The indoor tanning practices of undergraduate nursing students at University of Toledo

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2011
Acknowledgements

Thank you to my advisor, Dr. Lorie Gottwald, M.D., Chief of Dermatology, Professor of Medicine, for not only accepting my request for help but allowing me the freedom to take my project where I wanted to go with it. Thank you for the guidance and patience with this endeavor.

Thank you to the University of Toledo College of Nursing for their cooperation in completing the data collection. Special thank you to Dr. Donna Algase, PhD, RN, FAAN, FGSA, Professor and Associate Dean for Research and Evaluation for patiently answering my many questions and helping me strategically plan my execution of data collection.

A big hug and thank you to my classmate and sidekick, Erin Kume, for assisting me with the data collection. I greatly appreciate the time and work you put into my research project to make sure I would be successful.

Thank you to my sister, Dr. Jennifer Webb Burger, Psy D., for her professional insight and suggestions for the psychological aspects of this project. Thanks for taking my last-minute, late night phone calls and texts.
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Ever since Coco Chanel, the famous fashion designer, arrived in Cannes in 1923 with deeply bronzed skin, the tan has been “in” (Chrisholm, 2008; Mighall, 2008; Winterman, 2006). Although outdoor tanning increased soon after this, the advent of the indoor tanning bed to the public in the 1980s helped increase year-round tanning practices (Lazovich, Sweeney, & Forster, 2005; Mighall, 2008). Indoor tanning beds emit ultraviolet (UV) light, similar to natural sunlight, except at higher doses (Zeller, Lazovich, Forster, & Widome, 2006). These higher amounts of UV light in short periods of time allow for the creation of a tan quickly. Today, indoor tanning is a $2.6 billion industry with 28 million people tanning each year (American Academy of Dermatology, 2011a; The Skin Cancer Foundation, 2011). The typical tanner is a young, Caucasian woman (teens to 30s) who cites enhancing her appearance and relaxation, amongst others, as reasons for engaging in this behavior (American Academy of Dermatology, 2011a; Feldman et al., 2004; Hillhouse & Turrisi, 2002).

Over the last thirty years, research has shown UV exposure can damage skin and lead to skin cancer (American Academy of Dermatology, 2011a; American Cancer Society, 2011b; Curiel-Lewandrowski, 2011; Ratanaprasatporn, Neustadter, & Weinstock, 2011; Riker, Zea, & Trinh, 2010). Ultraviolet radiation is divided into ultraviolet A (UVA), ultraviolet B (UVB), and ultraviolet C (UVC) rays. UVC rays do not penetrate the Earth’s atmosphere and are not connected to skin cancer (American Cancer Society, 2011b; Lim et al., 2011) However, UVA and UVB rays have been cited as causes of skin cancer, wrinkling of the skin, and sunburns (American Academy of Dermatology, 2011a; American Cancer Society, 2011b; Lim et al., 2011). Because UVA wavelengths are longer than UVB, approximately 90-95% of the UV rays that reach Earth are UVA (Wang et al., 2001). The longer wavelengths also allow UVA to reach the
deeper tissues of skin where the melanocytes are found and act on them (Wang et al., 2001). Melanocytes are specialized skin cells that produce melanin. The more melanin a person produces, because of genetics or another stimulus, the darker the skin pigmentation will become. UVA rays are a stimulus to melanocytes and will cause tanning or “facultative skin color” (Park, 2011). UVA rays are responsible for producing immediate and persistent pigment darkening (Wang, 2001). Immediate pigment darkening fades after a few minutes of exposure, whereas persistent pigment darkening will remain for a few hours (Wang et al., 2001). Although it appears there is no damage to the skin, there are cellular-level reactions occurring that release free radicals which can lead to DNA damage and mutations (Lim et al., 2011; Park, 2011; Wang et al., 2001). Ultraviolet B rays have shorter wavelengths, but can also cause damage to skin. Since most of the UVB rays can only reach the outermost layers of the skin, they are responsible for the immediate effects of sunburn (Wang et al., 2001). After brief exposures to UVB, an inflammatory response occurs and the skin becomes erythematous, dry, and sometimes blistered depending on how long the individual was exposed (Wang et al., 2001). At the cellular level, the cells’ DNA becomes damaged which can create cancer-causing complexes and free radicals which can go on to destroy other healthy cells (Marneros, 2011; Wang et al., 2001). This process leads to “sunburn cells” which is apoptosis of the exposed skin cells (Marneros, 2011). Because of the different ways UVA and UVB react on the skin and Western culture values tanned, not burned skin, the majority of tanning beds and lamps on the market today emit only UVA rays (Wang et al., 2001). It is estimated that frequent tanners could be exposing themselves to 1.2 to 4.7 times the yearly UVA dose than those who receive UVA radiation from the sun alone (Wang et al., 2001).
A remarkable rise in skin cancer, particularly in young women, over the last several years has been observed (American Cancer Society, 2011a; Curiel-Lewandrowski, 2011; Riker et al., 2010; The Skin Cancer Foundation, 2011). Cancer occurs when normal cells change into abnormal cells because of damage to their DNA and therefore to grow out of control. In skin cancer, there are non-melanoma and melanoma types. In the non-melanoma category, there are two types: basal cell carcinoma and squamous cell carcinoma. Generally, the non-melanoma cancers are slow growing and most commonly occur superficially on the head, face, and neck. These type of cancers tend to look pink or red, swollen, bleed easily, peel easily, and have a scaly or crust-like layer (American Cancer Society, 2011b; Martin, 2011b). A few treatment options for non-melanoma skin cancers include, removing the lesion surgically, radiation therapy, cryosurgery, or a potent cream that is applied to the lesion (Martin, 2011b).

