the United States hydrogenated vegetable fats are more widely used (Clifton et al., 2004).

Another unique aspect of this study was that mid-study, in 1996, Australia removed all TFAs from the margarine supply. The authors found that when a major vegetable source of TFA was removed from the food supply, the TFAs in the adipose tissue rapidly disappeared. The authors found that men and women presenting with a first

MI consumed ~0.5 g/day (or 16%) more TFAs that the control matched subjects who were free of CHD (Clifton et al., 2004).

The findings of Ascherio et al. (1994) and Clifton et al. (2004) suggest that a reducing TFAs from the diet could lead to a reduction in presentation of first MI.

Fertility

The relationship between *trans* fat and fertility is fairly new, and to date, only one study has been documented. The objective the study carried out by Chavarro et al. (2007) was to assess whether cholesterol, total fat intake, and major types of fatty acids affected the risk of ovulatory infertility. They hypothesized that TFAs increase the risk of ovulatory infertility whereas PUFAs reduce the risk. Using a prospective cohort design, participants included 18,555 premenopausal, married women from the Nurses' Health Study who did not have a history of infertility and who attempted a pregnancy or who became pregnant between the years of 1991-1999. There were 438 incidents of ovulatory infertility reported during the follow-up period. Infertility was defined as "the inability to conceive after 12 months of unprotected intercourse" (Chavarro et al., 2007, p. 231). In a logistic regression analysis it was found that total intake of fat, cholesterol, and most types of fatty acids were not related to ovulatory infertility. However, again using logistic regression analyses, each two percent increase in energy intake from *trans* fat, as opposed to carbohydrates, was associated with a 73% greater risk of ovulatory infertility. The association remained constant even after adjusting for suspected and known risk factors for this condition. Obtaining two percent energy from TFAs rather than from MUSF was connected with a more than double risk of ovulatory infertility (RR = 2.31,

95% CI 1,09, 4.87; p = .028). These data suggests that when TFAs replace carbohydrates or unsaturated fats commonly found in vegetable oils, risk of ovulatory infertility increases.

Because replacing *trans* fat with unhydrogenated oils is also likely to reduce the risk of CHD, women who plan on becoming pregnant should consider reducing or eliminating *trans* fat from their diet. Given that the association betwee between ovulatory infertility and TFA have not been previously reported, further research in large prospective studies as well as randomized trials is warranted (Chavarro et al., 2007).

Prostate Cancer

Risk of prostate cancer and blood levels of TFA is also a new field of research. In the first study of its kind, Chavarro et al. (2006) conducted a nested case-control study among 14,916 U.S. physicians. The outcome of interest was the hypothesis that there was a link between blood TFA levels and the risk of prostate cancer (Chavarro et al.). The study recruited 14,916 U.S. physicians who provided a blood sample in 1982 that was frozen until assessed. Prostate cancer cases accrued through 1995 and were matched to controls by smoking status at baseline, age, and length of follow-up. For 479 cases of prostate cancer and their 491 matched controls, TFA levels as a percentage of total fatty acids were determined using gas chromatography. There was a weak positive association between the level of 18:2 TFA, an isomer that is a direct result of the hydrogenation process, and prostate cancer risk.

The authors suggest that blood levels of TFA, and in particular, TFAs resulting from the hydrogenation of vegetables could be associated with an increased risk of

prostate cancer. The association appears to be specific to non-aggressive and organ confined tumors.

Diabetes

The role that *trans* fat plays in regard to insulin resistance and development of type 2 diabetes remains unclear, and has not been thoroughly explored (Lefever et al., 2005). However, some research is showing that type of dietary fat intake is related to the risk of developing type 2 diabetes.

Researchers recruited healthy, non-smoking, overweight women and men from the Baton Rouge area. There were 22 subject selected who met eligibility requirements. For 16 days subjects ate a basal diet made up of 24% fat diet with 7% of energy coming from PUSF, 7% SF, and 10% of energy from monounsaturated fat. Researchers gave test subjects a high-fat test meal on Days 10 and 16. This one meal provided 40% of the individuals' daily energy need, with 50% of that energy coming from fat. It was observed that insulin levels were increased after just one meal in which 10% of energy from TFA replaced other *cis*-fatty acids suggesting an increase in insulin secretion and possibly an increase in insulin resistance. Although the amount of TFA in the test diet was higher than the estimated U.S. average of two percent, the findings may shed some light into the ongoing obesity epidemic. The findings suggest, as discussed by the authors, that *trans* fat may play a very specific role in the development of abdominal obesity (Chavarro et al., 2007).

Researchers have also used data from the Nurses' Health Study to examine relationships between dietary fat intake and the risk of developing type-2 diabetes

(Salmeron et al., 2001). During a 14-year follow-up researchers assessed 84,204 women aged 34-59 years, with no cancer, diabetes, or cardiovascular disease using detailed dietary information gathered at baseline in 1980 and then again in 1984, 1986, and 1990.

A multivariate analysis found that total fat intake, when compared with energy intake from equivalent carbohydrates, was not significantly associated with risk of type 2 diabetes (RR = 0.98 95% CI: 0.94, 1.02, $p = 0.96$). Intakes of SF or MUSF were also not significantly associated with diabetes risk. But, a 2% increase in energy from TFA increased the RR to 1.39 (CI:1.15, 1.67; $p = 0.0006$). The authors estimate that replacing 2% of energy from TFA with PUSF would lead to a 40% lower risk of developing type 2 diabetes (RR: 0.60, 95% CI:0.48, 0.75) (Salmeron et al., 2001).

Although association between *trans* fat intake and type 2 diabetes still needs further research, preliminary findings are showing that reducing or eliminating *trans* fat will lower the risk of developing type 2 diabetes. It may also reduce abdominal fat, known to be a risk factor for CHD and diabetes.

Ruminant Fats

The intake of TFAs from ruminant animal fats has shown a less consistent association with CHD than does the intake of industrially produced hydrogenated fats (Mensink et al., 2003). In fact, some research findings imply that ruminant TFA is innocuous, or even protective against CHD (Jakobsen et al., 2006).

An analysis conducted by Mozaffarain and colleagues (2006) stated that of four prospective studies that evaluated the relation between CHD and TFA intake from ruminants and none identified a significant positive association. However, three of the

studies identified a non-significant trend toward inverse association. The authors speculate that the absence of higher CHD risk when consuming ruminant TFA as compared with industrially produced TFA may be due to lower intake levels, different biologic effects, or perhaps the presence of other factors in dairy or meat products that balance out any effect of the traces of TFA contained in them (Mozaffarian et al., 2006).

Similar results were found by Jakobsen and others (2006) in an overview of the intake of ruminant TFAs and risk of CHD. The conclusion states that a change in ruminant TFA can only come about by changing intake of dairy and ruminant meat products, a complex issue. But, industrially produced TFA can be drastically reduced by removing hydrogenated oils from foods, almost eliminating TFA from the diet. More research needs to be conducted in this area in order to establish if there are safe levels of ruminant fat (Jakobson et al., 2006).

Much research has been conducted in regard to TFA and risk of CHD, while research is still emerging in association with TFA and cancer, fertility, and diabetes. Most of the research findings suggest that dietary intake of TFA is associated with increased risk of CHD. Because of this risk, many health organizations are making recommendations for TFA intake in the diet.

Health Organization Recommendations

Many national health organizations have and are recommending changes that decrease dietary intake of *trans* fat to lower the risk of CHD. Among these is the National Academy of Sciences (NAS). Chartered by congress in 1863, it is composed of

approximately 2,000 elected members, more than 200 of whom have won Nobel Prizes. The NAS has a mandate to advise the government on science and technology policy (National Academy of Sciences [NAS], 2007).

One component of the NAS is the Institute of Medicine (IOM). The IOM provides science-based advice on medicine, biomedical science, and health. In 2005 the Food and Nutrition Board, part of the IOM, published "Dietary Reference Intakes: The Essential Guide to Nutrient Requirements" (IOM, 2005). This report states that *trans* fat provides no known health benefits and are not an essential part of the diet. NAS set no recommended daily allowance (RDA) or adequate intake (AI) because of the positive linear trend between LDL cholesterol concentration and *trans* fat intake. There is also no upper limit (UL), the upper limit of intake that is considered safe for use by adults, because any increase in *trans* fat intake results in an increased risk of CHD. Recognizing that it would require significant dietary changes to totally eliminate all *trans* fat, some of which may produce undesirable health effects, the final IOM recommendation is that "*trans* fatty acid consumption be as low as possible while consuming a nutritionally adequate diet" (IOM, 2005, p. 424).

The USDHHS's Dietary Guidelines for Americans (USDHHS, 2005) echo the NAS, urging Americans to keep their intake of TFAs as low as possible. These guidelines are established by the United States Department of Agriculture (USDA) and the United States Department of Health and Human Services (USDHHS). The USDA and USDHHS intend the document to be a primary source of health information and base the guidelines on the latest scientific evidence (USDA & USDHHS, 2005). In addition to

recommending low *trans* fat intake, they state that processed food provide an overwhelming majority of TFAs in the diet, 80%, and recognize that the food industry will play and important role in removing TFAs by eliminating or cutting back on the use of partially hydrogenated oils so often seen in processed foods (USDA & USDHHS).

Improving lifestyle and diet is part of the AHA's goal to prevent cardiovascular disease, the leading cause of both mortality and morbidity in the U.S. The AHA recommends limiting *trans* fat to < 1% of energy, or < 2 g/day. Differing from the USDA and USDHHS guidelines, the AHA not only recognizes the crucial role of healthcare professionals, food industry, schools and restaurants, but also makes specific recommendations to these groups (AHA, 2006). Similar to the AHA, the World Health Organization concluded that the population goal for the consumption of TFAs is < 1% of energy (WHO, 2003).

The Harvard School of Public Health recommends three strategies that are effective in preventing CHD. 1.Substitute unsaturated fats, especially PUSF, for SF and TFA. 2. Increase omega-3 fatty acid consumption from plant or fish oil sources, and 3. eat a diet that is high in vegetables, fruit, whole grains and nuts. They recommend a combination of these approaches to bring about the greatest benefits in reducing CHD risk (Hu & Willett, 2002).

Public Health Efforts

Based on the recommendations of many national and world health organizations to limit consumption of foods that contain *trans* fat, consumers need to be aware of what

products contain *trans* fat. Because of the weight of scientific research evidence that *trans* fat has many negative health effects, the Food and Drug Administration (FDA) is now listing *trans* fat on food labels (USDHHS, 2003a).

FDA Labeling

On July 9, 2003 the FDA published a final rule that required food manufactures to list *trans* fat on the Nutrition Facts Panel. This rule came about from a 1994 petition from the Center for Science in the Public Interest (CSPI) requesting that the FDA take steps to require that *trans* fat be added to nutrition labels (USDHHS & FDA, 2003). The FDA responded to this petition in November, 1999 by issuing a proposed rule to amend current regulations and now require *trans* fat to be listed on nutrition labels. After reviewing comments made by various organizations, both in support and opposition to the rule and also after reviewing scientific evidence, the FDA's final rule required "manufactures of conventional foods and some dietary supplements to list *trans* fat on a separate line, immediately under saturated fat on the nutrition label" (FDA, 2003a, ¶ 2). For purposes of food labeling, the FDA defined TFA's as "the sum of all unsaturated fatty acids that contain one or more isolated double bonds in a trans configuration" (Moss, 2006, p.57). The rule went into effect January 1, 2006 and was the first significant change to the Nutrition Food Panel since it was established in 1993 (USDHHS, 2003b).

As discussed above, while confirming the relationship between *trans* fat intake and increased risk of CHD, no organization or scientific report has provided a reference value for *trans* fat that the FDA believes is sufficient to establish a Daily Reference

Value. Therefore, in the final rule the FDA does not list a % Daily Value (DV) as it does for other nutrients on the panel (USDHHS & FDA, 2003).

The FDA believes that by including *trans* fat information on the Nutrition Food Panel consumers will have additional information to make healthier choices that could potentially lower their intake of *trans* fat (FDA, 2003a). The new labeling requirements are also expected to reduce health care costs for Americans. The FDA estimated that these changes will save between $900 million and $1.8 billion each year in lost productivity, pain and suffering, and medical costs (USDHHS 2003a). Also, 3 years after the rule goes into effect, the FDA expects *trans* fat labeling to prevent from 600-1200 cases of CHD and 200-250 deaths per year (FDA, 2003a).

Others believe labeling alone is not enough to combat the negative health effects brought on by the consumption of *trans* fat. Willett and Ascherio (1994) estimated that approximately 30,000 premature deaths from CHD can be attributed to the consumption of TFAs. The FDA's final rule allows foods with < 0.5 g of *trans* fat per serving to be labeled zero grams on the nutrition panel. This leads to what some are calling "fake zero" foods, and over the course of a day these foods could add considerable amounts of *trans* fat to the diet (Mozaffarian et al., 2006). Mozaffarian and colleagues also assert that the labeling regulations do not apply to the fast food/restaurant industry where a bulk of *trans* fat foods, made from frying and cooking with partially hydrogenated oils, are found.

