Visual and Text Coverage of Skin Cancer and Recreational Tanning in Popular North American Magazines from 2000 to 2012

by

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AUTHOR'S DECLARATION

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be electronically available to the public.

STATEMENT OF CONTRIBUTIONS

This thesis contains material all of which I authored or co-authored. I would like to acknowledge Dr. Hoffman-Goetz as a co-author who contributed to the research publications (Chapters 3 to 8) described in this thesis. For each publication I was the lead author. In this role I: collected necessary background information and reviewed relevant literature, conceptualized and designed the studies, collected the data, analyzed and interpreted the data, wrote the articles, and revised the articles based on feedback from my supervisor/co-author.

In two cases, the journals within which the co-authored publications of this thesis appear required authorship statements of their own. These include:

BMC Public Health (Chapter 2): Both authors (JEM, LHG) contributed substantially to: the conception, design, analysis, and interpretation of data; the drafting of the manuscript and its revisions; and the approval of the final version. JEM led the conceptualization, data collection and analysis, interpretation of findings, and writing of the article. LHG co-led study conception, analysis, and interpretation of findings, and helped write and review the article. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Skin cancer is the most common type of cancer in North America and its incidence is increasing globally. It is a largely preventable disease through avoiding ultraviolet (UV) exposure and, when detected early, survival is high. The public's knowledge about skin cancer is poor, and sun protection behaviours and early detection through skin self-examination are infrequent. Moreover, despite the 2006 International Agency for Research on Cancer's (IARC) report linking indoor tanning and skin cancer, and the classification of indoor tanning as carcinogenic by IARC in 2009, the behaviour remains popular. The mass media is a popular and influential source of health information, including about skin cancer. Moreover, magazines are an important source of information about aesthetic ideals for the body, including tanned skin. Articles in the mass media often are accompanied by visual images, which can influence health behaviours. Little is known about mass media coverage (both article text and images) on skin cancer and tanning.

Objectives: The primary objectives of this doctoral research were to: describe and analyze how popular North American magazines report on skin cancer and recreational tanning (i.e., risk factors, UV behaviours, and early detection information); determine how magazine coverage has changed over time relative to the 2006 IARC report linking indoor tanning and skin cancer and the 2009 classification of tanning beds as carcinogenic; test how coverage differed by content type (text vs. images) and target audience (women vs. men, women vs. teenage girls, Canadians vs. Americans); and

determine the extent to which constructs from the Health Belief Model (HBM) were conveyed in articles and images about skin cancer and tanning.

Methods: Popular Canadian and U.S. magazines (n = 31) were selected for inclusion based on circulation, genre, and target audience. Using online databases and tables of contents, the magazines were searched for articles about skin cancer and tanning published between 2000 and 2012. Articles and their accompanying images were obtained from online databases and library archives. The quantity of articles and images published were determined and, using directed content analysis, detailed information was collected from articles and images. Descriptive statistics were used; chi-square and Fisher's exact tests enabled comparisons. The codebooks were developed based on previous research and the HBM constructs. Inter-rater reliability was conducted using a 10% sample of articles (n = 86) and images (n = 127) and kappa scores were high (0.82 to 1.00).

Results: Between 2000 and 2012, 855 articles (and 1372 accompanying images) were published about skin cancer and tanning in 31 popular North American magazines. The total number of articles about skin cancer and tanning increased modestly after (n = 410) compared to before (n = 351) the IARC report ($\chi^2 = 4.57$, $df = 1$, $p < .05$); however, key IARC report messages (e.g., avoid indoor tanning, UV exposure as a risk factor) were no more likely to be reported after than before the report. Magazines were more likely to encourage sunscreen use and less likely to promote the tanned look as attractive after the IARC report. The was no change in volume of coverage on skin cancer and recreational tanning before the 2009 classification of tanning beds as carcinogenic (n = 212) vs. after the classification (n = 198) ($\chi^2 = 0.48$, $df = 1$, $p = .49$). Key related messages (UV

exposure is a risk factor; avoid indoor tanning) were not reported on more frequently after the classification, but the promotion of the tanned look as attractive was conveyed more often afterwards, as was the use of high Sun Protection Factor (SPF) sunscreens. In terms of overall coverage of the variables of interest, UV exposure was the most common risk factor mentioned (37.7%) and sunscreen use the most common protection behaviour encouraged (60.0%); coverage of other risk factors and UV protective or avoidance behaviours was uncommon. Just 21.1% of articles, and even fewer images (7.0%), contained information about early detection. For nearly all variables, article text contained more information about risk factors, behaviours, and early detection compared to images. An important exception was that a greater proportion of images (36.9%) promoted the tanned look compared to text (25.2%). Women's magazines (n = 456) published more articles than men's magazines (n = 125) (χ^2 = 188.57, df = 1, p < .0001) and the nature of the messages differed between them (e.g., women's magazines more often promoted the tanned look, men's magazines more often promoted protective clothing). Women's magazines also published more articles about skin cancer and tanning (n = 79) than teenage girl's magazines (n = 43) (χ^2 = 10.62, df = 1, p = .001), with important differences in coverage (e.g., girls' magazines more often discouraged indoor tanning). There was no significant difference in the quantity of articles published in Canadian (n = 154) vs. U.S. magazines (n = 178) (χ^2 = 1.74, df = 1, p = .188), but the nature of the coverage differed (e.g., there was a greater emphasis on risk factors and early detection in U.S. coverage). Regarding the HBM constructs, perceived susceptibility (48.1%) and severity (60.3%) information was common in text. Perceived benefits (36.4%) and barriers (41.5%) to prevention of skin cancer were equally

mentioned in articles; barriers to prevention were also depicted in images (31.7%). Self-efficacy information focused on prevention (48.4%). There was little emphasis on HBM constructs related to early detection and few explicit cues to action. In most cases, HBM constructs were present to a significantly greater extent in text compared to images.

Conclusions: Coverage focused narrowly on one risk factor (UV exposure) and one behaviour (sunscreen use), while simultaneously promoting the tanned look as attractive and containing little information about early detection. Key international public health reports and decisions had limited impact on magazine coverage of skin cancer and tanning. Women were targeted with more and different information compared to men. Visual images infrequently offered helpful information and even promoted unhealthy UV behaviours. Magazine skin cancer and tanning content may contribute to inaccurate public understanding of risks, prevention, and early detection, and may not contain sufficient information to positively influence healthy skin behaviours. Cancer educators, public health communication specialists, and journalists should work together to improve mass media messages around skin cancer and tanning.

Future Directions: This body of research is the largest content analysis on magazine coverage of skin cancer and recreational to date and one of the only to include visual images. Two promising areas for further study are: to examine skin cancer and tanning messages in social and online media; and to assess the impact of mass media information on the public's knowledge and behaviours about skin cancer and recreational tanning.

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LIST OF ABBREVIATIONS

ABCD, Asymmetry, Border, Color, Diameter

AAD, American Academy of Dermatology

AST, Agenda Setting Theory

HBM, Health Belief Model

IARC, International Agency for Research on Cancer

SPF, Sun Protection Factor

SMOG, Simple Measure of Gobbledygook

SSE, skin self-examination

US, United States

UV, ultraviolet

WHO, World Health Organization

CHAPTER 1: LITERATURE REVIEW

1.1 Introduction and Overview

Skin cancer is the most common type of cancer in North America (Canadian Cancer Society, 2014; Rogers et al., 2010). The rising incidence of skin cancer is likely due to a parallel increase in exposure to ultraviolet (UV) radiation exposure from the sun and indoor tanning devices. UV exposure from the sun is the main cause of skin cancer. However, the use of indoor tanning devices is a common behaviour (Wehner et al., 2014), despite being the focus of health policy and legislative efforts to restrict access among minors and being classified as carcinogenic (El Ghissassi et al., 2009). Avoiding, or protecting oneself from, UV exposure helps to reduce the risk of skin cancer. Of equal importance is early detection, since skin cancer is highly treatable if caught early.

The mass media is an important and influential source of cancer information for the public and can potentially influence the health policy agenda. People's health knowledge, attitudes, and behaviours are frequently shaped by information conveyed through mass media communication channels. The mass media conveys this information through a variety of formats; in print media, this is through text and visual images. Despite skin cancer's significance as a public health problem, and the known importance of the role of media in shaping health policy and behaviours, relatively little is known about how skin cancer is reported on in the popular media.

The purpose of this literature review is to provide a brief background on: 1) skin cancer as a public health problem; 2) associated risk, prevention, and screening behaviours; 3) the issue of artificial UV radiation exposure through indoor tanning beds; 4) cultural beauty ideals of

suntanned skin; 5) the mass media as a source of skin cancer information; 6) the persuasive power of visual images in health communication contexts; 7) the important role visual images play in communicating information about skin cancer and recreational tanning; and 8) a summary of what is known to date about mass media reporting on skin cancer and recreational tanning. While not a systematic or comprehensive literature review, this chapter serves as an overview of the most salient evidence and contextualizes the doctoral thesis research. Example search terms used to uncover the research in this overview included, for example: skin cancer, melanoma, mass media, magazine, visual communication, health communication, behaviour, cancer information, indoor tanning, and beauty. This chapter begins with a description of the scope of skin cancer as a public health issue in North America.