Melanoma is the rarest of the skin cancers but the most serious. Melanoma can occur anywhere on the body, and although it may begin superficially, it can rapidly infiltrate deeper structures in the body and spread as a cancer to vital organs. Melanoma, at first, will grow by spreading out within the surrounding epidermis, which is called the horizontal growth phase (Oakley, 2011). If the melanoma is found at this stage, it can be surgically resected with no further treatment (Oakley, 2011). If left untreated, it will grow through the basement membrane of the dermis and be considered to have a vertical growth phase (Oakley, 2011). This is considered invasive melanoma and warrants more invasive treatments (Oakley, 2011). At this point it is possible for it to spread to regional lymph nodes and then later spread to visceral organs (Kim et al, 2011). The most common sites are lung, liver, brain, bone, and gastrointestinal tract (Kim et al, 2011).
It will generally appear as small, dark brown or black nevi that over time changes in its shape, size, and color. The ABCDE method is used to evaluate nevi for melanoma: **Asymmetry**, irregular **Borders**, changes in **Color**, large **Diameter**, and **Elevation/Evolution** over time (American Cancer Society, 2011b; Martin, 2011a). The most common treatment is surgical removal of the lesion and checking lymph nodes that are near the site to determine if the cancer has spread (American Cancer Society, 2011b; Martin, 2011a). Other treatments include immunotherapy, radiation therapy, and chemotherapy (American Cancer Society, 2011b; Martin, 2011a). Melanoma is the most common type of cancer and sixth most common fatal cancer in the U.S. (American Cancer Society, 2011b; Riker et al., 2010; The Skin Cancer Foundation, 2011). Given current practices, the lifetime probability of developing melanoma is 1 in 37 for men and 1 in 56 for women in the U.S. (Curiel-Lewandrowski, 2011). In 2010, in the United States, 68,130 new cases of invasive melanoma were diagnosed (Curiel-Lewandrowski, 2011).

In recent years, an association between skin cancer and the use of indoor tanning beds has been established (American Academy of Dermatology, 2011a, 2011b; American Cancer Society, 2011b; Curiel-Lewandrowski, 2011; Faurschou & Wulf, 2007; Junkins-Hopkins, 2010; Lim et al., 2011; Martin, 2011a; Ratanaprasatporn et al., 2011; Riker et al., 2010; The Skin Cancer Foundation, 2011). The World Health Organization has deemed sunlamps and tanning beds as class 1 carcinogens which recognizes these items as causing cancer in humans (Martin, 2011a; Riker et al., 2010). Sunlamps and tanning beds both emit ultraviolet light but vary in physical form. Sunlamps are usually tabletop or portable units for which their purpose is to emit UV light onto portions of skin (U.S. Food and Drug Administration, 2011). Tanning beds are
large, non-portable machines that individuals lie on and have their entire bodies exposed to UV light at once (U.S. Food and Drug Administration, 2011). There have been campaigns by the scientific community to educate the public of the harm from UV exposure. These programs emphasized the importance of avoiding sun exposure, using sunblock, and staying covered while outside (American Academy of Dermatology, 2011b; Hillhouse & Turrisi, 2002; The Skin Cancer Foundation, 2011; Turrisi, 2004). One popular public education campaign for sun protection, “Slip, Slap, Slop”, began in Australia in 1980 and data collected over twenty years show vast changes in perceptions of sunbathing and using protection in the sun (Marks, 2004). The incidence of melanoma also decreased in the cohorts that were targeted with this education campaign (Marks, 2004).

The number of skin cancer cases & indoor tanning practices continue to rise, however (American Academy of Dermatology, 2011a; The Skin Cancer Foundation, 2011; Turrisi, 2004). There have been debates in the literature as to why tanning continues despite mounting evidence that it can lead to skin cancer. One likelihood for continued tanning is all individuals who tan also indulge in other risky behavior, such as smoking cigarettes and marijuana, binge drinking, and having poor eating habits (Junkins-Hopkins, 2010; Mosher & Danoff-Burg, 2010; Poorsattar & Hornung, 2007; Schneider & Kramer, 2010). Several studies have shown that indoor tanning as a social activity with friends or family members encourages the continued use by adolescents (Baker, Hillhouse, & Liu, 2010; Heckman, Egleston, Wilson, & Ingersoll, 2008; Mosher & Danoff-Burg, 2010; Schneider & Kramer, 2010; Zeller et al., 2006). Studies that survey tanners find the most prevalent reason for tanning is to enhance one’s appearance (Choi et al.,
Several studies over the last decade have established that tanning is a type of substance addiction, particularly of young women (Feldman et al., 2004; Heckman et al., 2008; Kaur, Liguori, Lang, et al., 2006; Mosher & Danoff-Burg, 2010; Nolan & Feldman, 2009; Warthan, Uchida, & Wagner, 2005; Zeller et al., 2006). These studies look at the physiologic effects UV radiation from indoor tanning on young women and hypothesize that this is what drives the behavior to continue tanning, regardless if they know indoor tanning is unhealthy. Since many indoor tanners report relaxation or increased self-esteem as reasons for tanning, research as begun to look at the physiologic processes that may be occurring during UV exposure (Feldman et al., 2004; Poorsattar & Hornung, 2007; Robinson et al., 2008; Schneider & Kramer, 2010; Zeller et al., 2006). Endorphins are a type of neurotransmitters that carry messages through the nervous system to the brain (Stoppler, 2007; Waxman, 2011). They are mostly produced in the brain and secreted through the pituitary gland (Stoppler, 2007). Currently, there are twenty different types of endorphins located throughout the body (Stoppler, 2007). When the body is stressed or in pain, endorphins are released and connect with opiate receptors in the brain to block the negative feelings (Stoppler, 2007; Waxman, 2011). Thus, they act as natural pain killers (Stoppler, 2007). In some instances, such as acupuncture, massage therapy, prolonged work outs, meditation and sex, the body will secrete endorphins and give the feeling of euphoria (Stoppler, 2007). Drugs such as morphine and heroine are opioids and stimulate the release of endorphins creating the feelings of euphoria and relaxation in greater quality than what occurs naturally in the human body. However, becoming addicted to opioids occurs easily
and stopping can be very difficult due to the biological processes to which the body has become accustomed. Although controversial, it is thought that the activity of indoor tanning has the same addictive qualities as consuming opioids for some individuals secondary to the release of endorphins while exposed to UV radiation. In the last thirty years research has supported the theory that endorphins are secreted during UV exposure. Levins, et al, found that after exposure to UVA rays, the level of β-endorphins increased significantly (1983). Gilchrest et al. also reported significant increases in several types of endorphins in the sample epidermis after exposure to UV rays (1996). Kauser et al. found evidence of a β-endorphin/µ-receptor system in melanocytes in samples of human epidermal tissue which is highly suggestive that under stimulating circumstances, such as UV exposure, the melanocytes themselves can release endorphins and possibly have systemic effects (2003). Also supporting this theory, Schauer et al, and Wintzen et al, found evidence of other types of endorphins produced by keratinocytes in skin samples when exposed to UV rays (1994; 1996). However, it is one thing to show the release of endorphins in skin samples and another to show similar effects in participants. Wintzen et al. did not find endorphin levels to increase after UV exposure in epidermal samples, nor in a larger study with humans (2001; 2001). A very small study in which three frequent and three infrequent indoor tanners had blood samples taken before and after they were exposed to UV and non-UV tanning beds found no significant levels of endorphins in any of the six subjects, regardless of which tanning bed they used (Kaur, Liguori, Fleischer, & Feldman, 2006). It should be noted that since endorphins are produced in the brain and released through the pituitary gland as well as from epidermal cells, simple serum levels do not distinguish where the endorphins were released and creates uncertainty in the authors’ conclusions.
Since trying to find the proverbial “smoking gun” with blood samples to link endorphin secretions during UV exposure was proving inconsistent and difficult, Kaur, Liguori et al. tried the reverse hypothesis. If endorphins were secreted during indoor tanning and gave similar systemic effects like heroine or morphine, then logic would presume that if participants were given naltrexone, an antagonist to opioids, the participants would not report preferences for UV tanning beds over non-UV tanning beds (2006). A small study of eight frequent tanners and eight infrequent tanners were given either increasing doses of naltrexone or placebo and then exposed to either a UV or non-UV tanning bed. Those who frequently tanned and were given naltrexone exhibited a decreased preference for the UV tanning bed (Kaur, Liguori, Lang, et al., 2006). The infrequent tanners had lower preference rates for UV tanning beds regardless if they were taking the placebo or naltrexone (Kaur, Liguori, Lang, et al., 2006). Interestingly, a turn of events occurred during the study. Of the eight frequent tanners, four reported withdrawal symptoms after receiving 15 mg of naltrexone (Kaur, Liguori, Lang, et al., 2006). There were no reports of withdrawal symptoms (i.e.: agitation, anxiety, sweating, nausea, vomiting, etc.) by the infrequent tanners group when given naltrexone (Kaur, Liguori, Lang, et al., 2006). This observation among the frequent tanners group is similar to withdrawal symptoms found in opioid addicts. Similarly, a smaller, blinded study of three frequent indoor tanners were given 50 mg of naltrexone before using either a UV or non-UV tanning bed. The expectation was the subjects would not be able to distinguish between the two tanning beds (Kaur, Liguori, Fleischer, & Feldman, 2005). Two of the three subjects reported withdrawal symptoms shortly after taking the naltrexone (Kaur, Liguori, et al., 2005). All three subjects reported a preference for the non-UV tanning bed (Kaur, Liguori, et al., 2005). These two studies concluded that since
the subjects exhibited opioid withdrawal symptoms when given an opioid antagonist, the theory that the reinforcing effects of UV exposure is in part to an opioid-endorphin system in the skin and may have addictive characteristics (Kaur, Liguori, et al., 2005; Kaur, Liguori, Lang, et al., 2006). However, a common side effect to naltrexone is nausea, though it is reported that non-opioid users have no or more mild side effects from the drug than opioid users (Anderson, 2011).