The FDA allows partially hydrogenated vegetable oil in the U.S. food supply under a category known as GRAS, or "generally regarded as safe," in other words, not causing harm. Willett (2006) argues that the FDA has found TFA to be "more adverse"

than saturated fat when considering CHD risk, thus inflicting considerable harm on the population. The CSPI submitted another petition to the USDA, this time to remove TFA from the GRAS list, and more specifically TFA that comes from partially hydrogenated vegetable oils. Willett (2006) calls the FDA position of allowing TFA in the food supply "indefensible" (p. 71) and accuses the FDA of a failure to act responsibly toward the American people.

The FDA plans further improvements to the Nutrition Food Panel by seeking comments, information, and data in order to establish nutrient content and health claims about *trans* fat. They also pledged to conduct consumer research about how such claims might be received (Moss, 2006).

Although FDA required labeling of *trans* fat is a good first step toward educating consumers about the health risks of *trans* fat, more research need to be done in regard to partially hydrogenated oils remaining on the GRAS list. Also, since health organization recommendation never exceed one percent of total caloric energy, the labeling of foods containing 0.5 grams of *trans* fat or less warrants further discussion as to the safety and efficacy of the current labeling requirement.

Trans Fat Bans

In response to metabolic and epidemiologic studies, warnings from health organizations, and the FDA labeling of *trans* fat, many public health entities, food manufactures, and food establishments are tightening standards and trying to eliminate or reduce *trans* fat from the food supply. One of these public health entities is the Danish Nutrition Council.

Denmark. Thanks to the efforts of the Danish Nutrition Council, Denmark became the first country to impose a ban on the use of *trans* fat. In March 2003, Denmark passed legislation that limits *trans* fat to two percent of total fat in all food sold in the country, including fast food and restaurant food (Executive Order No. 106, 2003). The legislation stems from the Danish Nutrition Council, which was guided by the research evidence that industrially produced *trans* fat is more harmful than saturated fat, and that there is no evidence of any health benefits derived from the intake of industrially produced *trans* fat (Astrup, 2006). The Danish Nutrition Council provided three reports on the adverse health effects of *trans* fat in 1994, 2001, and 2003. In 1994 the Council recommended that industrially produced *trans* fat be removed from the Danish food supply within a few years. In response to this report the margarine industry successfully reduced or eliminated *trans* fat from its products. In 2001 the Council recommended the above legislation which, despite barriers, went into effect on June 1, 2003 (Astrup). The final 2003 report stated that "industrially produced *trans* fatty acids can be eliminated from human nutrients without any adverse effect on taste, price, or availability of foods" (Astrup, 2006, p. 46).

U.S. cities. On December 5, 2006, New York City became the United States' first city to implement a *trans* fat ban at restaurants (New York City Department of Health and Mental Hygiene, 2006). The amendment to the NYC health code gave restaurants 6 months to switch to shortening, margarine, and oil that contain less than 0.5 g of *trans* fat per serving. The New York Board of Health allowed restaurants up to 18 months to replace artificial *trans* fats that are used in cake batters, baking, and deep-frying yeast

dough. The Board of Health also provided technical support for the bakeries and restaurants to help disseminate information about alternatives and train restaurant personnel. Philadelphia also recently passed an ordinance similar to New York City that will rid restaurants of *trans* fat. Philadelphia began enforcing the ordinance September 1, 2007 (Jacobson, 2007).

Corporate trans fat bans. In early 2003 Frito-Lay was the first U.S. food company to remove *trans* fat from snack chips and was also the first company to list *trans* fat on the nutritional panel of its packaging (Frito-Lay, 2002). Frito-Lay reformulated many of their top selling products to reduce or eliminate *trans* fat including Doritos, Cheetos, and Tostitos.

In 2005 Kraft eliminated *trans* fat from most of its products following a 2003 lawsuit instigated by www.bantransfats.com Inc. Www.banstransfats.com Inc sued Kraft for marketing and selling *trans* fat laden Oreo's to kids. After gaining considerable media attention the lawsuit was dropped, but it spurred Kraft to action (www.bantransfats.com). In all, Kraft reformulated over 650 products to reduce and eliminate *trans* fat (Kraft, 2003). Buzzmetrics (2004) asserted that the Oreo lawsuit was the event that carried the *trans* fat issue from policymakers to the consumer and started widespread conversation about the dangers of *trans* fat as well as healthy alternatives.

The next year, Wendy's International Inc. made the switch to non-hydrogenated oils (Wendy's International, 2006).The third largest burger chain in America switched to using a non-hydrogenated blend of corn and soy oil in August of 2006. Wendy's was the first major fast food chain to offer french fries and breaded chicken items with zero

grams *trans* fat per serving. Following suite, after a two year research effort, KFC, based in Louisville, KY, announced in October, 2006 that all their restaurants would replace partially hydrogenated soybean oil with a low linolenic soybean oil by April, 2007, thus making all their fried products *trans* fat free (KFC Corporation, 2006).

The Walt Disney Co.'s domestic park and resort group is also making healthy changes to the food they serve (Jennings, 2006). All of the 180 restaurants and 200 Disney food kiosks are making healthy switches. Disney replaced fries with unsweetened applesauce, baby carrots, and fresh fruit in kids' meals. Milk, juice and water are offered instead of soda. Fries are still available by request and are scheduled to be *trans* fat free by October, 2007. Disney declined to renew a 10-year, $1 billion contract with McDonald's Corp, and officials said Disney would limit the licensing of animated film characters to food products that meet a certain standard of nutrition.

Although many positive changes are occurring, partially hydrogenated oils still have a valid presence in our food supply. Restaurants and other food establishments account of approximately 38% of the partially hydrogenated fats in the American food supply (Joseph, 2003-2008). As the restaurant industry is not managed by the FDA, no restaurants, except in very few cities including New York and Philadelphia, are required to list *trans* fat information.

As seen above, some national food suppliers are making the switch to nonhydrogenated oils, but just as many are not. McDonalds announced in September, 2002 that it was making a change in its cooking oil to a version with less *trans* fat. These changes were to be complete by February, 2003. Due to operational issues encountered

by McDonald's, the oils were not changed (Joseph, 2005). This lead to a lawsuit against McDonalds's with the plaintiffs claiming that it did not take sufficient steps to inform the public that the cooking oil had not been changed. The settlement required McDonald's to donate $7 million to the American Heart Association to be used at their sole discretion for public education regarding *trans* fat. Using these funds, the AHA created "Face the Fats" and interactive health communication website to be discussed in detail later in this literature review.

Consumer Awareness

With new labeling policies, marketing campaigns, *trans* fat bans, and mounting health evidence, research is finding that consumers are becoming more aware of *trans* fat than they have been in the past, though some confusion remains (AHA, 2006; Harris Interactive, 2006a; IFIC, 2007). In 2006 Harris Interactive reported on a survey called "Healthy Eating: Impact on the Consumer Packaged Good Industry." When asked how familiar they were with the impact of *trans* fatty acids on health, only 46% of participants reported being "somewhat" and "very familiar." Of those who were familiar, 79% were "very" or "extremely" concerned that TFAs pose a health hazard. Harris Interactive also found that 24% of people reported the nutrition facts panel as of "greatest importance" when purchasing a food or beverage and 18% cited the ingredients list as being the most important (Harris Interactive).

Also in 2006, the American Heart Association (AHA), in partnership with Cogent Research, conducted a proprietary consumer survey titled "Americans' Awareness,

Knowledge and Behaviors Regarding Fats: Benchmark." The objective of this study was to determine awareness, knowledge, and behavior among Americans regarding *trans* fat as well as other types of fat (AHA 2006, pg 2). The AHA developed a consumer education campaign "Face the Fats" to increase understanding of and influence behaviors related to *trans* fats. This study provided baseline data and helped identify the target audience for the educational campaign. Between March 22 – April 7, 2006, Cogent Research conducted the AHA web-based survey with a sample size of 1,000, weighted to reflect the U.S. population.

The AHA found that 69% of participants are concerned about heart heath. But results show Americans do not understand the relationship between HDL, LDL, and heart disease. Only 17% of participants correctly identify HDL cholesterol level as decreasing the risk of heart disease, and only 27% understand the negative effect of LDL cholesterol levels. As *trans* fat intake negatively effects serum lipoprotein cholesterol levels, it is important for consumers to be educated on how and why these values effect their health. When asked which information related to heart health they look for on food or beverage labels, total fat, sodium content, and total calories topped the list at 58%, 57%, and 56% respectively. Only 46% of participants looked for *trans* fat on food labels. Most consumers were aware of the basic fats and oils, and those who were aware held correct perceptions of the impact these fats and oils have on heart health. AHA found two-thirds of Americans believed *trans,* saturated, and animals fats are unhealthy, and polyunsaturated, monounsaturated, and Omega-3 fats are healthy.

This same study found knowledge of partially hydrogenated oils was low. More than half (52%) of participants did not know that partially hydrogenated oil was associated with *trans* fats. Also, knowledge of food containing *trans* fat was significantly lower than knowledge of foods containing saturated fats. Only 44% of participants could identify any one food containing *trans* fat, with the biggest correct response being doughnuts. Participants also reported more specific behavior changes regarding saturated fat than behavior changes regarding *trans* fat. The participants also believed that products with less saturated fat were healthier than products with more saturated fat, regardless of the amount of *trans* fat the product contained (AHA, 2006).

In 2007 the IFIC, also in conjunction with Cogent Research, conducted the "Food and Health Survey: Consumer Attitudes toward Food, Nutrition & Health." A benchmark survey was conducted in 2006, with the 2007 survey used as a follow-up. This trended research provides the opportunity to see how consumers view their diets, how they view their efforts to improve their diets, and how they view their understanding of the components of their diets. IFIC states that understanding these trends will help health professionals understand what issues are most important to the consumer, and thus be able to develop programs to help consumers make behavioral changes (IFIC, 2007). There were nine areas of inquiry in the 120 question web-based survey, and one area which specifically addressed the issue of dietary fats. A sample size of 1,000 interviews was collected and participants were constructed to reflect the U.S. population on key census characteristics.

The IFIC (2007) reported that 72% of participants were concerned with the type and amount of fat in their diet. Those more likely to be concerned with the amount and type of fat included women, those over the age of 35 years, those with a college degree or higher education, and those who are physically active. Awareness of *trans* fat rose significantly from 81% in 2006 to 87% in 2007. Awareness of partially hydrogenated oils remained stable. But only 23% of participants were aware that *trans* fat occurs naturally in some foods. Participants were also more likely to say they were trying to decrease consumption of saturated fat, *trans* fats, and animal fats in 2007 than in 2006. Just over one half the population (54%) reported trying to decrease *trans* fat consumption in 2006, whereas in 2007, 75% reported trying to limit intake. Segments of the population who reported trying to limit *trans* fat included those older than 25, those with some college education or higher, those concerned about weight, those who are physically active, and those who perceive their diet to be healthful.

More Americans perceive that food products are using more healthful oils than in 2006 (63% vs. 45%). In contrast to the AHA (2006) study, there was some confusion as to what oils are healthy. Of those surveyed, 42% said they were trying to eat fewer polyunsaturated fats, and 38% were cutting back on monounsaturated fats (IFIC, 2007).

These studies affirm that there is sill much work to be done in the area of consumer awareness of *trans* fat. One population that might benefit from *trans* fat education is college-aged individuals.

Health-Related Information on the Internet

Use of the Internet to find health information is increasingly common. Young adults between the ages of 18-25 years are avid internet users. The Pew Research Center (2007) reported that 86% of this age group use the internet, and that number increases with education. Nearly all college graduates in this group use the internet at least occasionally (Pew Research Center). The Pew Research Center called young adults "heavy" consumers of online health related information (The Pew Research Center, 2004).

In looking at a more general population, in 2006, 80% of Americans used the Internet to search for health related information and 51% had been online in the last month looking at health information. Interestingly, only 25% of these users deemed the information they found as "very reliable" (Harris Interactive, 2006b). Woodall, Buller and others (2007) reported more than 350 million Google listings were related to cancer prevention, diet, nutrition, and fruits and vegetables. Also, Madden and Fox (2006) found that one in five Americans who go online in search of health related information said the internet has greatly improved to way they get information about health care.

Escoffery et al. (2005) surveyed 743 undergraduate students at two academic institutions to examine internet use, attitude related to use of Internet to obtain health information, and health-seeking behaviors. Overall 74% of students reported having ever received health related information online and more than 40% reported frequently searching the Internet for health information.

Interactive Health Communication

One way in which some heath organizations and health professionals are trying to improve consumer knowledge of *trans* fat is through the use of interactive health communication (IHC). In 1999 the Science Panel on Interactive Communication and Health (SPICH) convened to better understand IHC and its role in providing health information to the public. SPICH also developed guidance for promoting effective, appropriate assessments. SPICH has defined IHC as:

> The interaction of an individual—consumer, patient, caregiver, or professional—with or through an electronic device or communication technology to access or transmit health information, or to receive or provide guidance and support on a health-related issue. (SPICH, 1999, p. 1).