1.2 Skin Cancer in North America

To understand the skin cancer burden for North American populations, the different types of skin cancer are first described. Skin cancer is usually divided into two main types: non-melanoma skin cancer and melanoma skin cancer (Canadian Dermatology Association, 2015). Non-melanoma skin cancer can occur anywhere on the skin, but typically is found on areas of the skin that are exposed to UV radiation. Non-melanoma skin cancer is further classified into two main sub-types: basal cell and squamous cell carcinomas. Basal cell carcinoma, originating in the basal cells of the skin (i.e., the lower layer of the epidermis or outer skin layer), is the most common form of skin cancer and is the least dangerous (Canadian Dermatology Association, 2015). Basal cell skin cancers grow slowly and rarely spread to other parts of the body (American Cancer Society, 2015a). Squamous cell carcinoma, originating in the squamous cells of the skin (i.e., the upper layer of the epidermis or outer skin layer), is the second most common

form of skin cancer (Canadian Dermatology Association, 2015). It is more likely to grow and metastasize to other parts of the body compared to basal cell carcinoma (American Cancer Society, 2015a). Melanoma skin cancer is cancer that begins anywhere on the skin in a particular type of skin cell called melanocytes, which are the cells that give the skin pigmentation (American Academy of Dermatology, 2015a). A key distinguishing factor between melanoma skin cancer and non-melanoma skin cancer is that at the population level, the melanoma incidence rate is low, but the mortality rate is high; in contrast, non-melanoma skin cancer has a high incidence rate in the population but a low mortality rate. Moreover, non-melanoma skin cancer can almost always be easily and successfully treated (Canadian Cancer Society, 2014).

On a global basis, it is estimated that between 2 and 3 million non-melanoma skin cancers and 132,000 melanoma skin cancers occur each year (World Health Organization, 2014). In Canada, for 2014, there were 6,500 melanoma cases and 1,050 deaths (Canadian Cancer Society, 2014). In the U.S., also for 2014, there were 76,100 melanoma cases and 9,710 deaths (American Cancer Society, 2015b). Melanoma skin cancer affects more men than women and men are more likely to die from melanoma than women (Canadian Cancer Society, 2014). For Canada, in 2014, the incidence rate of melanoma was estimated at 14.7 new cases per 100,000 for men and 11.9 cases per 100,000 for women; the mortality rate was estimated to be 3.2 deaths per 100,000 for men and 1.6 deaths per 100,000 for women (Canadian Cancer Society, 2014). This gender differential may be due to UV exposure and delays with screening.

Non-melanoma skin cancers (basal and squamous cell carcinoma) are more common but have a lower mortality rate in North American populations. It is estimated that 76,100 cases (440 deaths) of non-melanoma skin cancer occur annually in Canada (Canadian Cancer Society, 2014) and about 3.5 million occur annually in the U.S. (Rogers et al., 2010). Although non-melanoma

skin cancer is not usually fatal, it still carries significant health burdens and results in direct and substantial financial costs to the health care systems in the U.S. (Bickers et al., 2006) and Canada (Krueger, Williams, Chomiak, & Trenaman, 2010). In Canada, for 2004, skin cancer care cost $532 million, a value which is expected to increase to $922 million per year by 2031 (Krueger et al., 2010). In the U.S. the average annual cost of skin cancer treatment was $8.1 billion during the period from 2007 to 2011 (Guy, Machlin, Ekwueme, & Tabroff, 2015).

1.3 Skin Cancer Risk Factors and Behaviours

There are a number of key risk factors for non-melanoma skin cancer. These include: being exposed to the sun and/or other sources of UV radiation; having light-coloured skin, eyes, and hair; having a personal history of skin cancer; having had prior radiation therapy; having been exposed to certain chemicals (e.g., arsenic); having precancerous skin lesions (dysplastic nevi); and/or having a weakened immune system (Canadian Cancer Society, 2015a). Key risk factors for melanoma include: being exposed to solar and/or artificial UV radiation; having atypical moles or more than 50 moles; having light-coloured skin, eyes, and hair; having a personal or family history of skin cancer; having a weakened immune system; having certain inherited conditions (e.g., xeroderma pigmentosum); and/or having a history of severe and blistering sunburns (Canadian Cancer Society, 2015b). Of these, UV exposure and avoidance of sunburns stand out as key modifiable risk factors through health behaviour choices.

Skin cancer is largely preventable and early detection plays an important role towards ensuring the best possible outcome for those who develop skin cancer, especially melanoma. Examples of behaviours which help prevent skin cancer include avoiding UV exposure (sun and

indoor tanning beds), and, when it is unavoidable, wearing a hat, protective clothing, sunscreen, and seeking shade (Canadian Cancer Society, 2015c, 2015d; American Academy of Dermatology, 2015b).

Early detection of skin cancer, especially melanoma, is important because it is associated with better prognosis and lower mortality (Berwick et al., 1996; Kirsner et al., 2005; Weinstock, 2000). Early detection includes monitoring of the skin for abnormal or changing skin lesions through skin self-examination (SSE) (Berwick et al., 1996; Kersner et al., 2005) and via regular visits to the dermatologist or primary care physician (Weinstock, 2000). Dermatologists recommend early detection and screening for skin cancer because the number of deaths from melanoma would be much lower if the public knew the warning signs and how to examine their own skin for signs of skin cancer (American Academy of Dermatology, 2015c). Knowledge about risk factors, and engagement in both prevention and early detection behaviours, are essential target areas for focused health communication efforts.

1.4 Skin Cancer and Artificial UV Exposure

UV exposure is the most important risk factor for both melanoma and non-melanoma skin cancers (IARC, 2000; Armstrong & Kricker, 2001). UV radiation to the skin damages DNA in skin cells, producing genetic mutations that can lead to skin cancer (Skin Cancer Foundation, 2015). Through the same process, UV radiation also plays a role in premature skin aging (Skin Cancer Foundation, 2015). UV radiation, both solar and artificial, is classified as a known human carcinogen by the World Health Organization (El Ghissassi et al., 2009) and UV exposure is strongly linked to the etiology of skin cancers (World Health Organization, 2014). While most

people are primarily exposed to solar UV radiation, some people elect to receive significant UV exposure from artificial sources, particularly indoor tanning beds (WHO & IARC, 2006).

The International Agency for Research on Cancer (IARC) identified artificial UV radiation through indoor tanning and the etiology of skin cancer as a priority area for research and policy efforts (WHO & IARC, 2006). After conducting a systematic review, the authors of a 2006 IARC report found that there is an increased risk of melanoma skin cancer associated with early age (less than 30 years) at first use of indoor tanning beds and an increased risk of non-melanoma skin cancer (primarily squamous cell carcinoma) associated with indoor tanning bed use. The authors of the report concluded that there is strong causal plausibility between indoor tanning bed use and skin cancer etiology (melanoma and squamous cell carcinoma). As a result, the WHO and IARC encouraged the development and implementation of policy interventions to discourage indoor tanning bed use, especially among minors and young adults (IARC, 2006). Towards this end, in 2009 the WHO/IARC named UV exposure from artificial indoor tanning devices as a Group 1 carcinogen – the same category as tobacco cigarettes (El Ghissassi et al., 2009). Not only does artificial UV exposure lead to morbidity and mortality related to skin cancer as indicated by the results of the IARC report, but it also results in significant costs to governments. While the very significant average annual financial costs of skin cancer treatment in North American have been outlined earlier, there has been an Australian study examined the cost of treatment for those skin cancers linked exclusively to tanning salon use: these skin cancers alone are thought to cost the health system approximately $3 million annually (Gordon, Hurst, Gies, & Green, 2008).

The results of the 2006 IARC report are worrying given that tanning bed use is prevalent in North America, especially among youth (Demko, Borawski, Debanne, Cooper, & Stange,

2003). It is estimated that about 30 million people in the U.S. use indoor tanning devices annually (Kwon et al., 2002); 35% of U.S. adults, 59% of college students and 17% of teenagers report using a tanning bed in their lifetime (Wehner et al., 2014). Over 25% of Canadian women ages 16 to 24, and 15% of women ages 25 to 44, use indoor tanning equipment (National Skin Cancer Prevention Committee, 2010). The main users of tanning beds are women, although they are also used by men (Choi et al., 2010). The size and influence of the indoor tanning industry should not be underestimated – it is reported to have an annual estimated revenue of $5 billion in the U.S. (Demierre, 2003) and $1 billion in Canada (Blackwell, 2013). Indoor tanning facilities are widely available in North America, which partly explains their high usage among the population. For example, the number of indoor tanning salons in most large U.S. cities exceeds the number of other popular businesses, such as McDonald's or Starbucks (Hoerster et al., 2009).

There has been a recent push towards new and stricter legislation of tanning salons, including banning minors from using them in 11 U.S. states (National Conference of State Legislatures, 2015) and five Canadian provinces (Pawlak et al., 2012; CBC News, 2014). Nevertheless, tanning salons largely remain poorly regulated, often merely by voluntary guidelines (Health Canada, 2005). Research also indicates that tanning salons generally do not adequately inform patrons of the skin cancer risks associated with artificial UV exposure either verbally or through signage (Brouse, Basch, & Neugut 2011; Canadian Cancer Society, 2008). Moreover, in instances where signage is posted in tanning salons, it has been noted as difficult to notice by users (Brouse et al., 2011; Canadian Cancer Society, 2008) and even newly designed warning labels are only text-based (Health Canada, 2014a; Health Canada, 2014; U.S. Food and Drug Administration, 2014). Further, the indoor tanning industry uses similar advertising tactics as the tobacco industry, such as mitigating health concerns and promoting it as fashionable

(Greenman & Jones, 2009), which competes with the health warnings on such labels. If the tanning industry is not informing users of the risks associated with UV radiation from indoor tanning beds, it is unclear where the public would get this information. Unintentionally, users of tanning beds (and potential users) may be making uninformed, and possibly dangerous, health decisions regarding UV exposure and skin cancer risk.

1.5 Cultural Beauty Ideal of Suntanned Skin

Tanned skin is a cultural beauty ideal in North America (Hunt, Augustson, Rutten, Moser, & Yaroch, 2012). Before the 1900s, having fair skin was considered fashionable, beautiful, and was even thought to be indicative of high social standing. Having tanned skin, in contrast, was associated with outdoor manual labour and was thus considered undesirable in comparison (Segrave, 2005). The transition from a pale ideal to a tanned ideal was facilitated by a number of social factors including: changes in labour (outdoor manual labour shifting to indoor labour), growth of outdoor leisure time, changing medical paradigms, and trends in fashion (Chang et al., 2014; Segrave, 2005; Hunt et al., 2012). A recent historical analysis indicates that each of these changes correlates with a parallel increase in melanoma incidence (Chang et al., 2014).