Most of the research in tanning as an addiction has focused on the reinforcing psychological effects on tanners. Feldman et al. found that when established indoor tanners used UV and non-UV tanning beds during a blinded study, 95% chose the UV tanning bed as the bed of choice to use and participants reported a more relaxed and less tense mood when compared to using the non-UV tanning bed (2004). Each bed was the same make and model but the “non-UV” bed had an opaque filter placed in it that prevented the individual from receiving UV rays but with the same heat and light appearance of a traditional tanning bed (Feldman et al., 2004). Within this study by Feldman et al. one subject who had chronic lower back pain, reported decreased pain in her back and a general feeling of relaxation for several hours during and after using the UV tanning bed (Kaur, Feldman, Liguori, & Fleischer, 2005). She also reported that she did not receive that same amount pain relief when using the non-UV tanning bed (Kaur, Feldman, et al., 2005). The authors concluded that their study indicates that UV exposure through indoor tanning is a reinforcing stimulus (Feldman et al., 2004).

Continuing in the vein of research that tries to explain tanning through a psychological etiology, several studies attempted to modify existing addiction models. These studies modified
the CAGE questionnaire and/or the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* (DSM-IV-TR) criteria for substance dependence (Ewing, 1984; First, 2000). The CAGE questionnaire was introduced in the mid-1980s as a screening tool for alcoholism (Ewing, 1984). The questions ask the individual if they have felt the need to cut down on the amount of drinking, feel annoyed when others comment on their drinking habits, feel guilty after drinking, or need an alcoholic drink as an eye-opener first thing in the morning (Ewing, 1984). Two or more positive responses to any of the four screening questions suggests alcohol abuse and should be investigated further (Ewing, 1984). For the tanning studies, the questions were modified to tanning (i.e.: “Do you feel you should cut down on the amount of time you spend tanning?”) (Mosher & Danoff-Burg, 2010; Poorsattar & Hornung, 2007; Warthan et al., 2005). The CAGE questionnaire has also been modified for other substances like nicotine, street drugs, and opioids (Brown & Rounds, 1995; Rustin, 2000).

According to the *Diagnostic and Statistical Manual of Mental Disorders 4th edition-text revision* (DSM-IV-TR), substance dependence is “a cluster of cognitive, behavioral, and physiological symptoms indicating that the individual continues to use of the substance despite significant substance-related problems” (2000). The three main components that drive these behaviors are tolerance, withdrawal, and compulsive continued use of the substance that occur over a 12 month period (DSM-IV-TR, 2000). An individual would need to exhibit three or more of these behaviors over the same 12-month period to be considered dependent:

(1) tolerance, as defined by either of the following:

(a) a need for markedly increased amounts of the substance to achieve intoxication or desired effect
(b) markedly diminished effect with continued use of the same amount of the substance

(2) withdrawal, as manifested by either of the following:

(a) the characteristic withdrawal syndrome for the substance (refer to Criteria A and B of the criteria sets for Withdrawal from the specific substances)

(b) the same (or a closely related) substance is taken to relieve or avoid withdrawal symptoms

(3) the substance is often taken in larger amounts or over a longer period than was intended

(4) there is a persistent desire or unsuccessful efforts to cut down or control substance use

(5) a great deal of time is spent in activities necessary to obtain the substance (e.g., visiting multiple doctors or driving long distances), use the substance (e.g., chain-smoking), or recover from its effects

(6) important social, occupational, or recreational activities are given up or reduced because of substance use

(7) the substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance (e.g., current cocaine use despite recognition of cocaine-induced depression, or continued drinking despite recognition that an ulcer was made worse by alcohol consumption) (DSM-IV-TR, 2000).
The DSM-IV-TR emphasizes the importance of the criteria is on the individual’s knowledge that the substance is causing their problems or harming them yet the individual continues to use the substance (2000).