IHC applications can be found on a wide variety of health topics and range from simple applications designed to communicate a limited amount of health information to very complex clinical decision-support tools. Other applications are designed to influence or change health behaviors. User interactivity can be limited to a one-time use, or stretch to a succession of interactions over a prolonged period of time.

Examples of media that disseminate IHC applications include: the Internet, stand-alone or locally networked computers, dial-in services, cable, satellite and other wireless models, DVDs, CD-ROMs, and peer support chat rooms (SPICH, 1999). Functions of IHC applications include: relaying generalized or individualized health information, enabling informed decision-making, promoting healthy behaviors, promoting peer information exchange, promoting self-care, and managing demand for health services.

IHC applications use technology to further the goals of health communication, and when compared to traditional media, have the potential to improve health (SPICH, 1999). Some of the advantages of interactive media include: broader choices for users, improved access to individualized health information, anonymity of users, greater access to health information, enhanced ability to provide widespread dissemination of information, and ability to immediately update content.

Along with these benefits potential risks have also been identified, especially among those users who may not have the skills to evaluate the relevance or quality of the information they are receiving. Some of these risks include: inappropriate treatment or delays in getting care, damage to the patient-provider relationship, and unintended errors of the application that result in harm.

SPICH (1999) considers extensive evaluation as the key to improving the quality of IHC applications, with the purpose of evaluation being to obtain information that can be used to improve design, implementation, and their overall quality. Evaluating the effectiveness of an IHC application can be divided into five levels: (a) engagement and appeal, (b) learning, (c) behavioral change, (d) impact (i.e., did the changed behavior improve health status?), and (e) return on investment (i.e., do the impacts have more value than the cost of developing and maintaining the application?). SPIHC also recommends six key criteria to help users evaluate the quality of the IHC application they are using: (a) accuracy, (b) appropriateness, (c) usability (d) maintainability, (e) bias, and (f) efficacy.

Bensley and Lewis (2002) used the SPICH criteria to analyze 42 online health assessments. The online health assessments had to be completely online and free to the user in order to be included in analysis. Based on the primary purpose of the assessment, four categories were created; (1) HRA/Life Expectancy, (2) Health Status/Positive Well-Being, (3) Lifestyle Specific, (4) Condition Specific. A 45-item checklist was developed based on SPICH criteria, and both authors independently reviewed each online assessment. The online health assessments were compared in relation to combined scores from the six checklist categories. The highest average score was Health Status/Positive Well-Being category. At least 75% of sites received the maximum score for items relating to sponsors, background of developers, purpose of site, and site design. In contrast, only three of the 42 assessments (7% of all studied sites) received a score in the evaluation checklist category. Also, less than one in five sites received a maximum score for items relating to confidentiality, content issues, and evaluation results and effectiveness.

In the UK, Murray, Kerr, Stevenson, Gore, and Nazareth (2005) conducted a study to better understand why patients use IHC applications and what criteria they use to asses the quality of the application. The researchers recruited a socio-economically, ethnically, and geographically diverse sample of people who had a long-term illness, or who were caring for someone with a long-term illness. Each participant was shown three different IHC applications relevant to their specific disease and then a focus group discussion was held. Participants discussed whether they would use the IHC, when and why they might use it, and the weaknesses and strengths of each of the different

applications. In addition to the discussion group, once participants identified important criteria, a post questionnaire was sent asking participants to rate the criteria and list the three most important criteria to them.

The Murray et al. (2005) found that a good IHC application will provide detailed information about what to expect of the specific condition and treatment, medication, local services and resources, and information about new research as well as ensure that all information is up-to-date. Presentation of the information was also important and participants wanted easy navigation, links to other sites, and explanations of medical terms and jargon. They also wanted a range of interactive components such as: ask an expert, online chat with people with similar health problems, and personalized online assessments. Participants defined a good IHC as being accurate, having no commercial links, and being authored or sponsored by a known trustworthy organization.

In addition to evaluation, effectiveness of IHC applications is also important. Effectiveness of specific applications depends on the purpose of the application. Different purposes might include education, behavior change, or emotional support.

The AHA developed an online heart disease education application entitled "Heart Profilers" to educate patients on treatment options and medications (Foley, Whitney, & Robb, 2007). In an evaluation of the application, researches (Foley et al.) recruited 1,039 participants and 1,564 controls. Researchers asked participants to register with Heart Profilers and to complete the application to receive a free, personalized treatment options report. Users received information regarding success rates of treatments, potential medication side effects, and questions to discuss with their healthcare provider. Foley et

al. found that users were more aware of treatment options than controls. Users also reported a greater understanding of their medications and a tendency to use these medications as prescribed by their doctor.

A study conducted in North Carolina involving participants of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) also analyzed an IHC CD-ROM designed to boost nutritional knowledge and boost knowledge of infant feeding recommendations (Campbell et al., 2004). From two WIC clinics in North Carolina, a total of 307 respondents comprised the study sample. The intervention group completed a baseline survey, received the program titled "Foodsmart", and answered immediate post-program questions. Measures were also obtained in a 1 - 2 month follow-up. The control group completed the surveys, but did not receive the program until after follow-up.

"FoodSmart" had four main components: a full-motion video soap opera, interactive infomercials, tailored dietary feedback based on the baseline assessment questions, and take-home print materials. "FoodSmart" is based on health behavior theories, primarily the Transtheoretical Model, and Social Cognitive Theory (Bandura, 1988; Prochaska & Velicer, 1997).

At baseline, intervention and control groups did not differ in knowledge level for low-fat food choices or infant feeding recommendations. Knowledge level increased in both areas for the intervention group. Self-efficacy was also similar between the intervention and control group at baseline. Immediately post-program, the intervention group significantly improved their self-efficacy for consuming low-fat dairy foods but

there were no significant differences at follow-up between intervention and control groups for any of the dietary behavior assessed in the intervention. A possible explanation for the lack of behavior change could be that while one single "dose" of intervention can enhance knowledge levels, but it is not enough to make or sustain a behavior change (Campbell et al.,, 2004).

Stages of Change and Interactive Health Communication

The purpose behind most IHC applications is to enhance knowledge but to also change behavior. The Transtheoretical Model (TTM) or Stages of Change was developed in 1979 by James Prochaska and Carlo DiClemente to describe and explain different stages common to most behavior change processes in individuals (Prochaska, Redding, & Evers, 2002). The stages of change described by the model are based on the premise that individuals vary with regard to their readiness to change on a particular behavior, ranging from having no interest or motivation to change to have been engaged in change over a period of time. Also, each individual progresses through the stages at different rates, sometimes encountering set backs to earlier stages. Five stages are used to classify position along the readiness to change continuum: precontemplation—people do not intent to take action to change their behavior; contemplation—people intent to change within the next six months; preparation—people intent to change a behavior within the next month; action—making changes to behavior in the last six months; and maintenance—the behavior change has been sustained for more than six months (Prochaska et al.).

The Stages of Change have been applied to many different behavioral applications, many of them nutrition related. This section will focus on Stages of Change applied to nutrition education and health behavior change using IHC applications.

An interesting study was conducted by Bensley et al. in 2006. Participants were 39, 541 WIC patients from seven states who viewed five online modules of wichhealth.org and completed an online survey. Variables measured included stages of change movement, user belief in ability to engage in a particular behavior, and the perception of the usefulness of the site.

Nearly half of users who began any module in the precontemplation stage had advanced to the action stage by the end of the module session. Almost all individuals (98.4%) who entered wichealth.org in the preparation stage ended the module session in the action stage. Post-hoc analysis showed that users who began in the contemplation stages progressed through the greatest number of stages of change (average of 1.63 per user) when compared to preparation and precontemplation (Bensley et al. 2006).

Block and others (2000) developed an interactive CD-ROM designed to not only increase nutritional knowledge of users, but also to produce dietary behavioral changes such as lowering fat in the diet and increasing fruit and vegetable intake. Sponsored by the Food and Nutrition Service of the USDA, the CD-ROM was guided by four principles: (1) flexibility. Participants could choose topics that interested them; (2) screening of participants current dietary habits; (3) messages tailored toward participants readiness for change; and (4) individual goal setting. Participants were classified according to their individual stage of change and then after completing either module the

user was presented with a list of possible goals with the emphasis on small, practical steps that will move the user across the different stages of change.

The average length of time spent viewing the CD-ROM was 12 min (Block et al.). Almost 97% of users said the program was easy to use, 85% approved of the graphics, and 85% thought the program was just the right length, or could be a little longer. Approximately three fourths of participants said they learned something new about nutrition or learned something new about their personal eating habits. About 60% of users stated they had selected a personal goal to try for two week, and of participants who followed up, 50.5% reported following through on their goal, thus effectively moving these individuals to the action stage. The authors concluded that a low-cost IHC intervention, such as the CD-ROM, can be effective in stimulating participants to change dietary behavior (Block et al.).

Interactive Health Communication and *Trans* Fats

Using IHC and Stages of Change may be a useful way to promote dietary behavioral change in regard to *trans* fat intake. The AHA has developed an internet IHC application, and "edutainment" website, to support an educational campaign launched April 10, 2007, and to "teach consumers how to minimize *trans* fat in their diet, while avoiding the unintended health consequence of defaulting to more saturated fat" (AHA, 2007b para. 1). The 3 year "Fact the Fats" campaign is funded by an $8.5 million class action settlement from McDonalds. AHA sued the fast food chain in 2003 after

McDonalds went back on a promise to switch to healthier oils for its french fries (Squires, 2007).

The "edutainment" website features a webisode starring the "Bad Fats Brothers," Sat and Trans, developed to educate consumers regarding the role saturated fat and *trans* fat play in the diet and in which foods they commonly appear. The website features an interactive tool, the "My Fats Translator" which allows individuals to receive personalized daily limits for total fat, saturated fat, and *trans* fat. In addition to the "My Fats Translator" the campaign offers several other elements. "Fats 101" is an educational module to promote understanding and awareness of the different types of fats. "Live Fat-Sensibly" teaches users about healthy alternatives when cooking at home, snacking, eating out, or grocery shopping. Also included is a "Take the Fats Quiz" to test knowledge before or after viewing the website.

"Face the Fats" is the first widely available *trans* fat IHC application and has yet to be evaluated for effectiveness. IHC applications have produced varying results in the past and more research is needed to determine if IHC applications are effective in increasing knowledge and/or increasing participants' readiness for change. An evaluation of "Face the Fats" will yield important information regarding the ability of an IHC application to change *trans* fat knowledge and behavior.

Summary

Previous research has identified the health risks of *trans* fat and many health organizations are recommending limiting *trans* fat intake. IHC applications on a variety

of health-related topics have been developed to inform and encourage behavior change among various populations, although few have been evaluated for effectiveness. AHA's IHC application, "Face the Fats" is part of a high profile, multimillion dollar campaign aimed at raising *trans* fat awareness and ultimately changing *trans* fat intake. Given that it is the first of its kind regarding the subject matter, it is necessary to evaluate its effectiveness.

CHAPTER III

METHODS

Introduction

This chapter will present information regarding procedures used in this study. The research design, sample, instrumentation, data collection, and statistical analyses will be discussed.

Research Design

A one-group, pre-posttest design, using survey methodology, was used to measure the impact of the "Face the Fats" website on the *trans* fat knowledge level and readiness to change *trans* fat behavior of USU college students. The study utilized a non-random convenience sample obtained from 12 Utah State University general education classes. Students were asked to complete a pretest assessing knowledge of *trans* fat. Students then viewed the "Face the Fats" website at their own pace. Immediately after viewing the website students completed a posttest, which was similar to the pretest in content. This design allowed for a comparison of student knowledge both before and after viewing the *trans* fat IHC application.

A one-time, web-based intervention design was chosen to simulate an environment in which college students might go to find information on health-related issues. Harris Interactive (2006b) estimated that 80% of U.S. adults have searched for health-related information online.

Wallen and Fraenkel (2001) consider this research design a weak form of experimental research due to threats to internal validity. However, they note four stipulations that if met, may make the design an appropriate choice. (a) The measured variable should not be one that could have been impacted by other events, or by pretesting. As the pretest, intervention, and posttest will all occur on the same day, it is unlikely that other events will have any significant impact on the measured variable, although pretesting may cause improvement scores as participants seek out answers to survey items while viewing the website. (b) The instrument used in data collection must be free of collector bias and of instrument decay. Testing conditions and survey instrument are standardized, thus eliminating bias and decay. (c) During the intervention the researcher should either be completely detached or completely integrated to the treatment process. This researcher was completely detached from the process, as participants completed surveys and viewed the intervention online. (d) Subjects should not be selected based on any pretesting. Participants in this study were self-selected with no other criteria than being enrolled as a student at Utah State and being 18-25 years old. This research meets the recommendations set by Wallen and Fraenkel, making the one-group, pre-posttest research design an acceptable choice.