In the early 20th century, physicians began endorsing UV exposure to treat a variety of ailments and for the general promotion of health (Chang et al., 2014; Albert & Ostheimer, 2002). The number of articles and advertisements promoting the "advantageous" aspects of tanned skin in fashion magazines began to increase in the late 1920's (Martin et al., 2009). The facilitation of the transition to a bronzed skin ideal as fashionable is attributed to fashion designer Coco Chanel

who declared, “The 1929 girl must be tanned. A golden tan is the index of chic!” (Vannini & McCright, 2004, p. 311). It was at this time that tans were linked to leisure activity, vacationing, beauty, and wealth (Vannini & McCright, 2004; Segrave, 2005). It was thus considered attractive and desirable to have a suntan (Segrave, 2005). By the 1960s, tanned skin had replaced pale skin as a cultural symbol of leisure time, wealth, and health (Andrieu, 2009) and swimwear designs, particularly the bikini for women, left more skin exposed to the sun (Chang et al., 2014). Gloria Steinem, a journalist, feminist, and political activist, summed up the allure of the tan, and the willingness of people to go to great lengths to achieve one, when she wrote, “Nothing is as transient, useless, or completely desirable as a suntan. […] A tan, they say, is healthy. […] What a tan will do is make you look good, and that justifies anything.” (Steinem, 1963, p. 2).

The allure of the tan still exists today and continues to be conflated with health. For example, studies have shown that many people think tans look healthy (Banerjee, Campo, & Greene, 2008; Merten, Higgins, Rowan, & Ragle, 2014). Further, many health clubs and fitness facilities contain indoor tanning facilities (GoodLife Fitness, 2015; Anytime Fitness, 2015) thereby juxtaposing health action with tans. People who want to have the look of a tan attain this through solar UV radiation exposure, artificial UV radiation exposure (i.e., indoor tanning bed use), or through topical application of cosmetic products (i.e., bronzing make-ups or self-tanners). The first two of these avenues temporarily darken the skin by exposing it to UV radiation – both confer increased skin cancer risk. Self-tanners temporarily darken the colour of the skin through a chemical reaction: “sunless tanners” contain a chemical called dihydroxyacetone, which reacts with amino acids in the upper layer of the skin to form brown-black coloured compounds which deposit in the skin (Balk, 2011). Topical application of self-tanners is generally considered safe – it is approved for use as a tanning agent by the U.S. Food

and Drug Administration – (Balk, 2011) and their use (when paired with sunscreen) has been suggested by the American Academy of Dermatology as an alternative to indoor tanning (American Academy of Dermatology, 2015b). However, long-term health effects of self-tanners are not well established, especially for sprays compared to lotions (Dayton, 2011). Bronzing products, on the other hand, tint the skin with water-soluble dyes and are readily removed with soap and water (Balk, 2011).

People indicate they choose to tan because it will make them look attractive. The tanned beauty ideal and outward appearance is a primary motivator for people to use indoor tanning devices (Lazovich et al., 2004; Cafri, Thompson, & Jacobsen, 2006). Enforcement and emphasis of these tanned beauty ideals by the mass media, including popular magazines, are important channels of cultural "normative" beauty ideals (Wolf, 1997). Appearance reasons have been suggested to mediate the relationship between media influence and UV exposure and sun protection (Cafri et al., 2006).

1.6 Mass Media and Cancer Information

Mass media refers to the primary means of mass communication to people collectively through sources such as newspapers, magazines, and television (Oxford English Dictionary, 2012). The public frequently obtains information about health from the mass media (Bennett, 1999). In fact, the mass media is considered a main source of health and disease information, at least as much as, or even more so, than health care providers (Hofstetter, Schultze, & Mulvihill, 1992). The public carefully follows mass print media for health news; this is especially true for magazines (Doherty, 2004).

Health information in the mass media is an important resource for both those who are passively exposed to, and those who actively seek, information about cancer (Napoli, 2001). The mass print media (i.e., newspapers, magazines) is largely a passive form of health information; those who actively seek health information, such as when they are experiencing disease symptoms or have received a diagnosis, tend to rely on other sources, such as the Internet (Carlsson, 2000). Sun protection and skin cancer information are mainly acquired passively through the mass media, including print (Eadie & MacAskill, 2007). Given the importance of prevention and early detection behaviours for skin cancer, the mass print media occupies a unique role where information about these behaviours can be provided to people who may be at risk, but are not actively seeking health information from other sources. This is illustrated by the following example: an individual at risk for skin cancer might not actively Google symptoms if they are symptom-free; however, they might serendipitously read an article about skin cancer that is found in a magazine that is otherwise of interest to them.

The mass media is an important source of cancer information including for detection and prevention of cancer (O'Keefe, Boyd, & Brown, 1998; Meissner, Potosky, & Convissor, 1992; Cline & Haynes, 2001; Friedman & Hoffman-Goetz, 2003). Cancer in the mass print media has been studied previously, including the coverage of: breast cancer in magazines (Blanchard, Erblich, Montgomery, & Bovbjerg, 2002; Black, 1995; Clarke, 1999a; Donelle, Hoffman-Goetz, & Clarke, 2004), cancer in Canadian women's magazines (Hoffman-Goetz & MacDonald, 1999), colon cancer in women's magazines (Gerlach, Marino, Weed, & Hoffman-Goetz, 1997), prostate and colon cancer in popular magazines (Katz et al., 2004; Clarke, 1999b), testicular cancer in magazines (Clarke & Robinson, 1999), and skin cancer in magazines and other forms of mass media (Cho, Hall, Kosmoski, Fox, & Mastin, 2010; Stryker, Solky, & Emmons, 2005).

The cancer types that have been most frequently covered in popular magazines have been breast, colorectal, skin, prostate, and ovarian cancers (Clarke & Everest, 2006). In newspapers, the most common cancer types receiving coverage between 2002 and 2003 were breast, colon, prostate, lung, and brain cancer; in news magazines, for the same time period, the most common cancer types reported on were breast, prostate, cervical, colon, lung, and skin cancer (Slater, Long, Bettinghaus, & Reineke, 2008). The incidence of media reports about cancer more than tripled between 1991 and 2001, which was mainly attributable to an increase in breast cancer coverage (Clarke & Everest, 2006). Despite the media increase in the volume of reporting on cancer, information about behaviours related to cancer prevention and screening, strategies or skills for performing behaviours, and mobilizing information were uncommon in the content (Moriarty & Stryker, 2008; Stryker et al., 2005; Stryker et al., 2007; Hoffman-Goetz & Macdonald, 1999). To a large extent, the media coverage has focused on causes and treatment rather than prevention information (Slater et al, 2008).

The content of mass media cancer information can impact health-related knowledge and health behaviours. Mass print media coverage of health risks can potentially influence public policy and individual behaviour (Yanovitsky & Bennett, 1999; Yanovitzky, 2002). For example, one study (albeit older) found that people who reported the mass media as the most important source for health information were more likely to be knowledgeable about cancer screening than those who reported relying on a doctor for similar information (Meissner et al., 1992). Media coverage of breast cancer has been associated with an uptake of mammography for breast cancer screening (Yanovitzky & Blitz, 2000). Moreover, when the media covers a celebrity who has, or is raising awareness about, a particular type of cancer, subsequent increases in cancer screening

behaviours have occurred (Nattinger, Hofmann, Howell-Pelz, & Goodwin, 1998; Brown & Potosky, 1990; Cram et al., 2003; Chapman, McLeod, Wakefield, & Holding, 2005).

The mass media is an important outlet for health communication in part because it is significantly less costly – indeed, sometimes free – compared to expensive local or national campaigns, which may use up large portions of public health communication budgets (Viswanath et al., 2006). Nonetheless, it is important to keep in mind that health education is not the primary purpose of the mass media. Magazines are owned by large media corporations whose purpose is to make a profit. To that end, magazines contain content that is attractive to readers, who then purchase the magazines. The cost of printing the magazine is offset by subscription fees for readers advertisers who purchase space within the magazine to promote their products to the readers. Thus, health communication content is, at best, secondary – even ancillary – to the main mission of magazines and mass media corporations.

Despite these caveats, the mass media has an important role in communicating about health, and cancer specifically, in order to inform the public and influence their health behaviours. One further important proviso remains: the use of mass print media for health information requires sufficient literacy skills to understand text prose. It has been recommended that health education materials be written at reading grade levels of five or six (Meade, McKinney, & Barnas, 1994; Hoffman-Goetz, Donelle, & Ahmed, 2014); however, print information about cancer and cancer-related issues is often written at much higher reading grade levels (reading grade levels of 12 or 13) (Abdelmutti & Hoffman-Goetz, 2009; Friedman & Hoffman-Goetz, 2003). This is concerning because nearly half of Canadians do not have the minimum level of literacy necessary to function well at work and in daily living (Hoffman-Goetz et al., 2014; HRSDC & Statistics Canada, 2005). The readability level of skin cancer information

in the mass print media is presently unknown, but much like other types of cancer information, it is likely too high for the general public.

1.7 Importance of Visual Images for Cancer Communication

While text information is critical for sharing cancer information with the public, it is also important to consider images and the visual information they communicate. There are several visual communication theories, and a growing body of research evidence, to support why the study of visual imagery accompanying cancer information is imperative. Two of these theories are described below: Visual Persuasion and the Pictorial Superiority Effect.