Warthan et al. performed the first study to implement the CAGE questionnaire and the DSM-IV-TR Substance Dependence criteria to tanning (2005). They surveyed 145 beachgoers using the modified tools and found 26% scored positively on the CAGE questionnaire and 53% met the DSM-IV-TR criteria for substance dependence (Warthan et al., 2005). The authors concluded that tanning could be a novel form of substance dependence and also may explain why traditional education campaigns about skin cancer and tanning may not effectively change behaviors in tanners (Warthan et al., 2005).

Three other studies have duplicated this method with modifications. Poorsattar et al. surveyed 375 undergraduate students with the modified CAGE questionnaire about their outdoor and indoor tanning practices (2007). They found 76% of the female students tan with 9% tanning 20 times or more a month (Poorsattar & Hornung, 2007). The authors also found that 18% of the undergraduate students who tanned had a positive CAGE result (Poorsattar & Hornung, 2007). Harrington et al. surveyed 100 frequent indoor tanners using the modified CAGE questionnaire and DSM-IV-TR substance dependence criteria (2010). The authors found 41% of the subjects met criteria for a “tanning addictive disorder” and 74% scoring positively on the CAGE questionnaire (Harrington et al., 2010). The authors concluded that frequent tanners exhibited behaviors consistent with other established addictions such as alcohol (Boyd, McCabe, & d'Arcy, 2003; Harrington et al., 2010; Werner, 1992). The third study by Mosher et al., also used both modified CAGE questionnaire and modified DSM-IV-TR substance
dependence criteria to ascertain the indoor tanning practices of 421 college students and implemented the Beck’s Anxiety and Depression Inventories to evaluate any anxiety or depression co-existing in the subjects (2010). The study found 54% of those surveyed use indoor tanning beds and of those indoor tanners, 39% met the DSM-IV-TR criteria and 30% met the CAGE criteria for tanning addiction (Mosher & Danoff-Burg, 2010). The results also revealed that those subjects that scored positively on the surveys also reported greater symptoms of anxiety, increased alcohol consumption, and increased marijuana and other substance use than those who did not meet the criteria for tanning addiction (Mosher & Danoff-Burg, 2010). The authors concluded that their findings suggest future education on UV exposure include methods that would also address addictive behaviors (Mosher & Danoff-Burg, 2010).

With many of these studies reporting high rates of indoor/outdoor tanning and significant portions of those tanners exhibiting addictive/dependent-type characteristics, researchers found the majority of the tanners surveyed in several studies are aware that tanning can cause skin cancer, premature wrinkling of the skin, and other unattractive changes of the skin (Harrington et al., 2010; Knight et al., 2002; Mosher & Danoff-Burg, 2010; Warthan et al., 2005). This finding then parlayed into the question as to what approach to decreasing tanning behavior would be effective in individuals who already possess the knowledge about the risks of tanning.

Only three studies on intervention for indoor tanning have been published and reported modest results. Two studies focused on decreasing the subjects’ perceptions that indoor tanning would enhance their appearance and underscore the unattractive consequences (Abar, 2010; Hillhouse & Turrisi, 2002). Hillhouse et al. used a workbook that outlined the damage UV
exposure can have on humans and emphasized the positive attitude toward healthy lifestyle choices (2002). The authors found that two weeks after the subjects completed the 11-page workbook, the subjects reported fewer intentions to tan in the next 12 months than the control group when compared to the pre-test (Hillhouse & Turrisi, 2002). After a two month follow up, the subjects reported a decrease in their tanning habits by 50% (Hillhouse & Turrisi, 2002). Abar et al took the study further and expanded the workbook and size of the study to over 300 college-aged females (Abar, 2010). The subjects were frequent indoor tanners and were given the workbooks to complete and then return one month and six months later to give feedback (Abar, 2010). The authors found that the subjects reported significantly less episodes of tanning compared to the frequency of tanning prior to the intervention when compared to the control group (Abar, 2010). The authors of both of these studies claim that brief appearance-focused interventions from their workbook can impact tanning behavior and reduce the risk of skin cancer in frequent tanners (Abar, 2010; Hillhouse & Turrisi, 2002). These studies, and the lack of others similar to it, led to the contemplation that if formal education plays a role in the indoor tanning practices by young women. More specifically, does having an education in healthcare, for example, nursing, reduce the subject’s frequency of indoor tanning when compared to the general undergraduate population?
Methods

After receiving approval from The University of Toledo Institutional Review Board (IRB) and coordinating with The University of Toledo College of Nursing, data was collected during the week of August 1-5, 2011 in the Collier Building. As third and fourth year undergraduate nursing students exited their classroom following the completion of their final exams, they were approached by either the author or the research associate to participate in an anonymous paper survey about indoor tanning practices as part of a graduate program requirement for the author. Participants were provided with the survey (Appendix A) and directed to review the IRB-approved informational flyer (Appendix B) that was posted on the door of their classroom and on the survey table prior to taking the survey. The flyers provided the individuals with information about the context of the survey and emphasized that their participation or lack of participation did not impact their grade and they could stop participating at any point during the survey. The flyer also contained contact names and numbers of the author and her advisor, should the participant have questions about the study at a later time. The participants were provided with a clipboard and a pen and given privacy to fill out the survey. Once the participant had completed the survey, it was immediately placed into a manila envelope with other completed surveys. The completed surveys were not reviewed by the author, research associate, or advisor until after the last day of data completion.

After the data was collected, the information was entered into SPSS (Statistical Package for Social Sciences) program for statistical analysis. The author utilized information from previous statistics classes, classmates, former professors, and current advisor to operate the program.
A total of 166 surveys were collected over the week. The author then screened the surveys for those reporting to be female and between the ages of 18-25 years of age. These criteria were based on studies that cite the most common characteristics of tanners as young women between the ages of 17-30 years old (American Academy of Dermatology, 2011a; Schneider & Kramer, 2010; The Skin Cancer Foundation, 2011). The surveys were then screened for completeness. The author had 111 surveys that met the criteria for review and those surveys were analyzed for this project. The paper survey was a two-sided questionnaire that asked for the individual’s age, gender, year in the undergraduate nursing program, their skin type based on Fitzpatrick’s Skin Phototypes Classification, if they previously had lectures on dermatology or skin cancer, and if they have ever indoor tanned.