Sample

A target population of Utah State University students was identified. Using a sample of convenience, students were recruited from 12 lower-level general courses during Spring Semester 2008. Although not required, the researcher requested that

professors offer extra credit to students participating in this study. Professors from five classes agreed to offer extra credit to those students who completed all aspects of the study. Participants printed the last page of the posttest to verify completion of the study to professors. Data were collected from the following undergraduate courses: two Sociology 1010 courses, two Accounting 2010 courses, two Family, Child, and Human Development 1010 courses, two Psychology 1010 courses, Family, Child and Human Development 1500, Biology 1010, and two Utah State University 1350 courses. The researcher also offered $100 cash prize drawing to those participants who completed all aspects of the study. A web link was provided to submit name and email address for the cash drawing. The link did not match personal identifiers with survey answers. A simple announcement of research objectives, instructions, and incentives to participate were made in each of the classes. Participating students were given a time frame of three days in which to complete the study. To be included in the study, participants had to be enrolled in a college course at Utah State University and be between the ages of 18-25 years.

A power analysis was conducted to determine an appropriate sample size for the study. Results showed a sample size of 70 would yield 80% power, with alpha being set at 0.05. Effect size was calculated between 0.5 and 0.73, which Cohen (1988) roughly defines as a medium effect size. A sample size of 100 would yield an effect size between 0.5 and 0.69, which would also be a medium effect size. This was determined by the thesis committee to be an acceptable sample size.

Instrumentation

As there have been no preexisting surveys created to specifically assess the *trans* fat knowledge level of college students, instrument development was necessary for this study. Both the pretest (Appendix A) and posttest (Appendix B) surveys were created by compiling items that (a) tested the fat knowledge of participants regarding material found on the 'Face the Fats" website; (b) evaluated the website and determine viewing time; (c) assessed behavioral readiness to change regarding consumption of *trans* fat; and (d) gathered demographic information (see Table 1). The pretest included demographic items, and the posttest included website evaluation items. Otherwise, the two tests were identical. Some items were created by the researcher after reviewing the website modules and other items were adopted from the AHAs proprietary study, "Americans' Awareness, Knowledge and Behaviors Regarding Fats: Benchmark" (2006). (Permission obtained via personal communication from Shirley Yin-Piazza, Senior Project Manager of the *Trans* Fat Initiative June 15, 2007; Appendix C) (Table 1).

The surveys were created using "SurveyMonkey," an online survey tool that allows for quick and easy survey design (www.surveymonkey.com). SurveyMonkey was also used to deliver the surveys to participants and collect results via the internet.

Table 1

Origin of Survey Items

Item Origin	Item Number
"Americans' Awareness, Knowledge and Behaviors Regarding Fats: Benchmark"	4, 5, 6, 7, 8, 12, 13, 14, 21, 22 (Numbers are the same on both the pretest and posttest)
Researcher	1, 2, 3, 9, 10, 11, 15, 16, 17, 18, 19, 20, 23, 24, 25, 26, 27 (Numbers are the same on both the pretest and the posttest) 28-32 pretest 28-32 posttest

The student researcher, thesis committee chair Phillip Waite, Ph.D., and committee members Julie Gast, Ph.D., and Mary Doty, Ph.D. conducted a critical review of the survey. The survey was reviewed for content and face validity. Based on critical review results, minor adjustments were made to the surveys. A pilot study of the survey and procedures were conducted once IRB approval was obtained. Information packets were passed out to 25 students and enrolled in HEP 2000: Health and Wellness, an undergraduate personal health course. Students were offered extra credit for their participation, and given three days to complete the study. Data were analyzed for problems and it was determined that no major changes were needed before implementation of the full study.

Item Description and Scoring

In order to successfully answer all research questions, the survey instruments included four types of items: multiple choice items, items using a Likert-type scale, open-ended items, and demographic items. Multiple choice items were used to determine participant knowledge level of *trans* fat and to assess any intent to change behavior. Some multiple choice items (8, 12) have more than one correct answer depending on the correct responses available on the individual item. Other multiple choice items (9, 10, 11, 15, 16, 17, 18, 19, and 24) have only one correct answer resulting in either a correct or incorrect answer. These items were scored by giving a score of 1 for correct answers and a score of 0 for incorrect answers. The scores for those items were summed in order to obtain subscale scores. Three subscales were created: *trans* fat facts, food labels, and healthy alternatives. Subscales and scoring procedures are outlined under each individual research question in the results section. Items using a 5-point Likert-scale (3, 22, 28, 29, and 30) were used to assess participants' perceptions of their *trans* fat knowledge level, determine feelings and attitudes of participants toward heart health and to evaluate feelings and attitudes toward the "Face the Fats" website. Explanation of Likert-scale scoring is discussed in detail in the results section. Open-ended items were used to determine knowledge of specific food items that contain *trans* fat and saturated fat. Open-ended items were also used to obtain feedback as to possible website improvements (Appendices A & B).

Data Collection Procedures

Approval for the study was obtained from Utah State University Internal Review Board on February 20, 2008 (Appendix D). Since this study presented minimal risk to the students and no personal identifiers were collected by this researcher, a letter of information (LOI) (Appendix E) was provided to the students as part of an instruction packet. The LOI contained printed information regarding the purpose of the study, inclusion criteria, potential benefits of the study, and contact information for the researchers. Directions on how to access the online surveys were also included in the packet. After first completing the pretest the students were asked to view specific modules of "Face the Fats" including "Fats 101," "My Fats Translator," "Live Fat-Sensibly," and "The Bad Fats Brothers" (Table 2).

Table 2

"Face the Fats" Modules and Content

Module Title	Information Addressed
Fats 101	Basic Information on different types of fat.
My Fats Translator	Interactive tool designed to provide individualized recommendations on daily caloric needs, recommended range for total fats, and limits for saturated and *trans fats*.
Live Fat Sensibly	Tips for reading a food label and tips for healthy shopping, snacking and eating out. Also included in this section are fat-sensible substitutions.
Bad Fats Brothers	Webisode focusing on saturated fats and *trans* fat. Also features "Meet Sat" and "Meet Trans", designed to help viewers identify foods containing saturated and *trans* fat.

Students viewed the website at their own pace and then completed the posttest. No time limit was given in order to simulate a true to life viewing situation, but the participants were asked to record viewing time in the posttest for analytical purposes. They were asked to record a start time in the pretest, and a stop time in the posttest. The LOI also included a unique survey number to be entered online in the pretest and posttest to pair up the data for each participant.

Data collection began on February 21, 2008. The first 10 paired surveys, which comprised the pilot data set, were collected between February 21, 2008 and February 27, 2008. The remaining surveys were collected between February 27, 2008 and March 6, 2008.

Statistical Analysis

Data were analyzed using Microsoft Excel. Descriptive statistics were computed and paired sample *t*-tests were used to compare knowledge level changes on multiple choice items. Paired sample *t* tests were also used to test for differences in responses for all Likert-scale type items. A Pearson correlation coefficient was calculated to assess the relationship between knowledge level change and amount of time spent viewing the website. A chi-square test was used to assess participants' readiness to change *trans* fat behavior (Table 3).

Table 3

Study Research Questions, Corresponding Survey Items, and Statistical Analysis

Research Questions	Survey Item	Statistical Analysis
1. Does participants' ability to identify health risks associated with *trans* fat and saturated fat change as a result of the completion of the "Face the Fats" web application?	4, 5, 6	Paired sample *t*-tests on item scores
2. Does participants' ability to identify foods containing *trans* fat and saturated fat change as a result of the completion of the "Face the Fats" web application?	7, 8, 12, 13	Paired sample *t*-tests on item scores
3. Is the AHAs "Face the Fats" website effective in changing participants' basic knowledge of general *trans* fat facts?	9, 10, 11, 15, 16, 17, 18, 19, 24	Paired sample *t*-test on *trans fat facts* subscale score
	3	Paired sample *t*-test
4. Are participants more ready to make dietary changes after viewing "Face the Fats"?	2, 14	Chi-square test
5. Does participants' knowledge of *trans* fat nutritional information on food labels change as a result of the	20, 21, 23	Paired sample *t*-test on *food labels* subscale score

completion of the "Face the Fats" web application?		
6. Does *trans* fat nutrition information impact participants' decision to purchase/consume food?	22	Paired Sample *t*-test
7. Is there a relationship between the amount of time spent viewing the website and knowledge level change?	28 (Posttest only)	Pearson's Correlation Coefficient
8. Does participants' ability to identify healthy alternatives to *trans* fat change as a result of the completion of the "Face the Fats" web application?	25, 26, 27	Paired sample *t*-test on *healthy alternatives* subscale score

Summary

The purpose of this chapter was to define the methods that will be used to carry out this research study. Included are the research design, sample, data collection procedures, instrumentation, and statistical analysis. Chapter IV will detail results of each research question presented in the study.

CHAPTER IV

RESULTS

Introduction

In order to evaluate the short-term educational and behavioral impact of the American Heart Association's, "Face the Fats" web application has upon college students; a study involving 162 Utah State University undergraduate students was conducted. After inspecting the data for errors or discrepancies, 41 respondent's surveys were not included in the analysis. There were 28 participants who completed a pretest but did not complete a posttest, five participants with incomplete surveys, and 13 participants who did not meet the age requirement, leaving 116 paired surveys to be included in the final analysis. Also, survey item 14 was not included for analysis because of a miss-wording on the posttest, which made analysis impossible.

Sample Characteristics

This study included 116 participants. Of these participants, two chose not to disclose demographic information. Six participants (31%) were male and 80 (69%) were female, which according to the Utah State University Office of Accreditation (Enrollment Summary,2008), did not correspond with the USU population of male to female students (53% to 47%). Participants who attend school full-time made up 111 participants (96%) in the sample, with 5 (4%) participants being part-time students. USU reports 77% of students as full time and 23% as part-time. Most participants were of Caucasian/non-

Hispanic descent, 105 (89%), closely matching USU data. About 85% of USU students identify with this ethnic status.

One study question also asked participants to classify the healthfulness of their diet. Using a scale of one to five, with one being "extremely unhealthful" and five being "extremely healthful," 58 (49%) participants rated their diet as a three. Table 4 provides a detailed comparison between the study sample and USU student population.

Table 4
Demographic Comparison of Sample and USU Population

	Sample		Population	
Characteristics	Frequency	Percentage	Frequency	Percentage
Gender	116	100	13650	100
Male	36	31	6370	53
Female	80	69	5682	47
Age	116	100	13650	100
18	21	18	-	-
19	30	25	-	-
20	16	17	-	-
21	16	13	-	-
22	13	11		-
23	9	7	-	-
24	5	4	-	-

25	5	5	-	-
Enrollment Status	116	100	13650	100
Full-Time	111	96	13650	77
Part-Time	5	4	3139	23
Marital Status	116	100.0	-	-
Single, never married	96	84	-	-
Married	15	13	-	-
Divorced	2	1	-	-
Living with Partner	3	2	-	-
Race	116	100.0	13650	100.0
Caucasian (White)	105	91	12,323	86
Asian/Pacific Islander	5	4	191	1
African American	3	3	86	<1.0
Other	2	2	-	-
Ethnicity	116	100	13650	100
Hispanic/Latino	4	4	273	2
Non-Hispanic/Non-Latino	112	96	11739	86

Research Question 1: Does participants' ability to identify health risks associated with *trans* fat and saturated fat change as a result of the completion of the "Face the Fats" web application?

To address this research question, data were collected on three survey items (4, 5, and 6) that addressed participant knowledge on the effects of different fats on overall heart health, HDL cholesterol, and LDL cholesterol. Item 4 asked participants to assess how different fats affect the risk of developing heart disease. Nine different fats were listed, and participants chose between "increase risk of heart disease," "decrease risk of heart disease," "has no effect on risk," or "don't know." Scores for this item had a potential range of 0 – 9 with a score of representing nine correct answers. The pretest and posttest mean scores and standard deviations are listed in Table 5. Results of the paired samples *t*-test indicated that scores did improve and that the change was statistically significant (t = -7.535, p = < .000). Item 5 asked about the effect of monounsaturated, polyunsaturated, saturated, and *trans* fats on HDL cholesterol. Participants selected the correct answer from a list of possible choices including "increase," "decrease," "no effect," and "don't know." Scores for this item had a potential range of 0 - 4 with a score of 4 representing four correct answers. Paired t-test results indicated a statistically significant positive change from the pretest to posttest (t = -5.47, p = <.000) (See Table 5). The last health risk item, item 6, asked participants about the effect of different fats on LDL cholesterol. Types of fat and multiple choice options were the same as on item 5. A paired sample *t*-test showed a statistically significant and positive change from pretest to posttest (t = -6.389, p < .000).

Table 5

Knowledge of Risk of Heart Disease from Different Fats

Health risk factors	*N* (valid cases)	Pretest Mean/SD % correct	Posttest Mean/SD % correct
Risk of heart disease from different kinds of fats (item 4)	116	5.43/1.84 60	6.83/1.49 75*
Effect of different fats on HDL cholesterol (item 5)	116	2.5/1.6 64	3.4/1.1 86*
Effect of different fats on LDL cholesterol (item 6)	116	2.5/1.4 63	3.4/1.04 87*

*$p < .05$

Research Question 2: Does participants' ability to identify foods containing *trans* fat and saturated fat change as a result of the completion of the "Face the Fats" web application?