1.7.1 Visual Images and Communication

Visual images are powerfully persuasive: they can contribute to shaping attitudes, beliefs, and behaviours of individuals and populations. Lester (2006) refers to persuasion as the use of "factual information and emotional appeals to change a person's mind and promote a desired behavior" (p. 73). Visual persuasion focuses on how an image is communicated to and persuades the viewer (Foss, 2005). Persuasion, including visual persuasion, plays a significant role in marketing and advertising (Messaris, 1997) and in shaping health-related attitudes and behaviours. Visual Persuasion, however, is most often used implicitly in health research, and is sometimes embedded within other theories. For example, tobacco health warning labels (consisting of images and text) are placed on cigarette packages with the intention that they will persuade people to cease or avoid smoking; however, research in this area is usually guided by theories about fear appeals (e.g., Extended Parallel Process Model) (Hammond, 2011). For the tobacco warning labels fear induced by gruesome images is the persuasive tactic. Dixon and

colleagues (Dixon, Warne, Cully, Wakefield, & Dobbinson, 2011) used persuasion theory to inform research about the role of images of tanned models in the media on tanning attitudes and behaviours. Images of tanned models were persuasive: exposure to images of tanned models in women's magazines was associated with an increased likelihood of women attempting to get a tan.

One reason why visual images are persuasive may relate to how much attention they evoke in viewers compared to accompanying text information. Research has shown that people pay more attention to visual images than to text (Pieters & Wedel, 2004) and recall and recognition of visual information is greater than for verbal or text information. This latter aspect is known as the Pictorial Superiority Effect (PSE) (Paivio & Csapo, 1973). There are several reasons why images may be superior when it comes to attention, recall, and recognition. First, images are dual coded into verbal and visual memory (Paivio & Csapo, 1973), which thereby increases recall (Paivio, 1991). Second, images are cognitively encoded more uniquely than verbal or text information (Nelson, 1979). Further, images are more likely than text to access meaning in the brain during encoding (Weldon & Roediger, 1987). Although PSE has not been used explicitly in connection to visual images and health communication, this theory has been used implicitly in some health communication research. For example, Emmons et al. (2011) used the PSE to inform their research on sun protection, sunburns, and skin self-examinations among beachgoers. These researchers tested the effectiveness of a text-based educational program to influence sun protective attitudes and intentions with and without accompanying visual images (i.e., photographs). They found that the program that included visual images led to increased sun protection behaviours, fewer sunburns, and an increased perceived risk of skin cancer.

Visual images are pervasive in the mass media, are a compelling format for communication (Messaris, 1997), and are of particular importance because they can shape the interpretation of text information attended to by the reader. People often accept visual images as reality (Messaris & Abraham, 2001) and visual images convey non-verbalized meaning (Messaris & Abraham, 2001). When accompanying mass media article text, images are crucial to consider for several reasons. First, photographs may be noticed and processed even if the accompanying article is not read (Messaris & Abraham, 2001). Second, when the article is read, photographs aid readers to interpret the mass media story (Messaris & Abraham, 2001). Third, visuals can influence a reader's perceptions of otherwise neutral mass media content (Gibson & Zillman, 2000; Zillman, Gibson & Sargent, 1999). In fact, researchers have concluded that "reactions to featured photographs shift the primarily text-based perceptions and evaluations of issues in the direction suggested by the photographs" (Gibson & Zillman, 2000, p. 355). It is, therefore, not unreasonable to assume that visual images accompanying print articles about skin cancer and tanning have a significant impact on readers' attention to and processing of health content.

1.7.2 Visual Health Communication

Visual Health Communication is defined as "an area of theory, research, and practice that involves the use of visual imagery (e.g., photographs, illustrations, maps, graphs, diagrams) to convey information about health and disease in order to improve health-related knowledge, attitudes, and behaviours of individuals and populations" (McWhirter & Hoffman-Goetz, 2014, p. 14). Visual images affect attention, recall, and comprehension of health information as well as health behaviours (Houts, Doak, Doak, & Loscalzo, 2006). Specific examples of areas in which

images have been studied include their effectiveness towards inhibiting the use of tobacco products (Hammond, 2011), increasing the comprehension of medical and pharmaceutical instructions for patients (Morrow, Hier, Menard, & Von Leirer, 1998; Delp & Jones, 1996), and motivating the performance of breast self-examination (Hall, 1992). Visual images are particularly important for aiding the understanding of written health information for people with low literacy (Houts et al., 2006; Michielutte, Bahson, Digman, & Schroeder, 1992). Thus, the presence and appearance of visual images in mass print media about skin cancer and skin cancer behaviours are important considerations that frame the text content they accompany.

1.7.3 Visual Health Communication and Skin Cancer Behaviours

Visual images influence skin cancer prevention and screening behaviours. A recent systematic review found that visual images improve UV exposure attitudes and behaviours in a direction which encourages skin protection and UV avoidance (McWhirter & Hoffman-Goetz, 2013a). A number of different types of images emerged as effective in promoting skin health including UV photographs depicting skin damage, images of photoaging, graphic images of skin cancer, and images of attractive models or celebrities without tans. These images were found to influence a variety of skin cancer related behaviours. For example, UV photographs were linked to decreased sunburns (Emmons et al., 2011; Pagoto, Schneider, Oleski, Bodenlos, & Ma, 2010), decreased tanning bed use (Gibbons, Gerrard, Lane, Mahler, & Kulik, 2005), and increased sun protective behaviours such as wearing a hat or seeking shade (Mahler, Kulik, Gerrard, & Gibbons, 2006; Stock et al., 2009). A common theoretical construct used to examine the impact of images on UV-related attitudes and behaviours in these studies was the Health Belief Model (e.g., Mahler et al., 2006). Images were effective in supporting the various aspects of the HBM,

including increasing perceived susceptibility, severity, benefits, and self-efficacy and reducing perceived barriers regarding UV exposure and protection (Mahler, Kulik, Gobbons, Gerrard, & Harrell, 2003; Mahler et al., 2006; Mahler, Kulik, Gerrard, & Gibbons, 2007; Jackson & Aiken, 2006; Emmons et al., 2011). Therefore, exposure to certain types of visual images, particularly those depicting the negative appearance consequences of UV exposure, appears to be influential towards decreasing UV exposure, thereby potentially deceasing skin cancer incidence.

With respect to early detection of skin cancer, visual images also improve the frequency and accuracy of performing SSE to check for dangerous skin lesions (McWhirter & Hoffman-Goetz, 2013b). The types of images that were effective included, among others, body maps (Chiu, Won, Malik, & Weinstock, 2006), example images of lesions (Girardi, Gaudy, Gouvernet, Teston, Richard, & Grob, 2006), and baseline photographs of moles to serve as a reference point for future change in mole shape, size, or colour (Oliveria, Chau, Christos, Charles, Mushlin, & Halpern, 2004). Example images of malignant skin lesions are frequently used to visually train patients and the public to recognize melanoma (Girardi et al., 2006; Tsao et al., 2015). These are typically a group of four or five photographs of lesions, each of which illustrates one of the "ABCD(E)" characteristic of melanoma: asymmetry, border irregularity, colour, diameter, and sometimes evolution (change) (American Academy of Dermatology, 2015c). The use of visual images to help people recognize early signs of skin cancer and conduct effective SSE is important as many skin cancers are first detected by patients themselves (Carli et al., 2003). Increasing visually-informed self-monitoring of skin lesions may contribute to reduced morbidity and mortality from skin cancer.

Despite the importance of images in positively influencing skin cancer prevention and early detection behaviours, it is unknown whether these types of influential images (e.g., UV

photographs, example images of skin cancers) are utilized in the mass print media. Little is known about how the mass media visually portrays skin cancer and tanning, but the modest amount of research that does exist on this issue is summarized in the next section.

1.8 Skin Cancer and Tanning in the Mass Media

Most information about skin cancer and sun protection is obtained passively by the public through the mass media (Eadie & MacAskill, 2007). Skin cancer content in the mass media has been studied in a variety of ways, including its overall frequency, the content of article text, and, much less commonly, the content and correspondence of accompanying visual images.

1.8.1 Frequency of Skin Cancer in the Mass Media

Compared to other cancers, skin cancer receives less attention in the mass media (Stryker et al., 2005; Clarke & Everest, 2006; Slater et al., 2008; Heneghan, Hazan, Halpern, & Oliveria, 2007). More specifically, skin cancer has been found to be the third most common cancer portrayed in popular North American magazines (Clarke & Everest, 2006) and the fifth most common cancer reported on in U.S. news magazines (Slater et al., 2008). Skin cancer was not commonly included in mainstream U.S. newspapers (Slater et al., 2008) and there were just five articles about melanoma in 31 Aboriginal Canadian newspapers over a four-year time span (Hoffman-Goetz, Shannon, & Clarke, 2003). Of particular note is the finding by Stryker and colleagues (2005): in a single year the Associated Press produced more stories about breast cancer than they did in 25 years (1979 to 2003) about skin cancer. This lack of skin cancer coverage occurs despite skin cancer being the most common (and highly preventable) cancer in

North America. Given that skin cancer receives less media coverage than other cancers, the content of articles is potentially even more important in terms of impact on the public.

Although skin cancer does not receive as much attention as other types of cancer, there is evidence that its coverage in the mass media is increasing. A content analysis of over two decades of U.S. news coverage found that media attention about skin cancer increased between 1979 and 1986, but it did not increase further between 1986 and 2003 (Stryker et al., 2005). In that study, the coverage spiked in the year 1985 with 70 news stories, which the authors point out corresponded with Ronald Reagan's treatment for basal cell carcinoma and the scientific discovery that the ozone layer was thinning (Stryker et al., 2005). Another content analysis, focusing exclusively on articles published in *The New York Times*, found a slight upward trend in skin cancer articles between 1980 and 2004 (Heneghan et al., 2007). These authors suggested the slight increase may have reflected the establishment of skin cancer prevention programs in the U.S., beginning in the mid-1980s (Heneghan, 2007). Still another study found an increase in Australian newspaper coverage of skin cancer prevention between 2001 and 2012 (Scully, Wakefield, & Dixon, 2014). The authors hypothesized this may have been due to the media reporting on Clare Oliver, a young Australian woman who died of melanoma in 2007. Concerning, however, is that as these increases in volume of mass print media skin cancer coverage have occurred, so too has the mass print media coverage of controversies (e.g., Vitamin D deficiencies because of sun protection or limited sun exposure) and issues which may not be positive for encouraging UV protection among readers (e.g., reporting that many people desire a suntan despite its dangers) (Scully, Wakefield, & Dixon, 2008).