The Fitzpatrick’s Skin Phototypes Classification is based on basic skin color classifications of black, brown, and white (Wolff & Johnson, 2009). Since there are varying degrees in ability to develop a tan in persons with white skin, Fitzpatrick’s allows for the individual to describe how their skin reacts to UV exposure (Wolff & Johnson, 2009). The classification is broken down into six skin phototypes that include discrepancies for individuals with varying dark skin. For the purpose of this survey, it was modified into five to simplify the choices for the participants. The classifications were listed as: I- always burn, never tan; II- always burn, rarely tan; III-sometimes burn, often tan; IV- rarely burn, always tan; and V-never burn, always tan. This wording and condensed form was modeled off the Warthan et al. study for outdoor tanners.

For those who reported they have never indoor tanned, they were directed to Question #15 on the survey and answer the last five questions. These questions were answered by everyone regardless of their tanning practices: Do you believe you can develop skin cancer from
indoor tanning? Do you believe skin cancer can be easily treated? Do you believe you can die from skin cancer? Do you know of a person (family member, friend, co-worker, classmate) who has/had skin cancer? and Do you believe indoor tanning will lead to premature wrinkling of the skin? These questions were asked to determine if the individual possessed the knowledge that skin cancer and other undesirable skin changes are caused by indoor tanning.

If the individual stated they have indoor tanned, they were asked when was the last time they indoor tanned: this week, last week, past month, past six months, past year, or more than a year. If the individual stated that they had last indoor tanned in the past year or more than a year they were considered infrequent tanners and were directed to questions about why they had indoor tanned in the past and if they planned to indoor tan in the next 6 months. If the individual stated they did not have plans to indoor tan in the future, they were given the opportunity to state why.

If the individual stated they had indoor tanned in the past six months or more recently, they were considered current tanners and asked to complete modified CAGE (mCAGE) and DSM-IV-TR (mDSM-IV-TR) questions about indoor tanning. The questions were modified from the Warthan, et al study with outdoor tanners to apply to indoor tanners. A verbal consent by Dr. Molly Warthan was obtained in March 2011 to modify the questions. The questions fulfilled the DSM-IV-TR Substance Dependence criteria about tolerance and dependence. It was later determined by a licensed psychologist that none of the questions on this survey sufficiently met the DSM-IV-TR criteria for withdrawal or relating to self-knowledge of dependence (Criterion 2a, 2b, and 7). However, it was determined by the psychologist that the questions on the survey were sufficient to meet the remaining DSM-IV-TR criteria to determine dependence. The
individuals were also asked the mCAGE questions as modeled after the Warthan et al. study. Individuals were asked: Do you ever get irritated when people tell you not to indoor tan? Do you ever feel guilty after you indoor tan? and Do you ever feel the need to go indoor tan right after waking up? It was determined after the completion of the survey and during data analysis that the question “Do you feel you should cut down on how much you indoor tan?” had inadvertently been omitted on the survey and therefore, only three of the four mCAGE questions had been asked.

After completing the mDSM-IV-TR and mCAGE questions, current tanners were then asked if they planned to indoor tan in the next 6 months and given the opportunity to state why they choose to indoor tan.
Results

For this study, 67% (N=111) of the surveys met the criteria for consideration (female, ages 18-25, completed the survey). Data from the surveys were entered into SPSS and frequencies were executed for each question. The majority (78%) of the participants were 20-21 years old with the next largest group (16%) being 22-23 year olds. The majority (40%) of respondents claimed to be a Fitzpatrick III skin type and 31% said they were a IV. Two-thirds (65%) of the respondents were in their 3rd year of undergraduate nursing program.

There were some discrepancies to their curriculum as 62% of respondents said they did receive lectures in dermatology while 30% said they did not. The inconsistency continued with 87% of respondents said they did receive lectures on skin cancer while 6% said they did not. The director of the baccalaureate nursing program for The University of Toledo stated students learn to assess skin under a variety of medical settings and receive lectures on skin cancer throughout the third and fourth years of the nursing program.

When participants were asked if they had EVER indoor tanned, 65% said yes.

Respondents who replied they had indoor tanned at some time in their life (N=72), were asked to state when they had last indoor tanned. Thirty-one percent said in the past six months, 15% said they had indoor tanned that week, 5% the previous week, and 11% in the last month.

These respondents were considered current tanners. Thirty-eight percent of the remaining respondents reported it had been in the past year or more than one year. These respondents were considered infrequent tanners.

The infrequent tanners (N=28) were asked why they indoor tanned in the past from a list of choices. Respondents could choose more than one reason. Seventy-one percent tanned
for a special occasion, 29% wanted to enhance their everyday appearance, 14% tanned for relaxation, 14% tanned to feel better about themselves, and 11% tanned as a social activity with friends.

When asked if they planned to indoor tan in the next 6 months, 96% said no. The one respondent that said yes stated her reason for continuing was the same as why she had tanned the previous year: to enhance her appearance, feel better about herself, and for relaxation.

The infrequent tanners who do not plan to indoor tan in the next 6 months (N=27) were asked to choose from a list of reasons why they will not tan. Respondents could choose more than one answer. Sixty-seven percent think it’s not good for them, 37% thinks it costs too much, and 26% have other reasons such as “Not good for you”; “Only tan if I’m going to Florida”; “Boyfriend does not like”; “don’t need to”; “Just don’t want or need to”; and “expensive”. Seven percent say they don’t have enough time and 4% say they don’t like the way they look when they indoor tan.