Four survey items addressed this research question; two addressing saturated fat (7, 8), and two addressing *trans* fat (12, 13). Unaided, participants were asked to list three

sources of saturated fat (item 7). Scores had a potential range of 0 – 3 with a score of 3 representing three correct answers. The mean pretest score for the number of correct saturated fat sources participants could list unaided was 2.2 correct sources, and the mean posttest score was 2.8 correct sources. When completing a paired sample *t* test, the result was significant ($t = -6.389$, $p < .000$). When asked to name three sources of *trans* fat unaided (item 12), the mean pretest score for number of correct *trans* fat sources was 1.3. The mean posttest score increased to 2.5, which also yielded a significant result ($t = -9.299$, $p < .000$) (Table 6).

Next, participants were asked to check sources of saturated fat (item 8) from a list of 17 foods. There were nine correct food choices, and the pretest mean was 6.9 correct answers. The posttest mean decreased to 5.3 correct sources and a paired *t* test indicated that this was a significant decrease ($t = 7.01$, $p < .000$). Finally, participants were asked to check sources of *trans* fat from the same list of 17 foods (item 8). There were eight correct food choices and the pretest mean was 4.9. The posttest mean increased to 5.3 correct answers (Table 6) and a paired *t* test showed this to be a statistically significant increase in the means ($t = -2.42$, $p = .009$). Results of individual food sources for items 8 and 13 are listed in Tables 7 and 8.

Table 6

Food sources of saturated and trans fat

Awareness of saturated and *trans* fat in food	N (valid cases)	Pretest Mean/SD	Posttest Mean/SD % correct
Unaided sources of saturated fats (item 7)	116	2.2/1.23	2.8/0.87*
Listed sources of saturated fat (item 8)	116	6.9/2.07	5.3/2.23*
Unaided sources of *trans* fat	116	1.3/1.22	2.5/0.87*
Listed sources of *trans* fat	116	4.9/2.2	5.3/3.3*

*p < .05

Table 7

Awareness of Saturated Fat Sources

Sources of saturated fat	% aware on pretest	% aware on posttest
[b]Vegetable shortening	73	47
[a]Butter	89	93
Hard Margarine	72	69
Soft tub margarine	67	38
[a]Fatty beef	79	91
[b]French Fries	80	63
[a]Whole Milk	58	78

Chicken	47	44
Cookies	72	55
[b]Pastries	72	49
Crackers	24	34
[b]Lard	89	86
Fruit juice	10	6
Vegetables	6	2
Fruit	4	2
[b]Doughnuts	77	51
None of these	0	0

Note. [a] indicates food sources with high amounts of saturated fat.

[b] indicates food sources containing both *trans* and saturated fat.

Table 8

Awareness of trans fat sources

Sources of *trans* fat	% aware on pretest	% aware on posttest
[b]Vegetable shortening	54	51
Butter	56	51
[a]Hard Margarine	62	60
Soft tub margarine	54	39
Fatty beef	46	38
[b]French Fries	78	87
Whole Milk	26	28
Chicken	26	22
[a]Cookies	63	79

bPastries	67	88
[a]Crackers	38	54
[b]Lard	53	42
Fruit juice	9	9
Vegetables	7	2
Fruit	7	2
[b]Doughnuts	72	90
None of these	2	<1

[a] indicates food sources with high amounts of *trans* fats

[b] indicates food sources containing both *trans* and saturated fat.

Research Question 3: Is the AHA's "Face the Fats" website effective in changing participants' basic knowledge of general *trans* fat facts?

Nine survey items recorded information about general *trans* fat facts (9, 10, 11, 15, 16, 17, 18, 19, 24). Responses to items were scored by giving a score of 1 for correct answers and a score of 0 for incorrect answers. The scores for the 9 items were summed in order to obtain a *trans* fat facts subscale score with a possible range of 0 – 9, with 0 indicating no correct answers, and 9 indicating all multiple choice items correctly answered. Participants identified a mean of 4.4 (SD = 1.45) correct answers at the pretest and a mean of 7 (SD = 1.91) correct answers at the posttest. A paired t-test indicated that the positive change was statistically significant (t = -12.403, p = < .000).

Another survey item (3) asked participants to rate their knowledge of *trans* fat on a scale of one to five, with 1 = "not at all knowledgeable" and 5 = "extremely

knowledgeable." The mean pretest score was 2.25(*SD* = 0.89) and after viewing "Face the Fats" the posttest mean rose to 3.4 (*SD* = 0.88). A paired sample t-test was performed to asses if the difference between the pretest and posttest means was significant and results of that test showed a statistically significant increase in the means (*t*= -11.878, *p* < .000).

Table 9

Basic Trans Fat Facts

Basic *trans* fat facts	*N* (Valid cases)	% correct on pretest	% correct on posttest
AHA limits saturated fat to 7% of daily calories	116	33	76*
AHA recommends mono and polyunsaturated fats	116	73	95*
Partially hydrogenated oils are related to *trans* fat	116	26	70*
AHA limits *trans* fat to less than 2% of daily calories	116	22	65*
Based on 2,000 calorie diet, that is 2 grams *trans* fat/day	116	41	72*
Food manufacturers use *trans* fat because it is cheap and has a long shelf life	116	72	85*
Foods labeled "*trans* fat free" are not always healthy	116	96	97
Trans fat occurs	116	57	76*

naturally in small amounts in some foods			
All fats are equally high in calories	116	19	66*

*p <.05

Research Question 4: Are participant's more ready to make dietary changes regarding *trans* fat intake after viewing "Face the Fats"?

Research Question 4 reflects the notion of readiness to change as articulated in the Stages of Change theory (Prochaska & Velicer, 1997). Participants were asked if they were seriously considering reducing *trans* fat intake and given three responses to choose from: within 30 days, six months, or not thinking of changing this behavior (item 2). On the pretest, 46% of participants said they were not thinking of changing any behavior related to *trans* fat intake while 41% stated they were thinking of a behavior change in the next 30 days, and 13% within the next six months. Posttest results showed 66% of participants seriously thinking of reducing *trans* fat intake in the next 30 days. Nineteen percent were thinking of making a change in the next six months, and only 15% said they were not thinking of changing any behavior. Results of a chi-square test indicated a statistically significant difference in the frequencies of the three responses ($X^2 = 27.86$, $p = < .000$).

Table 10

Dietary Behavior Change Regarding Trans Fat Intake

Intended dietary changes	Frequency/Percentage on Pretest	Frequency/Percentage on posttest	*N* (Valid cases)
Within 30 days	47/41	77/66	116
Within 6 months	15/13	22/19	116
Not thinking of any change	54/46	17/15	116

Research Question 5: Does participants' knowledge of *trans* fat nutritional information on food labels change as a result of the completion of the "Face the Fats" web application?

To gather data on participants' knowledge of *trans* fat nutritional information on food labels, three items were included on the surveys (20, 21, 23). These items included information about where to find *trans* fat information on a food label, FDA labeling policy, and the labeling of "0 grams *trans* fat" food items. A food labels subscale was

created with a possible score range of 0 – 3, with a score of 0 indicating that the participant selected no correct answers, and 3 indicating that the participant correctly answered all three multiple choice items. Participants obtained a mean score of 2 (*SD* = 0.7) correct answers at the pretest and a score of 2.3 (*SD* = 0.79) at the posttest. A paired t-test indicated that the positive change was statistically significant ($t = -3.92$, $p < .000$).

Research Question 6: Does *trans* fat nutrition information impact participants' decision to purchase/consume food?

Participants were asked to rate on a scale of one to five, with one being "no impact" and five being "a great deal of impact", the impact that *trans* fat information on food labels had on their decision to purchase or consume food (item 22). Participants obtained a mean score of 2.6 (*SD* = 1.2) at the pretest and a mean score of 3.2 (*SD* = 1.17) at the posttest. Results of a paired t-test test indicated that the positive change was a statistically significant one ($t = -5.09$, $p = < .000$). Table 11 shows the percent of participants who selected each category.

Table 11

Impact of Trans FatInformation on Decision to Consume/Purchase Food

Impact of *trans* fat information on food labels	% Pretest	% Posttest
1= "no impact"	20.7	10
2	28.4	19.9
3	25	25
4	19	32.9
5 = "a great deal of impact"	7	12

Research Question 7: Is there a relationship between the amount of time spent viewing the website and knowledge level change?

To answer this research question, the nine item *trans* fat general knowledge subscale was used and a difference score from pretest to posttest was calculated. Another posttest survey item asked participants how much time, in minutes; they spent viewing the website (28).

Next, data were plotted on a scatterplot graph and a linear fit to the data was created. The relationship between time spent on website and knowledge level change was positive (r = .454) and of medium size (Cohen, 1988).

Participants were allowed to view the website at their own pace, spending as much or as little time as they liked in order to simulate a true to life viewing situation. Times ranged from 5 - 100 min, with the average viewing time being 43 min. When a linear fit to the data was created, it was found that for every 10 minutes spent viewing the website, the final score improved 5%.

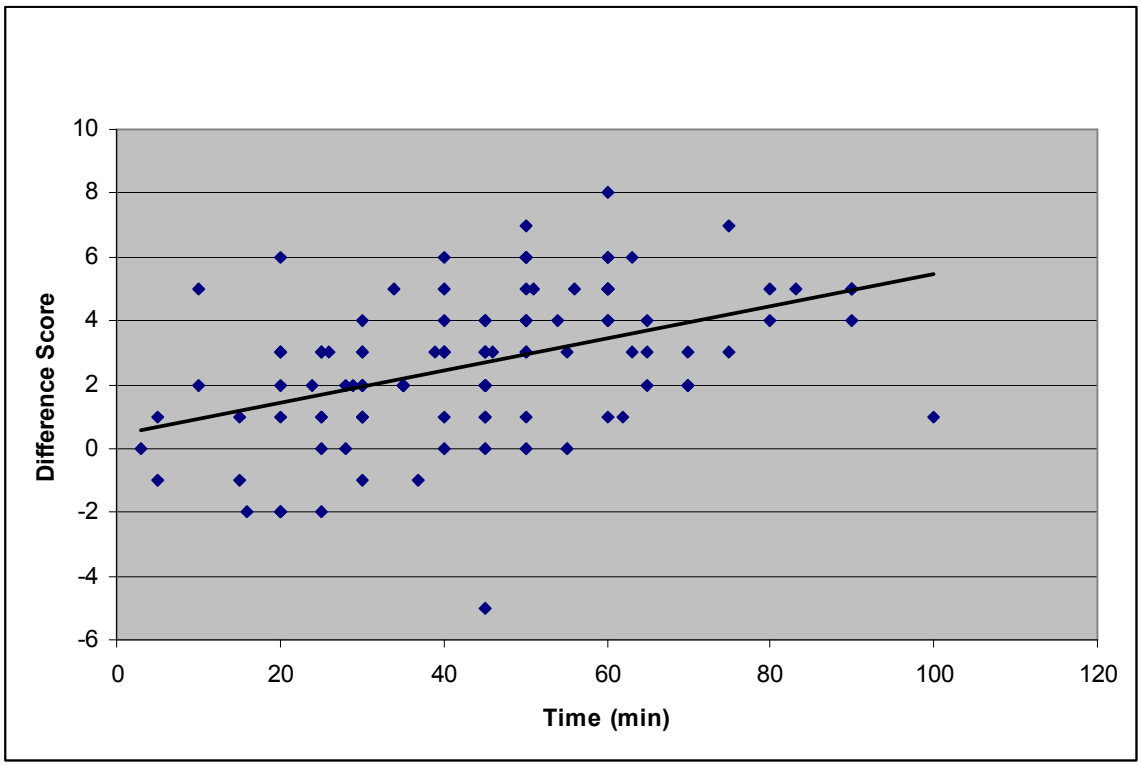

Figure 1. Correlation of time spent viewing website and difference score from pre- to posttest.

Research Question 8: Does participants' ability to identify healthy alternatives to *trans* fat change as a result of the completion of the "Face the Fats" web application?

There were three items (25, 26, 27) on the surveys pertaining to healthy alternatives to *trans* fat. Participants were asked to select a good alternative to cooking with butter or solid stick margarine, identify healthy alternatives to frying, and choose a fast food item with the least amount of saturated and *trans* fat. A healthy alternatives subscale was created from these items with a possible range of 0 - 3 with 0 indicating the participant selected no correct answers, and 3 indicating the participant correctly answered all three multiple choice items. Participants obtained a mean pretest score of 2 (*SD* = .7) and a mean posttest score of 2.3 (*SD* = .79). A paired sample *t* test was conducted and the results indicated that the increase in the mean was statistically significant. (t =-3.91, p = < .000). Individual healthy alternatives item results are provided in Table 12.