1.8.2 Text Content on Skin Cancer and Tanning in the Mass Media

The majority of research on skin cancer and tanning in the mass print media has focused on the text of articles, the results of which are summarized as follows. Content analyses on mass print media coverage of skin cancer suggest there are important gaps in reporting. Among newspaper stories about cancer that contained prevention and detection information, sun protection/avoidance and skin self-examination (SSE) received little attention compared to prevention and detection information for other types of cancers (Moriarty & Stryker, 2008). Another mass media content analysis found that skin cancer prevention and detection received significantly less attention than skin cancer treatment; sun protection practices and self-detection were infrequently discussed (Stryker et al., 2005). The authors reported that 20% of skin cancer stories published by the Associated Press between 1979 and 2003 were reports of new research (breakthroughs) or celebrity experiences with skin cancer, just under 4% mentioned avoidance of indoor tanning or a skin cancer prevention strategy, under 6% mentioned SSE, and less than 3% mentioned warning signs of skin cancer (Stryker et al., 2005). Similarly, a content analysis of popular women's and girls' magazines found that while attention was given to skin cancer prevention, much less attention was given to skin cancer detection (Cho et al., 2010). There was also less focus on indoor tanning beds as a risk factor of skin cancer compared to outdoor sun exposure in the magazines (Cho et al., 2010). Another content analysis on skin cancer prevention in newspapers and magazines showed that only certain aspects of skin cancer prevention were identified (Cokkinides, Kirkland, Andrews, Sullivan, & Lichtenfeld, 2011). The use of sunscreen and wearing of protective clothing were described, but much less frequently was there information advising readers not to allow their skin to burn in the sun, avoiding sun tanning or tanning beds, or how to appropriately use sunscreen. This focus primarily on only selective skin

cancer prevention methods has been found elsewhere: women's and girls' magazines focus on the application of sunscreen (Cho et al., 2010) and Stryker and colleagues (2005) concluded that skin cancer stories in the mass media generally do not contain important educational information about prevention and early detection.

As described in a previous section of this literature review, the mass media has the potential to influence the public's knowledge and behaviours related to health and to impact public health policy. Mass media coverage of skin cancer and tanning is of particular importance in this regard and much of the research in this area comes from Australia. Australia has been a leader in both research and policies related to UV exposure and skin cancer. This may be, in part, because Australia has among the highest skin cancer rates worldwide (Cancer Council Australia, 2014a). For example, the incidence rate of melanoma was 49 cases per 100,000 people in 2008 (Australian Government, 2014) and there were 434,000 cases on non-melanoma skin cancer diagnosed in 2008 (Cancer Council Australia, 2014b). Following a period of negative media coverage of tanning beds, there was a significant reduction in tanning bed business listings in Australia (Makin & Dobbinson, 2009). Intensive media coverage of a young woman, Clare Oliver, who attributed her melanoma to tanning bed use, was linked to an increase in the Australian public's recognizing the role of tanning beds in skin cancer risk (Jalleh, Donovan, Lin, & Slevin, 2008). This was also thought to have been the impetus for aggressive legislation against tanning beds on the policy agenda in Australia (Sinclair & Makin, 2008). Prior research, again based in Australia, showed an association between sun-related health media coverage and the attitudes and beliefs of adults regarding skin cancer and recreational tanning (Dixon, Warne, Scully, Dobbinson, & Wakefield, 2014). News stories about the positive aspects of sun protection and negative aspects of indoor tanning were associated with the belief that tans do not

look healthy and less preference for a deep tan, respectively (Dixon et al, 2014). Thus, the way the mass print media reports on skin cancer and tanning risks is important not only for the public's knowledge and behaviours related to the disease, but also for public health policy.

1.8.3 Visual Images of Skin Cancer and Tanning in the Mass Media

Few studies have included evaluation of visual images related to skin cancer and tanning in the mass print media. There is, however, a modest body of research evidence about images of the tanned beauty ideal in the mass media. Recent evidence suggests that tans are still promoted through mass media imagery.

The mass print media (magazines) frequently portrays Caucasian men and women as unprotected from the sun and with tanned skin (McWhirter & Hoffman-Goetz, 2012). Over time, there was a general decrease in the visual portrayal of dark tans in magazines from 1982 to 1999 (Chapman, Marks, & King, 1992; Dixon, Dobbinson, Wakefield, Jamsen, & McLeod, 2008; George, Kuskowski, Schmidt, 1996), followed by an increase in the visual portrayal of dark tans between 1999 and 2006 (Dixon et al., 2008). In parallel, since the early 1980's, there has been a decrease in the visual portrayal of protective clothing and hat use in magazines (Chapman et al., 1992; Dixon et al., 2008).

Men and women may be targeted differently with mass media imagery related to skin cancer and tanning. There is some research to suggest that men have been portrayed in magazines as having darker tans than women (Chapman et al., 1992; George et al., 1996; Basch, Hillyer, Ethan, Berdnik, & Basch, 2014). Men pictured in magazines tended to be shown with more skin protection from clothing than women whose skin was more exposed (George et al.,

1996); however, men were also shown wearing hats for UV protection less often in the images compared to women. In addition to editorial content in mass media, advertisements have also been studied. Sunscreen advertisements in U.S. magazines have more commonly depicted women rather than men (George et al., 1996), U.S. women's magazines published significantly more Sun Protection Factor (SPF) advertising than U.S. men's, teen's, and general interest magazines (Witherspoon, Uchida, & Wagner, 2008; Lee, O'Riordan, Swetter, Demierre, Brooks, & Geller, 2006). Lee and colleagues (2006) noted that many of the sun care advertisements in magazines, especially those in women's magazines, were for cosmetics or moisturizers with SPF and lacked recommendations for safe use of sunscreen (e.g., minimum SPF level, appropriate quantity, reapplication) (Lee et al., 2006).

The aforementioned studies focused on imagery accompanying any type of content within magazines (i.e., any type of advertising or editorial content on any topic). There is only one study to date that has examined images specifically accompanying skin cancer editorial content in the mass print media. Cho and colleagues (2010) found that the images accompanying skin cancer articles in eight popular U.S. women's and girls' magazines from 1997 to 2006 did not always clearly discourage UV exposure; in fact, some images encouraged UV exposure or portrayed conflicting messages about UV exposure.

Seeing images of people with suntans in the media influences men's and women's attitudes and behaviours. For men, exposure to images of other men with tans on television directly predicted positive attitudes towards tanning and indirectly predicted tanning intentions (Cho & Choi, 2011). Women are also influenced by images of tanned ideals in the mass media: women who experience greater exposure to mass media where this tanned ideal imagery is stressed are more likely to desire and seek out a suntan (Dixon et al., 2011). Further, an

experimentally tested psychosocial model for sun protection and sun bathing indicates that "image norms" directly influence intentions of young women to suntan (Jackson & Aiken, 2000). Given the significance of visual images for communication about skin cancer and tanning, and the lack of research on images connected to skin cancer in the mass print media, this is an important area for research.

1.8.4 Tanning Industry in the Mass Media

In addition to the editorial content of skin cancer, images of the tanned ideal, and sunscreen advertisements in the mass media, the indoor tanning industry also actively promotes itself in the mass media. Tanning industry websites were found to feature images of models' "bronze tans" and tend to most commonly depict women rather than men (Team & Markovic, 2006). Tanning advertisements in newspapers have been found to encourage overexposure to UV radiation through pricing incentives for frequent or unlimited tanning sessions (Kwon et al., 2002). The tanning industry also frequently and commonly markets artificial UV radiation to adolescents via advertisements in high school newspapers (Freeman, Francis, Lundahl, Bowland, & Dellavalle, 2006). The mass media marketing strategies of the tanning industry have been found to be similar to those used by the tobacco industry by: attempting to mitigate health concerns by citing research studies; appealing to a sense of social acceptance by linking tanning to popularity, fashion, and celebrities; emphasizing the beneficial psychotropic effects tanning can have, such as relaxation and escape; and targeting specific population segments, especially women and teens (Greenman & Jones, 2009).

1.9 Summary of the Literature and Research Gaps

Skin cancer is a major public health concern in North America. It is the most common cancer among Canadians and Americans and is associated with significant morbidity and mortality to the individual and financial costs to the health care systems. Skin cancer is a disease of importance to those concerned with public health communication because it is largely preventable and, when detected early, is often curable. The most important risk factor for all types of skin cancer is UV exposure, which is most often acquired in voluntary, recreational contexts (outdoor sun exposure or indoor tanning beds). UV exposure through either route is classified as carcinogenic by the WHO and IARC. Given the research evidence that tanning salons are poorly regulated and inadequately inform patrons of the health risks associated with the use of tanning beds, the importance of other sources of this health risk information may be heightened.

The mass media is a pervasive source for health information for the public. This is particularly the case for information about skin cancer and tanning, which tends to be obtained passively by the public through mass media outlets, including magazines. The mass media has been shown to influence health behaviours of the population and may inform public health policy. While there is some evidence of a slight increase in mass print media coverage of skin cancer and tanning over the past several decades, there is room for improvement in the reporting, especially in connection to prevention and early detection information.

Articles in the mass media are typically accompanied by visual images. The importance of visual images for communication, including health communication and cancer education, has been demonstrated, including for those with low health literacy. Images are more likely to be noticed and remembered compared to text information. Images can also shape the message that

readers take away from articles. Research has shown that images are influential towards encouraging healthy behaviours to prevent skin cancer and help with regards to its early detection among the public.

Based on this literature review, several important gaps in our knowledge about skin cancer and tanning in the mass media emerge, indicating the need for a significant update and large expansion on what is currently known. There has not been a comprehensive content analysis of skin cancer and tanning in the U.S. mass print media for nine years and Canadian mass print media coverage of skin cancer and tanning has not been studied. Whether the 2006 IARC report, which emphasized the dangers of indoor tanning and its connection to melanoma, or the WHO's IARC classification of indoor tanning devices as carcinogenic in 2009, have served as points of inflection for mass media coverage also remains unknown. There has also been no research about how mass media targeting men reports on the issues of skin cancer and tanning. Despite the significance of visual health communication, and the influence visual images can have on skin cancer and tanning related attitudes and behaviours, most content analyses have focused exclusively on text information.