Respondents that were considered current tanners (N=44) were asked the modified DSM-IV-TR substance dependence questions for indoor tanning. The table below (Table 1) displays the frequency for each question from the survey.
Table 1. mDSM-IV-TR

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Need to increase time tanning to maintain your tan?</td>
<td>45%</td>
<td>55%</td>
</tr>
<tr>
<td>2. Think tan will fade if spend same amount of time in bed?</td>
<td>11%</td>
<td>89%</td>
</tr>
<tr>
<td>3. Continue to tan so tan will not fade?</td>
<td>68%</td>
<td>32%</td>
</tr>
<tr>
<td>4. Spend more time in bed than planned?</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>5. Like tanning best over all other activities?</td>
<td>39%</td>
<td>61%</td>
</tr>
<tr>
<td>6. How many days a week do you tan? *0-1=NO 2+=YES</td>
<td>64%</td>
<td>36%</td>
</tr>
<tr>
<td>7. Do you tan year round?</td>
<td>32%</td>
<td>68%</td>
</tr>
<tr>
<td>8. Missed work/school due to sunburn?</td>
<td>5%</td>
<td>95%</td>
</tr>
<tr>
<td>9. Missed work/school to tan instead?</td>
<td>5%</td>
<td>95%</td>
</tr>
</tbody>
</table>

For Question #6, a breakdown in frequencies for the number of days indoor tanned are found below (Table 3).

Table 3. Number of Days Per Week Subjects Indoor Tan

<table>
<thead>
<tr>
<th>Days Per Week</th>
<th>Indoor Tan</th>
<th>Percent (N=44)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None to One Day</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Two Days</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Three Days</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Four Days</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Five Days</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Six Days</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

The current tanners (N=44) were then asked the CAGE questions modified for indoor tanning. As mentioned before, the fourth question of the screening tool was inadvertently omitted from the survey. See the table below (Table 2) for frequencies of each CAGE question.
A positive mCAGE response is two or more “Yes” answers to the questions and suggests probable tanning abuse, or “problematic tanning behavior” (Harrington et al., 2010). Only six (14%) had a positive mCAGE response. There were twenty (45%) current tanners that reported one positive response out of the three questions. Of the current tanners, one participant scored positively on the mCAGE questionnaire and the mDSM-IV-TR criteria while seven (16%) score positively for tanning dependence on the mDSM-IV-TR only. Four of the seven who scored positively for tanning dependence on the mDSM-IV-TR criteria had a negative mCAGE score (0 out of 3). The remaining three positive mDSM-IV-TR criteria tanners had a relatively negative mCAGE score (1 out of 3).

The current tanners (N=44) were asked if they planned to continue indoor tanning in the next six months and 84% stated they intend to indoor tan again. Their reasons for continuing to tan are listed in the table below (Table 4). Respondents picked from a list and were able to write in their own reasons. They could choose more than one answer.

<table>
<thead>
<tr>
<th>Table 2. mCAGE</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get irritated when people tell you not to tan?</td>
<td>30%</td>
<td>70%</td>
</tr>
<tr>
<td>Feel guilty after tanning?</td>
<td>46%</td>
<td>64%</td>
</tr>
<tr>
<td>Need to tan after waking up?</td>
<td>5%</td>
<td>95%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4. Reasons to Continue Indoor Tanning in the Next Six Months</th>
<th>Percent (N=44)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To enhance their appearance</td>
<td>75%</td>
</tr>
<tr>
<td>2. For relaxation</td>
<td>59%</td>
</tr>
<tr>
<td>3. To feel better about themselves</td>
<td>55%</td>
</tr>
<tr>
<td>4. Other reasons written in: “So I’m not so white”; “work”; “get base tan b/c I burn in the sun”; “in wedding”; “to be tan”; “special occasions only”; “acne”; and “love it”.</td>
<td>28%</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5. To decrease anxious feelings</td>
<td>11%</td>
</tr>
<tr>
<td>6. Something to do with friends</td>
<td>9%</td>
</tr>
</tbody>
</table>

All respondents (N=111) were asked to respond to the last five questions on the survey regardless of their indoor tanning practices. Nearly all respondents (98%) believe indoor tanning causes skin cancer and 75% believe skin cancer is not easily treated. Almost all respondents (97%) believe you can die from skin cancer and believe indoor tanning leads to premature wrinkling of the skin. Two-thirds of the respondents know of a family member, friend, classmate, or co-worker who has/had skin cancer.
Discussion

Four studies are currently published that use the modified CAGE and/or DSM-IV-TR questions for tanning. Only one study, Poorsattar and Hornung, focused on undergraduate students similar to this study (2007). When comparing the two studies, Poorsattar and Hornung found 76% of their female respondents had tanned while this study had similar findings of 72% (2007). Likewise, Poorsattar and Hornung found 12% of their female respondents had positive scores for the mCAGE questions and in this study, 14% were found to have positive responses. Warthan et al., Harrington et al., and Mosher et al., had mCAGE findings of 26%, 33%, and 31%, respectively (2005, 2010, 2010). However, although it appears those three studies had higher positive mCAGE responses and therefore higher incidences of problematic tanning behavior, this study only had three of the four questions mCAGE questions on the survey and therefore, the percentage of positive mCAGE responses could be closer to the other studies.

The mDSM-IV-TR responses were harder to compare with the other studies. Warthan, et al were the first to utilize this criteria but after a more thorough analysis by this author and a licensed psychologist, it was determined that not all of the questions asked by Warthan et al and subsequently this author could fit all the criteria for substance dependence. Specifically, Criteria 2a which pertains to withdrawal syndrome for the substance is not addressed in the questions. Criteria 2b was to be addressed by the survey question, Do you continue to indoor tan so your tan will not fade? However, it was determined by the psychologist that the question does not go far enough to address the last part of Criteria 2b, which is, is the substance taken to relieve or avoid withdrawal syndrome. Criteria 7 pertains to continued use by the individual despite them having knowledge that their physical or psychological problems are caused by the substance (DSM-IV-TR, 2000). The questions from the survey Do you believe you can develop skin cancer from indoor tanning? and Do you believe indoor tanning will lead to premature wrinkling of the skin? were to address Criteria 7. However, the psychologist did not think these questions went far enough to address the criteria thoroughly. The survey questions do not show
the individual believes skin cancer risk or current undesirable skin changes will happen to them as a result of their tanning behaviors. The survey questions only reflect their understanding of cause and effect in the general population, not of their own personal self. A third conflict in interpretation arose when comparing this study to the others. Criteria 5 pertains to the amount of time one spent in the activity and there are discrepancies as how to interpret it. Research has not yet shown how much time devoted to tanning would be deemed problematic or addictive, so this criterion is open to interpretation. Warthan et al. and Mosher et al. concluded an answer of one or more days a week spent tanning was a positive response for Criteria 5 (2005, 2010). This low threshold appears to set the participant up for falling under the category of having a tanning addictive disorder since it would require only two more positive answers to be labeled as such. Given that this author has already pointed out the loose application of survey questions for Criteria 2a, 2b, and 7, it is reasonable to conclude there may be false positives in the other published studies. However, Warthan et al. and Mosher et al. applied these survey questions to the DSM-IV-TR criteria for substance dependence (2005, 2010) and found 53% and 39% of their participants met the mDSM-IV-TR criteria for substance dependence, respectively (2005, 2010). Harrington, et al modified their questions to fit Criteria 2a, 2b, and 7 and found 41% of their participants met the DSM-IV-TR criteria for substance dependence (2010). For this current study, omitting positive responses for the controversial questions, 16% met the DSM-IV-TR criteria for substance dependence.