Table 12

Healthy Alternatives to Trans Fat

Healthy alternatives to *trans* fat	% correct on pretest	% correct on posttest
Trans fat information on a food package	40	57
FDA labeling requirement on nutrition facts panel	69	82
"0 grams *trans* fat" labeling	90	93

Summary

Statistical analysis of the data revealed that "Face the Fats" was successful in changing the general *trans* fat knowledge of participants ($p = < .000$). Results also showed that participants' knowledge of health risks associated with different types of fat increased ($p = < .000$). Knowledge of *trans* fat nutritional information on food labels also significantly increased ($p = < .000$) and participants were more able to name foods containing *trans* fat, although some confusion remained among foods that contained both saturated and *trans* fat. Using a chi-square test, it was found that participants were more likely to state they were seriously considering reducing *trans* fat intake within the next 30 days after viewing "Face the Fats" ($p = < .000$). Results of a paired sample t-test also

showed an increase in the impact that *trans* fat information had on participants' decision to purchase and consume food ($p = < .000$).

CHAPTER V

DISCUSSION

Introduction

This study was designed to examine an IHC application's impact on improving knowledge and moving consumers through early stages of change. *Trans* fat Internet education is still in its infancy and to date no other similar research has been done. This chapter discusses the results of the current study, examines how these results relate to other IHC evaluation studies reported in the literature, suggests possible implications for health education and makes recommendations for further research in the area.

Demographic Influences of the Sample

The demographic makeup of the participants in this study may have had a considerable impact upon the results of this study. Firstly, 69% of the participants were female and secondly, all participants had at least some college education. Both of these characteristics have interesting implications on the findings of this study and how they might relate to the general population.

Women and Nutrition

It has often been found in health research that women and men have significantly different eating habits, and different attitudes about nutrition (Fox, 2006; FDA, 2008). In the "Health and Diet Survey" the FDA (2008) reports that women were more likely than men to be of the opinion that nutrition is very important while food shopping (70% vs.

54%). Women were also more likely than men to have heard of the Dietary Guidelines, the Five-a-Day program, and the MyPyramid Program. More women than men contended that they had been making healthier choices than they were six months ago. Women also reported eating the recommended five servings of fruits and vegetables more often than men (4.3 days/weekk vs. 3.6 days/week). Of importance to this study was the FDA finding that 58% of women had tried to avoid *trans* fats, whereas only 44% of their male counterparts reported trying to avoid *trans* fats. Results of this study showed that even before viewing "Face the Fats" almost 50% of participants were seriously considering reducing *trans* fat intake in the next 30 days. It could be that because a majority of participants were female they were more aware of *trans* fat and more likely to be ready to make a change than a sample of equal gender representation.

One reason for the disparities in nutritional attitude, behaviors, and knowledge between women and men could include the fact that more college women are trying to lose weight than men (Davy, Benes & Driskell, 2006). In polling students at the University of Nebraska, results showed that 1/3 of college women have dieted compared with 1/5 of college men. A huge portion, 83%, was not pleased with the results of the diets they had tried. If current diets are not getting desired results, it could be that women are very open to learning about and trying new nutrition behaviors and would be more willing to view an IHC application such as "Face the Fats."

Because women are more likely to identify nutrition as important and are also more likely to adopt healthy nutrition behaviors, results of this survey, where participants

were predominately female, may be skewed when compared to a population with equal gender representation.

Another interesting finding came from the Pew Internet and American Life Project (2006). Lead by Associate Director Susannah Fox, the study found that 82% of online women were "health seekers." A health seeker was defined as "Internet users who search online for information on health topics, whether they are acting as consumers, caregivers, or e-patients" (Fox, 2006, p. 1). Also, this study found 53% of women have looked online for information regarding diet and nutrition, compared to 45% of men.

The current study also noted some differences between the level of knowledge obtained by men and women. Using the *Trans* Fat General Knowledge subscale, the scale used in Research Question 3, it was found that the average male posttest score for correct answers was 6.6 (with a possible nine correct answers). Female participants scored higher than their male counterparts, with an average of 7.2 correct answers.

More women than men turn to the Internet as a source of health information. Participants for this study were self selected and because "Face the Fats" is an online educational tool perhaps it appealed to women more than it appealed to men, accounting for some of the discrepancy in the gender of participants.

Education level

Like gender, education level is often associated with nutritional attitudes and behaviors. The FDA (2008) reported that Americans with at least some college education are more likely to say that nutrition is very important to them while food shopping. Americans with at least some college education are also more likely to say that they are

actively trying to eat a healthy diet. Since all our participants were enrolled in at least one college course they may have been more interested in being educated on a nutritional topic therefore spending more time on the website than would the general population.

Also, the FDA reported that 61% of those with at least some college education have attempted to reduce *trans* fat intake in the last 30 days. This could mean that the current study population had already had exposure to *trans* fat information and were more well informed of the health risks of consuming *trans* fat than a population with a lesser degree of education.

Education also seems to play a role in people who go to the Internet for health information. The Pew Internet and American Life Project (2006) stated that 80% of Internet users with some college education and 89% of Internet users with a college degree have looked online for health information. Because "Face the Fats" is an online application and all college students have access to campus computer labs this population might have had an easier time accessing the information. They also may have already been familiar with how to find nutritional information on the Internet, therefore having an easier time navigating through the different web modules and making sense of the information presented.

Trans Fat Knowledge

Health Risks

The first research question in the current study addressed participants' ability to identify health risks associated with *trans* fat and saturated fat (Items 4, 5, 6). Item 4

asked participants about the effect of different types of fat on the risk of heart disease. The AHA consumer study (2006) found that two thirds of Americans understood the unhealthy nature of *trans* fat, but Harris Interactive (2006a) found that only 46% of people were familiar with the impact of *trans* fat on health. Pretest results for the current study showed that 81% of participants could correctly identify that *trans* fat increases the risk of heart disease. The discrepancy between the AHA finding and that of the current study may have been impacted by the effects of gender and education that dominated this sample. Because this sample was mostly female, and all participants had at least some college education, it could be that this sample was already more informed about the impact of *trans* fat on health. After viewing the "Face the Fats website," the posttest number rose to 97%. This significant increase suggests that "Face the Fats" may be effective in the very short term at teaching viewers the health risks of *trans* fat. This is important because an understanding of health risks that ultimately result in consumers cutting back their *trans* fat intake could result in a reduction in the risk of developing heart disease. The significant increase in knowledge about the unhealthy nature of *trans* fat could also be due to the fact that this intervention was online. Pew also reported that as of August 2006 70% of American adults has internet access. As the base of the internet population broadens, it is likely that IHC health applications will be more appealing than traditional educational methods.

The AHA consumer study (2006) also found that Americans do not understand the relationship of HDL, LDL, and heart disease. Only 17% of AHA study participants correctly identified HDL cholesterol levels as decreasing risk of heart disease, and 27%

correctly identified LDL cholesterol levels as increasing risk of heart disease. The current study asked participants specifically how monounsaturated, polyunsaturated, *trans,* and saturated fats effect HDL and LDL cholesterol levels. At the pretest, about 63% of participants correctly identified monounsaturated and polyunsaturated fats as increasing HDL levels and saturated and *trans* fat at decreasing HDL levels. Pretest results also showed about 50% of participants could correctly identify monounsaturated and polyunsaturated fats as decreasing LDL levels, and 67% and 77%, respectively, understood that saturated and *trans* fat increased LDL levels. These percentages are much higher than reported by the AHA, and after viewing "Face the Fats" these numbers increased even more. Posttest results showed about 85% of participant understanding the relationship of fat to HDL cholesterol, about 80% understanding the relationship of monounsaturated and polyunsaturated to LDL cholesterol, and 90% understanding the relationship of saturated and *trans* fat to LDL cholesterol. Over the past few years there has been an increased effort made by the FDA (through food labeling), certain food companies (though eliminating hydrogenated oils in their food products), and public health organizations (such as the AHA's "Face the Fats" website) to increase awareness of "good" and "bad" fats. It could be that through a culmination of these efforts, the public is more aware of specific fats and their effect on HDL and LDL cholesterol levels than in 2006 when the AHA conducted their benchmark study.

One interesting finding was that even after viewing the website only about half of participants could correctly identify vegetable oil as a healthy fat that decreases the risk of heart disease. This indicates that more time may need to be spent educating consumers

about the good types of fat instead of mostly tailoring the educational experiences toward the bad types of fat. In May 2008, after the completion of this study, the AHA added "the Better Fats Sisters" as part of the "Face the Fat" campaign. Additional studies are needed to see if this important addition will better educate viewers about the healthier fats, monounsaturated and polyunsaturated.

Saturated and Trans Fat

One of the goals of "Face the Fats" is to help consumers minimize *trans* fats in their diet, while avoiding the health consequence of defaulting to eating more saturated fats. This research question focused on the ability of consumers to identify foods containing saturated fat and foods containing trans fat. The AHA consumer study (2006) found that less than half of participants could identify any one food as typically containing *trans* fat. In the current study, after viewing "Face the Fats," participants could name more correct sources of saturated (2.3 on pretest and 2.8 on posttest) and *trans* fat (1.3 on pretest and 2.5 on posttest) than they could on the pretest. The website was successful in increasing participant knowledge of individual sources of saturated and *trans* fat. This is important because individuals must be able to accurately identify sources of saturated and *trans* fat in order to make healthy food choices and ultimately change their behavior regarding intake of *trans* and saturated fat. The "Bad Fats Brothers" webisode focused on teaching consumers exactly what foods contain saturated fats and what foods contain *trans* fat. This fun, easy to follow feature is likely the reason for the significant increase in knowledge of saturated and *trans* fat sources.

Possibly the most interesting posttest finding was the decreased ability of participants to identify saturated fat in foods that contain both saturated AND *trans* fat: cookies, doughnuts, pastries, vegetable shortening, french fries, decreased (see Table 7). For example, on the pretest 77% of participants identified doughnuts as having saturated fat, and then on a later survey item, 72% identified doughnuts as having *trans* fat, both of which are true statements. Posttest results showed that 90% of participants identified doughnuts as having *trans* fat, but only 51% of participants identified doughnuts as a source of saturated fat. The same held true for the other food items containing both saturated and *trans* fat (cookies, pastries, vegetable shortening, french fries) (See Tables 7 & 8).While the number of people who thought these items had *trans* fat increased, the number of people who thought these items had saturated fat actually decreased.

This result implies that the IHC application taught participants to distinguish foods containing saturated fats and those containing *trans* fat, but was not successful in teaching viewers that there are some foods that contain both types of bad fat. Another possibility may be that the website did actually teach this, but the wording of the survey items were such that participants felt they must pick one or the other. Future research should be done in this area to see if "Face the Fats" is successful at meeting the AHA's goal of teaching about *trans* fat without defaulting to eating more saturated fat.

Education versus Behavior Change

The ability of an educational program to prompt participants to make dietary changes can set one program apart from another. Many IHC applications have shown

increased nutritional knowledge levels in participants, but this knowledge does not always translate into behavior change (Block et al., 2000; Campbell et al., 2004). Reasons for the disparity between knowledge and action could include: lack of time to research healthier food choices, lack of time to prepare food at home, real and perceived issues of the cost of healthy foods and access to these foods, difficulties understanding food packaging and lack of social support. Few studies have been done to evaluate long term behavior change of participants. Some studies (Bensley et al., 2006) track participants through the early stages of change, but there are no longitudinal studies to track the effectiveness of Internet IHC applications to promote or sustain behavior change.

Research question 4 of this study was designed to gain insight into the area of readiness to change behavior, and sought to understand if participants were seriously thinking of reducing *trans* fat intake. A survey item (2) adapted principles from Stages of Change theory (Prochaska & Velicer 1997) and asked participants if they were thinking of reducing *trans* fat intake within the next 30 days (preparation), within the next 6 months (contemplation), or not thinking of changing any behavior (precontemplation). Pretest results showed 46% of participants in the precontemplation stage, and 41% of participants in the preparation stage. The other 13% were in contemplation. After viewing the website, 66% of participants were now in the preparation stage, 19% in contemplation, and participants in the precontemplation stage dropped to 14.7%. Based on these results, it is possible that the "Face the Fats" IHC website was successful in moving participants through the first few stages of change. If this change persists over a

long period of time, this could be an important finding. It may be that "Face the Fats" may become an valuable tool in reducing *trans* fat intake which may in turn result in lowered risks for heart disease and improved cholesterol ratios. Creating an environment that makes healthy choices affordable, accessible, and easy will be particularly important in helping consumers translate their nutrition knowledge into sustainable behavior change.

As described in the Stages of Change model, the next stage involves movement to action. Action for this particular topic would mean that participants reduced their intake of *trans* fat. Unfortunately, as data was collected at one point in time, this study cannot provide evidence as to whether participants were successful in implementing any dietary changes or modifications. Follow-up research would be necessary to track the long term benefits of "Face the Fats" on reducing *trans* fat intake. As positive behavior change should be the goal of most nutrition IHC applications, future evaluations of "Face the Fats" should focus on providing longitudinal data to track behavior change.