Understanding how the mass print media reports on skin cancer and tanning may help to set the stage for improving how, and how often, the mass media reports on these important health issues. It is hoped that the results of this work may provide impetus for health communication scholars and practitioners to work more closely with those involved with mass media content development and production in order to help market important skin cancer prevention and early detection information to the public.

1.10 References

Abdelmutti, N. & Hoffman-Goetz, L. (2009). Risk messages about HPV, cervical cancer, and the HPV vaccine Gardasil: a content analysis of Canadian and U.S. national newspaper articles. *Women & Health*, *49*, 422-450.

American Academy of Dermatology (2015a). *Melanoma.* Retrieved from https://www.aad.org/dermatology-a-to-z/diseases-and-treatments/m---p/melanoma

American Academy of Dermatology (2015b). *How do I prevent skin cancer?* Retrieved from https://www.aad.org/spot-skin-cancer/understanding-skin-cancer/how-do-i-prevent-skin-cancer

American Academy of Dermatology (2015c). *What to look for: The ABCDEs of melanoma*. Retrieved from https://www.aad.org/spot-skin-cancer/understanding-skin-cancer/how-do-i-check-my-skin/what-to-look-for

American Cancer Society (2015a). *What are basal and squamous cell skin cancers?* Retrieved from http://www.cancer.org/cancer/skincancer-basalandsquamouscell/detailedguide/skin-cancer-basal-and-squamous-cell-what-is-basal-and-squamous-cell

American Cancer Society (2015b). *Melanoma Skin Cancer: What are the key statistics about melanoma skin cancer?* Retrieved from http://www.cancer.org/cancer/skincancer-melanoma/detailedguide/melanoma-skin-cancer-key-statistics

Albert, M. R. & Ostheimer, K. G. (2002). The evolution of current medical and popular attitudes toward ultraviolet light exposure: part 1. *Journal of the American Academy of Dermatology, 47*, 930-937.

Andrieu, B. (2009). Universal exposure to the sun. In: Azoulay E, Demain A, Frioux D., eds, 100,000 Years of Beauty: Modernity/Globalisation (pp. 211-214). Paris: Gallimard.

Anytime Fitness (2015). *Why Anytime Fitness?* Retrieved from https://www.anytimefitness.com/membership#seg209

Armstrong, B. K. & Kricker, A. (2001). The epidemiology of UV induced skin cancer. *Journal of Photochemistry and Photobiology B: Biology, 63*, 8–18.

Australian Government. (2014). *Melanoma of the skin statistics*. Cancer Australia. Retrieved from http://canceraustralia.gov.au/affected-cancer/cancer-types/melanoma-skin/melanoma-skin-statistics

Balk, S. J. (2011). Ultraviolet radiation: A hazard to children and adolescents. *Pediatrics*, *127*, e791-e817.

Banerjee, S. C., Campo, S., & Greene, K. (2008). Fact or wishful thinking? Biased expectations in I think I look better when I'm tanned. *American Journal of Health Behavior, 32,* 243-252.

Basch, C. H., Hillyer, G. C., Ethan, D., Berdnik, A., & Basch, C. E. (2014). Tanning shade gradations of models in mainstream fitness and muscle enthusiast magazines: implications for skin cancer prevention in men. *American Journal of Men's Health*. doi: 10.1177/1557988314543511

Bennett, P. (1999). Understanding responses to risk: some basic findings. In P. Bennett and K. Calman (Eds.), *Risk Communication and Public Health* (pp. 3-19). New York: Oxford University Press.

Berwick, M., Begg, C. B., Fine, J. A., Roush, G. C., & Barnhill, R. L. (1996). Screening for cutaneous melanoma by skin self-examination. *Journal of the National Cancer Institute, 88,* 17-23.

Bickers, D.R., Lim, H.W., Margolis, D., Weinstock, M.A., Goodman, C., and Faulkner, E. et al., (2006). The burden of skin diseases: 2004 a joint project of the American Academy of Dermatology Association and the Society for Investigative Dermatology. *Journal of the American Academy of Dermatology, 55,* 490-500.

Black, M. E. (1995). What did popular women's magazines from 1920 to 1949 say about breast cancer? *Cancer Nursing, 18,* 270-277.

Blackwell, T. (February 23 2013). 'Can cause cancer': Ottawa proposes cigarette-package-type notices for tanning beds. *National Post*. Retrieved from http://news.nationalpost.com/2013/02/23/can-cause-cancer-ottawa-proposes-cigarette-package-type-notices-for-tanning-beds/

Blanchard, D., Erblich, J., Montgomery, G. H., & Bovbjerg, D. H. (2002). Read all about it: the over-representation of breast cancer in popular magazines. *Preventative Medicine, 35,* 343-348.

Brouse, C. H., Basch, C. E., & Neugut, A. I. (2011). Warning signs observed in tanning salons in New York City: Implications for skin cancer prevention. *Preventing Chronic Disease, 8,* A88. Retrieved from http://www.cdc.gov/pcd/issues/2011/jul/10_0153.htm

Brown, M. L. & Potosky, A. L. (1990). The presidential effect: the public health response to media coverage about Ronald Reagan's colon cancer episode. *Public Opinion Quarterly, 54,* 317-329.

Cafri, G., Thompson, J. K., & Jacobsen, P. (2006). Appearance reasons for tanning mediate the relationship between media influence and UV exposure and protection. *Archives of Dermatology, 142,* 1067-1069

Carli, P., De Giorgi, V., Palli, D., Maurchini, A., Mulas, P. Orlandi, C., … Giannotti, B. (2003). Dermatologist detection and skin self-examination are associated with thinner melanomas. *JAMA Dermatology, 139*, 607-612.

Canadian Cancer Society (2008). *Operations Compliance Testing of Toronto Tanning Facilities*. Prepared by Youthography Inc.

Canadian Cancer Society (Canadian Cancer Society's Advisory Committee on Cancer Statistics). (2014). *Canadian Cancer Statistics 2014*. Chapter 7: Special Topic: Skin cancers. Toronto, ON: Canadian Cancer Society. Retrieved from http://www.cancer.ca/~/media/cancer.ca/CW/cancer%20information/cancer%20101/Canadian%20cancer%20statistics/Canadian-Cancer-Statistics-2014-EN.pdf

Canadian Cancer Society (2015a). *Risk factors for non-melanoma skin cancer*. Retrieved from https://www.cancer.ca/en/cancer-information/cancer-type/skin-non-melanoma/risks/?region=on

Canadian Cancer Society (2015b). *Risk factors for melanoma skin cancer*. Retrieved from https://www.cancer.ca/en/cancer-information/cancer-type/skin-melanoma/risks/?region=on

Canadian Cancer Society (2015c). *Reducing your risk for non-melanoma skin cancer*. Retrieved from http://www.cancer.ca/en/cancer-information/cancer-type/skin-non-melanoma/risks/reducing-your-risk/?region=on

Canadian Cancer Society (2015d). *Reducing your risk for melanoma*. Retrieved from http://www.cancer.ca/en/cancer-information/cancer-type/skin-melanoma/risks/reducing-your-risk/?region=on

Canadian Dermatology Association. (2015). *Skin Cancer*. Retrieved from http://www.dermatology.ca/skin-hair-nails/skin/skin-cancer/#!/skin-hair-nails/skin/skin-cancer/malignant-melanoma/

Cancer Council Australia (2014a). *Skin cancer*. Retrieved from http://www.cancer.org.au/about-cancer/types-of-cancer/skin-cancer.html

Cancer Council Australia (2014b). *Non-melanoma skin cancer*. Retrieved from http://www.cancer.org.au/about-cancer/types-of-cancer/skin-cancer/non-melanoma.html

CBC News (March 14, 2014). Canadian Indoor Tanning Legislation. *CBC*. Retrieved from http://www.cbc.ca/news2/interactives/map-canada-tanning/

Carlsson, M. E. (2000). Cancer patients seeking information from sources outside the health care system. *Supportive Care in Cancer, 8*, 453-457.

Chang, C., Murzaku, E. C., Penn, L., Abassi, N. R., Davis, P. D., Berwick, M., & Polsky, D. (2014). More skin, more sun, more tan, more melanoma. *American Journal of Public Health, 104*, e92-e99.

Chapman, S., Marks, R., & King, M. (1992). Trends in tans and skin protection in Australian fashion magazines, 1982 through 1991. *American Journal of Public Health, 82*, 1677-1680.

Chapman, S., McLeod, K., Wakefield, M., & Holding, S. (2005). Impact of news of celebrity illness on breast cancer screening: Kylie Minogue's breast cancer diagnosis. *Medical Journal of Australia, 183*, 247-250.

Chiu, V., Won, E., Malik, M., & Weinstock, M. A. (2006). The use of mole-mapping diagrams to increase skin self-examination accuracy. *Journal of the American Academy of Dermatology, 55*, 245-250.

Cho, H. & Choi, J. (2011). Television, gender norms, and tanning attitudes and intentions of young men and women. *Communication Studies, 62*, 508-530.

Cho, H., Hall, J. G., Kosmoski, C., Fox, R. L., & Mastin, T. (2010). Tanning, skin cancer risk, and prevention: a content analysis of eight popular magazines that target female readers: 1997-2006. *Health Communication, 25*, 1-10.

Choi, K., Lazovich, D., Southwell, B., Forster, J., Rolnick, S. J., & Jackson, J. (2010). Prevalence and characteristics of indoor tanning use among men and women in the United States. *Archives of Dermatology, 146*, 1356-1361.

Clarke, J. N. & Everest, M. M. (2006). Cancer in the mass print media: Fear, uncertainty and the medical model. *Social Science & Medicine, 62*, 2591-2600.