This study was fraught with limitations. Originally, the author wanted to have the survey presented to students in various classes in order to gain data from first year through fourth year students. This cross-section of data would allow for analysis that had potential to also gauge the influence of healthcare education on indoor tanning behavior. However, due to College of Nursing regulations, this was not feasible for the timeframe of this study. The author was only permitted to contact the students outside the classroom either in person or through email. The author and her
advisor determined that an email survey had the potential for decreased number of completed surveys and it would be difficult to verify the participants were nursing students. It was determined that the best way to approach nursing students would be before or after class. To eliminate duplicate participants and to maximize the number of potential participants that could be contacted within the shortest timeframe, it was decided to survey nursing students during finals week before and after their exams. Approaching the students after they have completed a two hour final exam appeared to have left many of them mentally exhausted and it reflected in their responses. Many did not fully complete the survey or returned the survey in a very short length of time that left doubt in the author’s mind that the participant fully read and understood the questions.

The survey was inherently biased as individuals could opt out from participating, and therefore, the random factor of the study was deleted. The survey did not embed questions and therefore, the participant was aware of the intent of the survey. Perhaps a future study will incorporate questions about smoking, alcohol consumption, sleep habits and exercise behaviors in order to reveal a more clear picture of individuals’ tanning practices.

Season played a large role in the type of responses that were collected. Originally, the author had intended to collect data at the end of the spring semester, however IRB approval was not granted in a timeframe that permitted it. It was hypothesized that data collected at the beginning of May would reflect the indoor tanning practices of the students during the winter season and spring break which are traditionally the busiest times of the year for indoor tanning. Once IRB approved the survey and procedures, the author was unable to modify the questions that would include winter and spring break tanning habits before collecting data in August. The participants’ responses would reflect largely their spring and summer tanning activities.

As previously mentioned, the omitted mCAGE question prohibited a more accurate observation of the participants’ indoor tanning habits. It is not unreasonable to assume that with 45% of the
respondents reporting at least one positive response, the percentage of participants with possible indoor tanning abuse could be higher than 14%.

The most limiting factor for this study is the screening tools themselves. This study was modeled after a published study that surveyed outdoor tanners. In order to compare results of indoor tanners with the Warthan study, the same questions were asked without regard to the possibility that the Warthan study may not have taken into consideration the limitations of the DSM-IV-TR criteria. As previously mentioned, it was clear after analyzing the questions more carefully, the DSM-IV TR questions did not adequately translate to accurately observe indoor tanning behavior that would fully meet all of the DSM-IV-TR criteria for substance dependence. This concern was also brought up in a more recent study by Harrington, et al (2010). Although the data did reflect 16% of the students having substance dependence to indoor tanning, it does not reflect the true amount that could potentially have a tanning disorder.

Given the many limitations of the study, there are a few positive aspects that were observed. Nearly all of the nursing students who had not indoor tanned in more than six months did not plan to indoor tan in the future (96%). The number one reason why they will not tan is because they know it is harmful to themselves (85%). The other positive reflection of nursing students in this study was nearly all of the students thought indoor tanning can lead to skin cancer and skin cancer can cause death. However, knowing skin cancer can occur in the population is one concept but understanding the reality that skin cancer can occur as easily in one’s self because of their behaviors is another concept not demonstrated in this study.

From this study, one of the greatest concerns was the majority of nursing students who stated they had indoor tanned were current tanners (62%) and 84% of them planned to continue indoor tanning in the next six months. The top three answers to continuing tanning were similar to the other tanning studies: for relaxation, feeling better about themselves, and to enhance their appearance.
However, these same students also stated they knew indoor tanning can lead to skin cancer and skin cancer can lead to death. This attitude of the nursing students reflects the attitude of many young women in America who tan (Hillhouse & Turrisi, 2002; Turrisi, 2004) despite their exposure to lectures on skin cancer as healthcare professionals. The majority of respondents were third year students. The timing of skin cancer lectures may fall more frequently in their fourth year and that may influence their perceptions about tanning. Perhaps further questioning as to their personal exposure during clinicals to individuals with skin cancer may show a difference in attitudes toward UV exposure.
Conclusions

This study has revealed a major flaw in the current trend to use psychological screening and diagnostic tools to label individuals with tanning disorders. A lack of consistent application of the tools has lead to varying results that cannot be applied to the general population in regards to tanning. Addressing the psychological aspects of tanning is warranted, however, utilizing tools that more accurately reflect legitimate substance abuse disorders may mislead the researchers to artificial trends in tanners. Determining the legitimacy of addictive tanning through more research that can more firmly support a biochemical process that induces UV addiction, then the psychological tools needed to assess individuals may become more accurate. At this point in time, research is attempting to push the proverbial “square peg in a round hole” by utilizing screening and diagnostic tools meant for other well-established medical conditions that may not accurately encompass the addictive tanning condition. The refinement of these tools will develop over time, but until then, caution is advised when applying these statistics to the general population.