Implications for Health Educators

Results of this study were encouraging with regard to the effectiveness of IHC applications on the Internet. This study's findings indicated that participants learned about important *trans* fat related information and moved through the early Stages of Change in response to their interaction with the AHA IHC website. It will be important for future health promotion programs to explore how IHC applications might be used to promote not only knowledge acquisition, but behavior change as well. Cassell, Jackson

and Cheuvront (1998) postulate that the Internet represents a hybrid channel of communication that combines positive attributes of interpersonal communication with positive attributes of mass communication . They indicate that the Internet features many persuasive qualities of interpersonal communication that are fundamental to applying behavioral science theories and to promote healthy behaviors. The Internet also shares the broad reach of many other forms of mass communication, and can target large, diverse populations. The younger generation is increasingly turning to the Internet as a main source of health information, and it is important that accurate, effective and engaging information be available to them through this medium. Health educators need to work in conjunction with those who have expertise in advertising, behavioral science theory, research methods, and Internet technology in order to create programs that can effectively reach a broad audience and persuade them adopt healthy eating behaviors.

Evers, Prochaska, Prochaska, Driskell, Cummins, and Velicer (2003) commented on the strengths and weaknesses of health behavior change programs on the internet. Weaknesses included: few were theory driven, few were individualized, and few reported subsequent plans for evaluation. When health educators are creating Internet IHC applications, more focus should be placed on creating theory driven programs. Also, built into the application should be plans for evaluation to test the effectiveness of the application. By using theory, individualized messages, and evaluation, health educators can create IHC applications that are more likely to persuade viewers to positively change health behaviors.

Recommendations for Further Research

Although results of this study suggest "Face the Fats" is effective in increasing *trans* fat knowledge, further research needs to be done in the area of the behavioral impact of "Face the Fats." Additional studies should use a more strict experimental design, with the use of a control group as well as a variety of data collection methods, such as interviews, focus groups, or follow-up surveys, all of which would allow for a more in-depth exploration of any resulting long-term knowledge or behavior change. Also, future research should focus on the implications of gender and education to study results.

The impact of the internet on health education and research seems to broaden every day. Future research would do well to seek to understand the online habits of "health seekers" in order to effectively target IHC applications.

The current study used non-random sampling techniques, limiting the generalizability of the findings to other college age young adults. Future studies using true random sampling techniques would be strengthened. Data for this study were collected from one university, thus limiting the generalizability of the study to other college campuses. In future studies, data should be collected from college students in all parts of the country providing a more diverse and representative sample. Researchers would do well to also continue to draw samples from the general population in order to compare and contrast results.

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APPENDICES

Appendix A: Pretest

Trans Fat Final Pre-Test

Default Section

*** 1. Please enter your survey number located in the top right hand corner of your Instruction Sheet. If you cannot find this #, please email taracornell@yahoo.com to obtain one. DO NOT enter an arbitrary # as your survey answers will be invalid and you will not be eligible for the cash drawing or extra credit from your professor.**

*** 2. Are you seriously thinking of reducing your trans fat intake?**

- ◯ Yes, within the next 30 days
- ◯ Yes, within the next 6 months
- ◯ No, not thinking of changing any behavior

*** 3. How knowledgeable do you feel on the subject of trans fat? Scale: 1 = "not at all knowledgeable", 2, 3, 4, 5 = "extremely knowledgeable"**

◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5

*** 4. To the best of your knowledge, what effect, if any, do each of the following have on your risk of heart disease?**

	Increases Risk of Heart Disease	Decreases Risk of Heart Disease	Has no effect on risk	Don't know
Animal fats (e.g., lard, tallow, butter)	◯	◯	◯	◯
Monounsaturated fats (e.g., olive oil, avocado)	◯	◯	◯	◯
Omega 3 fatty acids (e.g., fish, fish oil)	◯	◯	◯	◯
Partially hydrogenated oils	◯	◯	◯	◯
Polyunsaturated fats (e.g., nuts, salmon)	◯	◯	◯	◯
Saturated fats	◯	◯	◯	◯
Trans fats	◯	◯	◯	◯
Tropical oils (e.g., palm oil, coconut oil)	◯	◯	◯	◯
Vegetable oils (e.g., canola oil, corn oil)	◯	◯	◯	◯

*** 5. To the best of your knowledge, what effect, if any, do each of the following have on HDL ("good cholesterol")?**

	Increases HDL	Decreases HDL	No effect on HDL	Don't know
Monounsaturated fats (e.g., olive oil, avocado)	◯	◯	◯	◯
Polyunsaturated fats (e.g., nuts, salmon)	◯	◯	◯	◯
Saturated fats	◯	◯	◯	◯
Trans fats	◯	◯	◯	◯

Trans Fat Final Pre-Test

*** 6. To the best of your knowledge, what effect, if any, do each of the following have on LDL ("bad cholesterol")?**

	Increases LDL	Decreases LDL	No effect on LDL	Don't know
Monounsaturated fats (e.g., olive oil, avocado)	◯	◯	◯	◯
Polyunsaturated fats (e.g., nuts, salmon)	◯	◯	◯	◯
Saturated fats	◯	◯	◯	◯
Trans fats	◯	◯	◯	◯

7. Can you name up to three types of food that contain saturated fats?

1.
2.
3.

*** 8. Which of these foods, if any, typically contain saturated fats? Check all that apply.**

- ☐ Vegetable shortening
- ☐ Butter
- ☐ Hard margarine
- ☐ Soft tub margarine
- ☐ Fatty beef
- ☐ French Fries
- ☐ Whole milk
- ☐ Chicken
- ☐ Cookies
- ☐ Pastries
- ☐ Crackers
- ☐ Lard
- ☐ Fruit juice
- ☐ Vegetables
- ☐ Fruit
- ☐ Doughnuts
- ☐ None of the above

Trans Fat Final Pre-Test

*** 9. The American Heart Association recommends limiting saturated fat consumption to less than _____ percent of your daily calories**

- ◯ 7%
- ◯ 10%
- ◯ 15%
- ◯ 20%

*** 10. The American Heart Association recommends most of the fats you eat everyday be:**

- ◯ saturated fats and trans fats
- ◯ monounsaturated and polyunsaturated fats
- ◯ trans fats and polyunsaturated fats
- ◯ saturated fats and monounsaturated fats

*** 11. Which of the following, if any, are partially hydrogenated oils closely related to?**

- ◯ Monounsaturated fats
- ◯ Polyunsaturated fats
- ◯ Saturated fats
- ◯ Trans fats
- ◯ None of the above
- ◯ Don't know

12. Can you name up to three types of food that typically contain trans fats? Again please consider only artificial trans fats for the purpose of this survey.

1. _____
2. _____
3. _____

Trans Fat Final Pre-Test

*** 9. The American Heart Association recommends limiting saturated fat consumption to less than _____ percent of your daily calories**

- ◯ 7%
- ◯ 10%
- ◯ 15%
- ◯ 20%

*** 10. The American Heart Association recommends most of the fats you eat everyday be:**

- ◯ saturated fats and trans fats
- ◯ monounsaturated and polyunsaturated fats
- ◯ trans fats and polyunsaturated fats
- ◯ saturated fats and monounsaturated fats

*** 11. Which of the following, if any, are partially hydrogenated oils closely related to?**

- ◯ Monounsaturated fats
- ◯ Polyunsaturated fats
- ◯ Saturated fats
- ◯ Trans fats
- ◯ None of the above
- ◯ Don't know

12. Can you name up to three types of food that typically contain trans fats? Again please consider only artificial trans fats for the purpose of this survey.

1. _____
2. _____
3. _____

Trans Fat Final Pre-Test

*** 13. Which of these foods, if any, typically contain trans fats? Check all that apply.**

- [ ] Vegetable Shortening
- [ ] Butter
- [ ] Hard margarine
- [ ] Soft tub margarine
- [ ] Fatty beef
- [ ] French fries
- [ ] Whole milk
- [ ] Chicken
- [ ] Cookies
- [ ] Pastries
- [ ] Crackers
- [ ] Lard
- [ ] Fruit juice
- [ ] Vegetables
- [ ] Fruit
- [ ] Doughnuts
- [ ] None of the above

*** 14. Which of the following, if any, are you doing on a regular basis? Check all that apply**

- [ ] Buying food products because they show "zero trans fat" on labels or packages
- [ ] Reviewing information on trans fats specifically before making decisions on purchases
- [ ] Reviewing information on trans fats and saturated fats together before making decisions on purchases
- [ ] Using a "zero/low trans fat" version of products instead of a solid fats version of the same type of products (e.g., stick margarine, shortening)
- [ ] Using more healthful fats instead of trans fats
- [ ] Using vegetable oils (e.g., canola oil, olive oil) instead of animal fats (e.g., butter)
- [ ] Using cooking sprays or liquid vegetable oils instead of butter
- [ ] Using more healthful fats instead of saturated fats
- [ ] Using more liquid vegetable oils (e.g., tub margarine, corn oil) instead of solid fats (e.g., butter, stick margarine)

Trans Fat Final Pre-Test

*** 15. The American Heart Association recommends limiting your trans fat consumption to less than _____ percent of your daily calories**

- ◯ 1%
- ◯ 2%
- ◯ 3%
- ◯ no intake is acceptable

*** 16. Based on a 2,000 calorie diet, how many grams of trans fat per day is this?**

- ◯ 0 grams
- ◯ 2 grams
- ◯ 4 grams
- ◯ 6 grams

*** 17. Why do food manufactures use trans fat?**

- ◯ 1. It is healthier than other fats
- ◯ 2. It is cheaper to manufacture than other fats
- ◯ 3. It has a longer shelf life than other fats
- ◯ 4. 2 & 3
- ◯ 5. None of the above

*** 18. Foods labeled "trans fat-free" are always healthy**

- ◯ True
- ◯ False

*** 19. Are there any naturally occuring trans fats?**

- ◯ Yes
- ◯ No

*** 20. Where on a food package can you find trans fat information?**

- ◯ On the front of the package
- ◯ Trans fat info isn't displayed on food labels
- ◯ On the Nutrition Facts Panel
- ◯ None of the above

Trans Fat Final Pre-Test

*** 27. Which of these fast foods contains the least amount of saturated and trans fat?**

- ◯ grilled chicken sandwich
- ◯ hamburger
- ◯ small French fry
- ◯ cheeseburger

*** 28. How would you rate the healthfulness of your overall diet? By "diet", we mean everything you consume, including foods, beverages, and dietary supplements. Scale: 1 = "not at all healthful", 2, 3, 4, 5 = "extremely healthful"**

◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5

*** 29. What gender are you?**

- ◯ Male
- ◯ Female

*** 30. Are you a full or part-time student**

- ◯ Full-time
- ◯ Part-time

*** 31. How old are you? _____years**

*** 32. Which of the following categories best describes your marital status?**

- ◯ Single, never married
- ◯ Separated
- ◯ Married
- ◯ Divorced
- ◯ Living with partner
- ◯ Widowed

*** 33. Which racial group do you belong to?**

- ◯ Caucasian (white)
- ◯ Asian/Pacific Islander
- ◯ African American
- ◯ Native American (American Indian)
- ◯ Alaskan Native
- ◯ Other

Trans Fat Final Pre-Test

* **34. Which ethnic origin do you belong to?**

- ◯ Hispanic/Latino
- ◯ Non-Hispanic/Non-Latino

35. Please make note of the time you complete this pretest and begin viewing the "Face the Fats" website. You will be asked to record your total viewing time on the posttest.