Clarke, J. N. & Robinson, J. (1999). Testicular cancer: Medicine and machismo in the media 1980 – 1994. *Health, 3*, 263-282.

Clarke, J. N. (1999a). Breast cancer in mass circulating magazines in the USA and Canada 1974-1995. *Women & Health, 28*, 113-130.

Clarke, J. N. (1999b). Prostate cancer's hegemonic masculinity in select print mass media depictions (1974-1995). *Health Communication*, 11, 59-74.

Cline, R. J. W. & Haynes, K. M. (2001). Consumer health information seeking on the internet: the state of the art. *Health Education Research, 16*, 671-692.

Cokkinides, V., Kirkland, D., Andrews, K., Sullivan, K., & Lichtenfeld, J. L. (2011). A profile of skin cancer prevention media coverage 2009. *Journal of the American Academy of Dermatology, 67*, 570-575.

Cram, P. Fendrick, A. M., Inadomi, J., Cowen, M. E., Carpenter, D., & Vijan, S. (2003). The impact of celebrity promotional campaign on the use of colon cancer screening – the Katie Couric effect. *Archives of Internal Medicine, 163,* 1601-1605.

Dayton, L. (August 22, 2011). Sunless tanning safer but can have a dark side. *Los Angeles Times*. Retrieved from http://articles.latimes.com/2011/aug/22/health/la-he-fake-tanning-20110822

Delp, C. & Jones, J. (1996). Communicating information to patients: the use of cartoon illustrations to improve comprehension of instructions. *Academic Emergency Medicine, 3*, 264–270.

Demierre, M. F. (2003) Time for the national legislation of indoor tanning to protect minors. *Archives of Dermatology, 139,* 520-524.

Demko, C. A., Borawski, E. A., Debanne, S. M., Cooper, K. D., & Stange, K. C. (2003). Use of indoor tanning facilities by White adolescents in the United States. *Archives of Pediatric and Adolescent Medicine, 157*, 854-860.

Dixon, H., Dobbinson, S., Wakefield, M., Jamsen, K., & McLeod, K. (2008). Portrayal of tanning, clothing fashion and shade use in Australian women's magazines, 1987-2005. *Health Education Research, 23,* 791-802.

Dixon, H. G., Warne, C. D., Scully, M. L., Wakefield, M. A., & Dobbinson, S. J. (2011). Does the portrayal of tanning in Australian women's magazines relate to real women's tanning beliefs and behavior? *Health Education & Behavior, 38,* 132-142.

Dixon, H., Warne, C., Scully, M., Dobbinson, S., & Wakefield, M. (2014). Agenda-setting effects of sun-related news coverage on public attitudes and beliefs about tanning and skin cancer. *Health Communication, 29,* 173-181.

Donelle, L., Hoffman-Goetz, L. & Clarke, J. N. (2004). Portrayal of genetic risk for breast cancer in ethnic and non-ethnic newspapers. *Women & Health, 40,* 93-111.

Eadie, D. & MacAskill, S. (2007). Results from an exploratory study of sun protection practice: implications for the design of health promotion messages. *Health Education, 107,* 250-260.

El Ghissassi, F., Baan, R., Straif, K., Grosse, Y., Secretan, B., Bouvard, V. *et al*. (2009). A review of human carcinogens—Part D: radiation. *Lancet Oncology, 10*, 751-752.

Emmons, K. M., Geller, A. C., Puleo, E., Savadatti, S. S., Hu, S. W., Gorham, S., & Werchniak, A. E. (2011). Skin cancer education and early detection at the beach: A randomized trial of dermatologist examination and biometric feedback. *Journal of the American Academy of Dermatology, 64,* 282-289.

Foss, S. K. (2005). Theory of Visual Rhetoric. In K. Smith, S. Moriarty, G. Barbatsis, & K. Kenney (Eds.). *Handbook of Visual Communication: Theory, Methods, and Media* (pp. 141-152). Hillside, NJ: Erlbaum.

Freeman, S., Francis, S., Lundahl, K., Bowland, T., & Dellavalle, R. P. (2006). UV tanning advertisements in high school newspapers. *Archives of Dermatology, 142*, 460-462.

Friedman, D. B. & Hoffman-Goetz, L. (2003). Sources of cancer information for seniors: a focus group pilot study report. *Journal of Cancer Education, 18*, 215-222.

Gerlach, K. K., Marino, C., Weed, D. L., & Hoffman-Goetz, L. (1997). Lack of colon cancer coverage in seven women's magazines. *Women & Health, 26*, 57-68.

George, P. M., Kuskowski, M., & Schmidt, C. (1996). Trends in photoprotection in American fashion magazines, 1983-1993. Will fashion make you look old and ugly? *Journal of the American Academy of Dermatology, 34*, 424-428.

Gibbons, F. X., Gerrard, M., Lane, D. J., Mahler, H. I., & Kulik, J. A. (2005). Using UV photography to reduce use of tanning booths: A test of cognitive mediation. *Health Psychology, 24*, 358-363.

Gibson, R. & Zillmann, D. (2000). Reading between the photographs: The influence of incidental pictorial information on issue perception. *Journalism and Mass Communication Quarterly, 77*, 355-366.

Girardi, S., Gaudy, C., Gouvernet, J., Teston, J., Richard, M. A., & Grob J. J. (2006). Superiority of a cognitive education with photographs over ABCD criteria in the education of the general population to the early detection of melanoma: A randomized study. *International Journal of Cancer, 118*, 2276-2280.

GoodLife Fitness (2015). *Tanning at GoodLife Fitness*. Retrieved from http://www.goodlifefitness.com/amenities/tanning.aspx

Gordon, L. G., Hirst, N. G., Gies, P. H. F., & Green, A. C. (2008). What impact would effective solarium regulation have in Australia? *Medical Journal of Australia, 189*, 375-378.

Greenman, J. & Jones, D. A. (2009). Comparison of advertising strategies between the indoor tanning and tobacco industries. *Journal of the American Academy of Dermatology, 62*, 685e1-685e18.

Guy, G. P., Machlin, S. R., Ekwueme, D. U., Yabroff, K. R. (2015). Prevalence and costs of skin cancer treatment in the U.S., 2002-2006 and 2007-2011. *American Journal of Preventative Medicine, 48*, 183-187.

Hall, L. S. (1992). Breast self-examination: use of a visual reminder to increase practice. *AAOHN Journal* (now *Workplace Health & Safety*), *40*, 186-192.

Hammond, D. (2011). Health warning messages on tobacco products: a review. *Tobacco Control*, *20*, 327-337.

Health Canada (2005*). Guidelines for Tanning Salon Owners, Operators and Users*. Cat. H46-2/05-389E.

Health Canada (February 26, 2014a). Government of Canada announces stronger labelling requirements for tanning beds – Warning labels remind users about skin cancer risk [press release]. Retrieved from http://www.hc-sc.gc.ca/ahc-asc/media/nr-cp/_2014/2014-025-eng.php

Health Canada (2014b). *Guidelines for Tanning Salon Owner, Operators and Users: A Guideline published in collaboration with the Federal Provincial Territorial Radiation Protection Committee*. Cat. No. H129-41/2014E-DPF. Ottawa, ON. Retrieved from http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/tan-bronzage/index-eng.php#appe

Heneghan, M. K., Hazan, C., Halpern, A. C., & Oliveria, S. A. (2007). Skin cancer coverage in a national newspaper: A teachable moment. *Journal of Cancer Education, 22*, 99-104.

Hoerster, K. D., Garrow, R. L., Mayer, J. A., Clapp, E. J., Weeks, J. R., Woodruff, S. I. et al. (2009). Density of indoor tanning facilities in 116 large U.S. cities. *American Journal of Preventative Medicine, 36*, 243-246.

Hoffman-Goetz, L., Donelle, L., & Ahmed, R. (2014). *Health Literacy in Canada: A Primer for Students*. Toronto, ON: Canadian Scholars Press Inc.

Hoffman-Goetz, L. & MacDonald, M. (1999). Cancer coverage in mass-circulating Canadian women's magazines. *Canadian Journal of Public Health, 90*, 55-59.

Hoffman-Goetz, L., Shannon, C., & Clarke, J. N. (2003). Chronic disease coverage in Canadian Aboriginal newspapers. *Journal of Health Communication, 8*, 475-488.

Hofstetter, C. R., Schultze, W. A., & Mulvihill, M. M. (1992). Communication media, public health, and public affairs: Exposure in a multimedia communication. *Health Communication, 4*, 259-271.

Houts, P. S., Doak, C. C., Doak, L. G., & Loscalzo, M. J. (2006). The role of pictures in improving health communication: A review of research on attention, comprehension, recall, and adherence. *Patient Education and Counseling*, *61*, 173-190.

Human Resources and Skills Development Canada & Statistics Canada (2005). *Building on our Competencies: Canadian Results of the International Adult Literacy and Skills Survey 2003*. Cat. No. 89-617-XIE.

Hunt, Y., Augustson, E., Rutten, L., Moser, R., & Yaroch, A. (2012). History and Culture of Tanning in the United States. In *Shedding Light on Indoor Tanning*. Edited by Heckman CJ, Manne SL. New York, NY: Springer Science+Business Media. Retrieved from http://www.springer.com/biomed/cancer/book/978-94-007-2047-3

International Agency for Research on Cancer (IARC) (2000). *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Solar and Ultraviolet Radiation*, vol. 55. Lyon, France: IARC.

Jackson, K. M. & Aiken, L. S. (2000). A psychosocial model of sun protection and sunbathing in young women: The impact of health beliefs, attitudes, norms, and self-efficacy for sun protection. *Health Psychology, 5,* 469-478.

Jackson, K. M., & Aiken, L. S. (2006). Evaluation of a multicomponent appearance-based sun-protective intervention for young women: Uncovering the mechanisms of program efficacy. *Health Psychology, 25*, 34-46.

Jalleh, G., Donovan, R. J., Lin, C., & Slevin, T. (2008) Changing perceptions of solaria and cancer risk: the role of the media. *Medical Journal of Australia, 188,* 735.