This study confirmed that students in the healthcare field are not immune to tanning. The nursing students’ numbers reflect similarly to other studies in regards to the number of students who indoor tan and how many may possibly have a tanning disorder. They also exhibit similar reasons for initial and continued tanning. The nursing students also reflect the knowledge that indoor tanning is harmful and can cause death, however, they continue to engage in these behaviors. Because of these attitudes in nursing students, traditional knowledge-based education campaigns will most likely not change tanning behaviors. It will be essential to elaborate on early studies that show effective interventions are programs that focus on the negative consequences on appearance when exposed to UV in the short- and long-term.
References


doi:10.1001/archderm.141.8.963


Appendix A

Please circle the answer that best describes you

<table>
<thead>
<tr>
<th>Age:</th>
<th>Gender: Female</th>
<th>Year in undergraduate nursing program:</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-19</td>
<td></td>
<td>1st year</td>
</tr>
<tr>
<td>20-21</td>
<td>Male</td>
<td>2nd year</td>
</tr>
<tr>
<td>22-23</td>
<td></td>
<td>3rd year</td>
</tr>
<tr>
<td>24-25</td>
<td></td>
<td>4th year</td>
</tr>
<tr>
<td>&gt; 25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Have you had lectures on dermatology: Y / N
Have you had lectures on skin cancer: Y / N

Circle the skin type that best describes how you react to sun exposure:

I. Always burn, never tan
II. Always burn, rarely tan
III. Sometimes burn, often tan
IV. Rarely burn, always tan
V. Never burn, always tan

Have you ever indoor tanned? Y / N
If no: please skip to Question #15
If yes: When was the last time you indoor tanned? Please circle one

This week  Last week  Past month  Past six months  Past year  More than a year

If you have NOT indoor tanned in more than 6 months, please answer Questions A & B below:

A. Why did you previously indoor tan? Please circle all that describe you
   Special Occasion  Social Activity with Friends  Enhance everyday appearance
   Relaxation  Reduce stress in life  Feel better about myself

B. Do you plan to indoor tan in the next six months?
   Yes  No
i) If Yes, please state why you plan to indoor tan:  ________________________________
   Please continue the survey at Question #15
   ii) If No, why do you plan NOT to indoor tan? Please circle all that describe you
   Costs too much  Not enough time  Don’t like the way I look
   Can’t find a salon I like  Think it’s not good for me  Other reasons:  ____________
   Please continue the survey at Question #15

If you have indoor tanned within the past six months, please answer the following questions:

1. Do you think you need to spend increasing amount of time tanning to maintain your tan?
   Yes  No

2. Do you think your tan will fade if you spend the same amount of time in the tanning bed each time?
   Yes  No

3. Do you continue to indoor tan so your tan will not fade?
   Yes  No

4. When you go to the tanning salon, do you usually spend more time in the tanning bed than you had planned?
   Yes  No
5. Do you try other non-tanning related activities, but find you really still like spending time in the tanning bed best of all?
   Yes  No

6. How many days a week do you indoor tan?
   0  1  2  3  4  5  6  7

7. Do you tan all year round?
   Yes  No

8. Have you ever missed work, school, or a social activity because of a sunburn?
   Yes  No

9. Have you ever missed work, school, social activity or an appointment because you decided to indoor tan?
   Yes  No

10. Do you ever get irritated when people tell you not to indoor tan?
    Yes  No

11. Do you ever feel guilty after you indoor tan?
    Yes  No

12. Do you ever feel the need to go indoor tan right after waking up?
    Yes  No

13. Do you plan to indoor tan in the next six months?
    Yes  No

14. Why do you indoor tan? circle all that describe you
    Relaxation  Enhance appearance  Feel better about myself
    Something to do with friends  Decrease anxious feelings Other reasons:_____________

15. Do you believe you can develop skin cancer from indoor tanning?
    Yes  No

16. Do you believe skin cancer can be easily treated?
    Yes  No

17. Do you believe you can die from skin cancer?
    Yes  No

18. Do you know of a person (family member, friend, co-worker, classmate) who has/had skin cancer?
    Yes  No

19. Do you believe indoor tanning will lead to premature wrinkling of the skin?
    Yes  No

***END OF SURVEY***

Thank you for taking the time to fill out this survey. Best wishes on your careers as future nurses!
Appendix B

Department of Dermatology
3120 Glen live Avenue
Kruppert Health Center Room 0012
Toledo, Ohio 43614
Phone 419-383-3781

Subject Information Sheet for
The Correlation between Levels of Healthcare Education and Tanning Practices of Undergraduate Nursing Students

Dear Nursing Students,

Purpose: You are invited to participate in the research study which is being conducted at the University of Toledo under the direction of Dr. Lorie Gottwald and Shannon Von Gunten. The purpose of this study is to learn more about the indoor tanning practices of young women.

Description of Procedures: This research study will take place in the hallways outside of the nursing lecture classrooms before and/or after classes. You will be asked if you would like to complete a written anonymous survey about indoor tanning practices. Shannon and/or her colleague will be present to handout surveys and answer questions. They will have on UT ID badges to denote their affiliation with the university. The survey will take approximately 5-7 minutes to complete and will be collected at that time in a large unmarked envelope.

Potential Risks: There is minimal (if any) risk to participation in this study but you may choose to stop participation at any point.

Potential Benefits: The only direct benefit to you if you participate in this research may be learning about how survey research is conducted. You may also learn about current tanning practices and the risks of tanning. Others may benefit by learning about the results of this research.

Confidentiality: The researchers will make every effort to prevent anyone who is not on the research team from knowing that you provided this information, or what that information is. The survey responses will not include names or other personal identifiers and will be presented to others only when combined with other responses.

Voluntary Participation: If you decide not to participate in this study, there will be no penalty or loss of benefits to which you are otherwise entitled and will not affect your relationship with The University of Toledo or any of your classes. In addition, you may discontinue participation at any time without any penalty or loss of benefits.

Contact Information: Before you decide to accept this invitation to take part in this study, you may ask any questions that you might have. If you have any questions at any time before, during or after your participation you should contact a member of the research team;

Lorie Gottwald, M.D. Principal Investigator 419-383-3781
Shannon Von Gunten Student Investigator 440-714-2801

UT IRB #107357
Version Date: 06/13/2011
Subject Information Sheet

APPROVED BY
UNIVERSITY OF TOLEDO IRB
Abstract

**Objective:** To observe current indoor tanning practices of undergraduate nursing students at University of Toledo and compare them to similar studies using modified substance dependence/abuse tools.

**Methods:** Paper surveys were distributed to the upperclassmen nursing students that asked the CAGE and DSM-IV-TR substance dependence criteria questions modified for indoor tanning behaviors.

**Results:** Of the 111 participants, 14% had positive mCAGE for possible tanning abuse and 16% had positive mDSM-IV-TR for possible addictive tanning disorder. Only one participant had a positive mCAGE screening result and positive mDSM-IV-TR result.

**Conclusions:** mCAGE results are similar to other studies for possible tanning and substance abuse. There is wide variation with mDSM-IV-TR results between similar studies. A more consistent questionnaire to address tanning behaviors is warranted.