Appendix B: Posttest

Trans Fat Final Post Test

Heart Health

*** 1. Please enter your survey number located at the top right hand corner of your "Letter of Information and Instrucion Packet". (This is the same # you entered in the pretest.)**

*** 2. Are you seriously thinking of reducing your trans fat intake?**

- ◯ Yes, within the next 30 days
- ◯ Yes, within the next 6 months
- ◯ No, not thinking of changing any behavior

*** 3. How knowledgeable do you feel on the subject of trans fat? Scale: 1 = "not at all knowledgeable", 2, 3, 4, 5 = "extremely knowledgeable"**

◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5

*** 4. To the best of your knowledge, what effect, if any, do each of the following have on your risk of heart disease?**

	Increases Risk of Heart Disease	Decreases Risk of Heart Disease	Has no effect on risk	Don't know
Animal fats (e.g., lard, tallow, butter)	◯	◯	◯	◯
Monounsaturated fats (e.g., olive oil, avocado)	◯	◯	◯	◯
Omega 3 fatty acids (e.g., fish, fish oil)	◯	◯	◯	◯
Partially hydrogenated oils	◯	◯	◯	◯
Polyunsaturated fats (e.g., nuts, salmon)	◯	◯	◯	◯
Saturated fats	◯	◯	◯	◯
Trans fats	◯	◯	◯	◯
Tropical oils (e.g., palm oil, coconut oil)	◯	◯	◯	◯
Vegetable oils (e.g., canola oil, corn oil)	◯	◯	◯	◯

*** 5. To the best of your knowledge, what effect, if any, do each of the following have on HDL ("good cholesterol")?**

	Increases HDL	Decreases HDL	No effect on HDL	Don't know
Monounsaturated fats (e.g., olive oil, avocado)	◯	◯	◯	◯
Polyunsaturated fats (e.g., nuts, salmon)	◯	◯	◯	◯
Saturated fats	◯	◯	◯	◯
Trans fats	◯	◯	◯	◯

Trans Fat Final Post Test

*** 6. To the best of your knowledge, what effect, if any, do each of the following have on LDL ("bad cholesterol")?**

	Increases LDL	Decreases LDL	No effect on LDL	Don't know
Monounsaturated fats (e.g., olive oil, avocado)	◯	◯	◯	◯
Polyunsaturated fats (e.g., nuts, salmon)	◯	◯	◯	◯
Saturated fats	◯	◯	◯	◯
Trans fats	◯	◯	◯	◯

Saturated Fat

7. Can you name up to three types of food that contain saturated fats?

1.
2.
3.

more sat fat

*** 8. Which of theses foods, if any, typically contain saturated fats? Check all that apply.**

- ☐ Vegetable shortening
- ☐ Butter
- ☐ Hard margarine
- ☐ Soft tub margarine
- ☐ Fatty beef
- ☐ French Fries
- ☐ Whole milk
- ☐ Chicken
- ☐ Cookies
- ☐ Pastries
- ☐ Crackers
- ☐ Lard
- ☐ Fruit juice
- ☐ Vegetables
- ☐ Fruit
- ☐ Doughnuts
- ☐ None of the above

Trans Fat Final Post Test

*** 9. The American Heart Association recommends limiting your saturated fat consumption to less than _____ percent of you daily calories**

- ◯ 7%
- ◯ 10%
- ◯ 15%
- ◯ 20%

*** 10. The American Heart Association recommends most of the fats you eat everyday be:**

- ◯ saturated fats and trans fats
- ◯ monounsaturated and polyunsaturated fats
- ◯ trans fats and polyunsaturated fats
- ◯ saturated fats and monounsaturated fats

Trans Fat

*** 11. Which of the following, if any, are partially hydrogenated oils closely related to?**

- ◯ Monounsaturated fats
- ◯ Polyunsaturated fats
- ◯ Saturated fats
- ◯ Trans fats
- ◯ None of the above
- ◯ Don't know

12. Can you name up to three types of food that typically contain trans fats? Again please consider only artificial trans fats for the purpose of this survey.

1. |
2. |
3. |

more Trans Fat

Trans Fat Final Post Test

*** 13. Which of these foods, if any, typically contain trans fats? Check all that apply.**

- [ ] Vegetable Shortening
- [ ] Butter
- [ ] Hard margarine
- [ ] Soft tub margarine
- [ ] Fatty beef
- [ ] French fries
- [ ] Whole milk
- [ ] Chicken
- [ ] Cookies
- [ ] Pastries
- [ ] Crackers
- [ ] Lard
- [ ] Fruit juice
- [ ] Vegetables
- [ ] Fruit
- [ ] Doughnuts
- [ ] None of the above

*** 14. Which of the following, if any, are you doing on a regular basis? Check all that apply**

- [ ] Buying food products because they show "zero trans fat" on labels or packages
- [ ] Reviewing information on trans fats specifically before making decisions on purchases
- [ ] Reviewing information on trans fats and saturated fats together before making decisions on purchases
- [ ] Using a "zero/low trans fat" version of products instead of a solid fats version of the same type of products (e.g., stick margarine, shortening)
- [ ] Using more healthful fats instead of trans fats
- [ ] Using vegetable oils (e.g., canola oil, olive oil) instead of animal fats (e.g., butter)
- [ ] Using cooking sprays or liquid vegetable oils instead of butter
- [ ] Using more healthful fats instead of saturated fats
- [ ] Using more liquid vegetable oils (e.g., tub margarine, corn oil) instead of solid fats (e.g., butter, stick margarine)

Trans Fat Final Post Test

*** 15. The American Heart Association recommends limiting your trans fat consumption to less than _____ percent of your daily calories**

- ◯ 1%
- ◯ 2%
- ◯ 3%
- ◯ no intake is acceptable

*** 16. Based on a 2,000 calorie diet, how many grams of trans fat per day is this?**

- ◯ 0 grams
- ◯ 2 grams
- ◯ 4 grams
- ◯ 6 grams

*** 17. Why do food manufactures use trans fat?**

- ◯ 1. It is healthier than other fats
- ◯ 2. It is cheaper to manufacture than other fats
- ◯ 3. It has a longer shelf life than other fats
- ◯ 4. 2 & 3
- ◯ 5. None of the above

*** 18. Foodls labeled "trans fat free" are always healthy**

- ◯ True
- ◯ False

*** 19. Are there any naturally occuring trans-fats?**

- ◯ Yes
- ◯ No

Food Labeling

*** 20. Where on a food package can you find trans fat information?**

- ◯ On the front of the package
- ◯ Trans fat info isn't displayed on food labels
- ◯ On the Nutrition Facts Panel
- ◯ None of the above

more Food Labeling

Trans Fat Final Post Test

* **21. Were you aware that as of January 2006, the FDA requires all food manufacturers to disclose the amount of trans fats in a serving on a separate line on the Nutrition Facts Panel?**

- ◯ Yes
- ◯ No
- ◯ Not Sure

* **22. What impact, if any, does the trans fats information on food labels have on your decision to purchase or consume the food? Scale: 1 = "no impact", 2, 3, 4, 5 = "a great deal of impact"**

◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5

* **23. If a food package says "0g Trans Fat," what is the amount of trans fats that product contains?**

- ◯ 0 grams per serving
- ◯ Less than 1 gram per serving
- ◯ Less than 0.5 grams per serving
- ◯ Less than 0.2 grams per serving

Alternatives to Trans Fat

* **24. All fats, trans, saturated, monounsaturated, and polyunsaturated are equally high in calories**

- ◯ True
- ◯ False

* **25. Which of the following is/are good alternatives to cooking with butter and stick margarine?**

- ◯ use coconut oil whenever possible
- ◯ use liquid vegetable oils whenever possible
- ◯ use unsalted butter whenever possible
- ◯ all of the above

* **26. Which of the following is a good alternative cooking method to frying?**

- ◯ stir-frying
- ◯ grilling
- ◯ steaming
- ◯ all of the above

Trans Fat Final Post Test

*** 27. Which of these fast foods contains the least amount of saturated and trans fat?**

- ◯ grilled chicken sandwich
- ◯ hamburger
- ◯ small French fry
- ◯ cheeseburger

Face the Fats Website

28. Please record the time you spent viewing the website in minutes.

*** 29. Please use a scale of 1 = "not at all" 2, 3, 4, 5 = "extremely" to answer the questions below.**

	1	2	3	4	5
a. How well did you like the website "Face the Fats" and "Bad Fats Brothers?	◯	◯	◯	◯	◯
b. How interesting did you find the website?	◯	◯	◯	◯	◯
c. How well-organized was the website?	◯	◯	◯	◯	◯
d. How easy was it to use?	◯	◯	◯	◯	◯
e. How well did you like the Bad Fats Brothers characters?	◯	◯	◯	◯	◯

*** 30. Using the scale 1= "not at all helpful" 2, 3, 4, 5 = "extremely helpful", how helpful was the "My Fats Translator" module?**

◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5

*** 31. Would you recommend this website to your family and/or friends?**

- ◯ Yes
- ◯ No
- ◯ Maybe

END

32. Do you have any suggestions for improvement of the "Bad Fats Brothers" and/or "Face the Fats" websites?

Appendix C: Permission to use questions from AHA's (2006) "Americans' Awareness, Knowledge and Behaviors Regarding Fats: Benchmark."

Tara: Received June 15, 2007

If by permission you mean using some of the same questions in your survey of college students, then you have my permission to do so. You will need the permission of the individuals to conduct the survey. If you wish, we can chat on the phone about this. Please call me.

Regards,

Shirley Yin-Piazza
Sr. Project Manager - *Trans* Fat Initiative
Cause Initiatives and Integrated Marketing
American Heart Association
National Center
7272 Greenville Avenue, S23029
Dallas, TX 75231-4596
(214) 706-1939 (phone)
(214) 706-5244 (fax)
Shirley.Yin-Piazza@heart.org

Appendix D: IRB APPROVAL

UtahState UNIVERSITY

INSTITUTIONAL REVIEW BOARD OFFICE
9530 Old Main Hill, Suite 214a
Logan, UT 84322-9530
Telephone: (435) 797-1821
FAX: (435) 797-3769

USU Assurance: FWA#00003308
Protocol # 2001

1/21/2008

SPO #:
AES #:UTA00

MEMORANDUM

TO: Phillip Waite
Tara Banks

FROM: True M. Rubal-Fox, IRB Administrator

SUBJECT: Evaluation of an Interactive Health Communication Trans Fat Website

Your proposal has been reviewed by the Institutional Review Board and is approved under exemption #2.

X There is no more than minimal risk to the subjects.
There is greater than minimal risk to the subjects.

This approval applies only to the proposal currently on file. **Any change in the methods/objectives of the research affecting human subjects must be approved by the IRB prior to implementation.** Injuries or any unanticipated problems involving risk to subjects or to others must be reported immediately to the IRB Office (797-1821).

The research activities listed below are exempt based on the Department of Health and Human Services (DHHS) regulations for the protection of human research subjects, 45 CFR Part 46, as amended to include provisions of the Federal Policy for the Protection of Human Subjects, June 18, 1991.

2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (a) information obtained is recorded in such a manner that human subjects can be identified, directly or through the identifiers linked to the subjects: and (b) any disclosure of human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Appendix E. Letter of Information

Letter of Information
Evaluation of the American Heart Association's (AHA) "Face the Fats" *Trans* Fat Educational Campaign

Dear Participant,

Introduction/Purpose: Tara Banks, a graduate student at Utah State University in the Department of Health, Physical Education & Recreation and under the direction of Dr. Phillip Waite, is conducting a research study to evaluate the short-term educational and behavioral impact of a one-time intervention, AHAs "Face the Fats" web campaign upon college students at Utah State University. You have been asked to take part in this study because you fall within our target population. There will be approximately 100 total participants in this research.

Procedures: If you agree to be in this research study, you will be asked to:

- Complete an online pretest survey at home or in a campus computer lab
- View certain modules within the "Face the Fats" website, and immediately following you will be ask to:
- Complete an online posttest survey at home or in a campus computer lab.

Your responses to test questions will be recorded in Surveymonkey.com, an online survey assessment tool. Neither your name, computer IP address, nor any other identifying information will be collected or recorded. It will take at least 1 hour and up to 2 hours to complete this study.

Risks/Benefits: There are no anticipated risks associated with participation in this research study. Participants could benefit from this study by being more informed about important health issues. The researcher may benefit from this study by learning if the AHA's *trans* fat campaign is effective.

Cash Drawing: Participants who complete all aspects of this research study will be entered into a drawing for $100 cash. The winner will be notified by email to obtain information about how to claim the prize.

Voluntary Participation and Withdrawal: Participation in this research study is entirely voluntary. You may refuse to participate or withdraw at any time without consequence. However, you will only be eligible for the $100 cash drawing if you complete all aspects of the study.

Confidentiality: Research records will be kept confidential, consistent with federal and state regulations. Only the researcher will have access to the data through Surveymonkey.com which is stored on serves kept in a locked cage requiring a passcard and biometric recognition. After the completion of the study all data will be deleted.

Offer to answer questions: Tara Banks will be happy to answer any questions you may have concerning this research study. You may reach her at 720-273-9537. You may also contact Dr. Waite at 435-797-7217.

USU Approval: The Institutional Review Board of the protection of human participants at USU has reviewed and approved this research study. If you have any questions or concerns about your rights, you may contact the IRB at 435-797-1821.

Tara Banks, Student Researcher
Department of Health, Physical Education, and Recreation
720-273-9537

Phillip Waite Ph.D., Principal Investigator
Department of Health, Physical Education, and Recreation
435-797-7217

Appendix F: Instruction Packet

YOUR SURVEY #_____

INSTRUCTIONS

- You will need a computer with internet access to begin this study
- Once you are at a computer and connected to the internet, please go to http://www.freewebs.com/transfatsurvey/instructions.htm.
- Here you will find all the instructions and website links necessary for you to complete this study. If you cannot access this page, please email Tara at taracornell@yahoo.com or call directly at 720-273-9537 to receive a hard copy of all instructions.
- Once you have completed the study, you will be directed to a website where you can enter your name and email address into a $100 cash drawing. This website is completely separate from the research study, and in no way connects your survey answers to your personal information. The winner of the money will be notified by email with instructions on how to claim the prize. If your professor is offering extra credit for participation in this study, please print the last page of the survey for verification.

THANK YOU FOR YOUR PARTICIPATION IN THIS RESEARCH STUDY!!