Katz, M. L., Sheridan, S., Pignone, M., Lewis, C., Battle, J., Gollop, C. & O'Malley, M. (2004). Prostate and colon cancer screening messages in popular magazines. *Journal of General Internal Medicine, 19*, 843-848.

Kirsner, R. S., Wilkinson, J. D., Ma, F., Pacheco, H., & Federman, D. G. (2005). The association of Medicare health care delivery systems with stage at diagnosis and survival for patients with melanoma. *Archives of Dermatology, 141*, 753-757.

Krueger, H., Williams, D., Chomiak, M., & Trenaman, L. (2010). *The Economic Burden of Skin Cancer in Canada: Current and Projected*. Toronto, ON: Canadian Partnership Against Cancer. Retrieved from http://www.partnershipagainstcancer.ca/wp-content/uploads/Economic-Burden-of-Skin-Cancer-in-Canada-Report-Final1.pdf

Kwon, H. T., Mayer, J. A., Walker, K. K., Yu, H., Lewis, E. C., & Belch, G E. (2002). Promotion of frequent tanning session by indoor tanning facilities: Two studies. *Journal of the American Academy of Dermatology, 46,* 700-705.

Lazovich, D., Forster, J., Sorensen, G., Emmons, K., Stryker, J., Demierre, M-F., Hickle, A., & Remba, N. (2004). Characteristics associated with use or intention to use indoor tanning among adolescents. *Archives of Pediatrics & Adolescent Medicine, 158,* 918-924.

Lee, E. T., O'Riordan, D., Swetter, S. M., Demierre, M. F., Brooks, K., & Geller, A.C. (2006). Sun care advertising in popular U.S. magazines. *American Journal of Health Promotion, 20,* 349-352.

Lester, P. M. (2006). *Visual Communication: Images with Messages*. California: Thompson Wadsworth.

Mahler, H. I. M., Kulik, J. A., Gerrard, M., & Gibbons, F. X. (2006). Effects of two appearance-based interventions on the sun protection behaviors of southern California beach patrons. *Basic and Applied Social Psychology, 28,* 263-272.

Mahler, H. I. M., Kulik, J. A., Gerrard, M., & Gibbons, F. X. (2007). Long-term effects of appearance-based interventions on sun protection behaviors. *Health Psychology, 26,* 350-360.

Mahler, H. I. M., Kulik, J. A., Gibbons, F. X., Gerrard, M., & Harrell, J. (2003). Effects of appearance-based interventions on sun protection intentions and self-reported behaviors. *Health Psychology, 22,* 199-209.

Makin, J. K. & Dobbinson, S. J. (2009). Changes in solarium numbers in Australia following negative media and legislation. *Australian and New Zealand Journal of Public Health, 33,* 491-494.

Martin, J. M., Ghaferi, J. M., Cummins, D. L., Mamelak, A. J., Schmults, C. D., Parikh, M. et al. (2009). Change in skin tanning attitudes: fashion articles and advertisements in the early 20th century. *American Journal of Public Health, 99,* 2140-2146.

McWhirter, J. E. & Hoffman-Goetz, L. (2012). Visual images for skin cancer prevention: A systematic review of qualitative studies. *Journal of Cancer Education, 27,* 202-216.

McWhirter, J. E. & Hoffman-Goetz, L. (2014). A Systematic Review of Visual Image Theory, Assessment, and Use in Skin Cancer and Tanning Research. *Journal of Health Communication, 19,* 738-757.

McWhirter, J. E. & Hoffman-Goetz, L. (2013a). Systematic review of population-based studies on the impact of images on UV attitudes and behaviours. doi: 10.1093/heapro/dat031

McWhirter, J. E. & Hoffman-Goetz, L. (2013b). Visual images for patient skin self-examination and melanoma detection: A systematic review of published studies. *Journal of the American Academy of Dermatology, 69,* 47-55.

Meade, C. D., McKinney, P., & Barnas, G. P. (1994). Educating patients with limited literacy skills: The effectiveness of printed and videotaped materials about colon cancer. *American Journal of Public Health, 84,* 119-121.

Meissner, H. I., Potosky, A. L., & Convissor, R. (1992). How sources of health information relate to knowledge and use of cancer screening exams. *Journal of Community Health, 17,* 153-165.

Merten, J. W., Higgins, S., Rowan, A., & Ragle, A. (2014). Sun safety knowledge, attitudes, and behaviours among beachgoing adolescents. *American Journal of Health Education, 45,* 37-41.

Messaris, P. & Abraham, L. (2001). The role of images in framing news stories. In S. Reese, O. Gandy, & A. Grant (Eds.), *Framing Public Life* (pp. 215-226). Mahwah, NJ: Erlbaum.

Messaris, P. (1997). *Visual Persuasion: The Role of Images in Advertising*. California: SAGE Publications.

Michielutte, R., Bahson, J., Digman, M. B., & Schroeder, E. (1992). The use of illustrations and narrative text style to improve readability of a health education brochure. *Journal of Cancer Education, 7,* 251–260.

Moriarty, C. M. & Stryker, J. E. (2008). Prevention and screening efficacy messages in newspaper accounts of cancer. *Health Education Research, 23,* 487-498.

Morrow, D. G., Hier, C. M., Menard, W. E., & Von Leirer, O. (1998). Icons improve older and younger adults' comprehension of medication information. *Journals of Gerontology - Series B Psychological Sciences and Social Sciences, 53,* 240-254.

Napoli, P. M. (2001). Consumer use of medical information from electronic and paper media: a literature review. In R.E. Rice, J.E. Katz (Eds.), *The Internet and Health Communication: Experiences and Expectations.* Thousand Oaks, CA: Sage Publications.

National Conference of State Legislatures (2015). *Indoor tanning restrictions for minors – a state-by-state comparison*. Retrieved from http://www.ncsl.org/research/health/indoor-tanning-restrictions.aspx.

National Skin Cancer Prevention Committee. (2010). *Exposure to and Protection from the Sun in Canada: A Report Based on the 2006 Second National Sun Survey*. Toronto, ON: Canadian Partnership Against Cancer. Retrieved from http://www.partnershipagainstcancer.ca/wp-content/uploads/Exposure-to-and-Protection-from-the-Sun-in-Canada.pdf

Nattinger, A. B., Hoffmann, R. G., Howell-Pelz, A., & Goodwin, J. S. (1998). Effect of Nancy Reagan's mastectomy on choice of surgery for breast cancer by U.S. women. *Journal of the American Medical Association, 279,* 762-766.

Nelson, D. L. (1979). Remembering pictures and words: appearance, significance, and name. In L. S. Cermak & F. I. Craik (Eds.), *Levels of Processing in Human Memory* (pp. 45-76). Hillsdale, NJ: Erlbaum.

O'Keefe, G. J., Boyd, H. H., & Brown, M. R. (1998). Who learns preventive health care information from where: cross-channel and repertoire comparisons. *Health Communication, 10,* 25-36.

Oliveria, S. A., Chau, D., Christos, P. J., Charles, C. A., Mushlin, A. I., & Halpern, A. C. (2004). Diagnostic accuracy of patients in performing skin self-examination and the impact of photography. *Archives of Dermatology, 140,* 57-62.

Oxford English Dictionary (2012). *Oxford English Dictionary*. Oxford: Oxford University Press. Retrieved from http://www.oed.com/

Pagoto, S. L., Schneider, K. L., Oleski, J., Bodenlos, J. S., & Ma, Y. (2010). The sunless study: A beach randomized trial of a skin cancer prevention intervention promoting sunless tanning. *Archives of Dermatology, 146,* 979-984.

Paivio, A. (1991). Dual coding theory: retrospect and current status. *Canadian Journal of Psychology, 45,* 255-287.

Paivio, A., & Csapo, K. (1973). Picture superiority in free recall: imagery or dual-coding? *Cognitive Psychology, 5,* 176-206.

Pawlak, M. T., Bui, M., Amir, M., Burkhardt, D. L., Chen, A. K., & Dellavalle, R. P. (2012). Legislation restricting access to indoor tanning throughout the world. *Archives of Dermatology, 148,* 1006-1012.

Pieters, R. & Wedel, M. (2004). Attention capture and transfer in advertising: brand, pictorial, and text-effects. *Journal of Marketing, 68,* 38-50.

Rogers, H. W., Weinstock, M. A., Harris, A. R., Hinckley, M. R., Feldman, S. R., Fleischer, A. B. et al. (2010). Incidence estimate of nonmelanoma skin cancer in the United States, 2006. *Archives of Dermatology, 146,* 283-287.

Scully, M., Wakefield, M., & Dixon, H. (2008). Trends in news coverage about skin cancer prevention, 1993-2006: increasingly mixed message for the public. *Australian and New Zealand Journal of Public Health, 32,* 461-466.

Scully, M., Makin, J., Maloney, S., & Wakefield, M. (2014). Changes in coverage of sun protection in the news: threats and opportunities from emerging issues. *Health Education Research,* doi: 10.1093/her/cyu013

Segrave, K. (2005) *Suntanning in 20th century America*. Jefferson, NC: McFarland & Company Inc.

Sinclair, C. A. & Makin, J. K. (2008). Sometimes it takes a loss of life to make a difference. *British Medical Journal, 336,* 73.

Skin Cancer Foundation (2015). *Understanding UVA and UVB*. Retrieved from http://www.skincancer.org/prevention/uva-and-uvb/understanding-uva-and-uvb

Slater, M. D., Long, M. Bettinghaus, E. P., & Reineke, J. B (2008). News coverage of cancer in the United States: A national sample of newspapers, television, and magazines. *Journal of Health Communication, 13*, 523-537.

Steinem, G. (1963). *The Beach Book*. Viking Adult.

Stock, M. L., Gerrard, M., Gibbons, F. X., Dykstra, J. L., Weng, C. Y., Mahler, H. I., Walsh, L. A., & Kulik, J. (2009). Sun protection intervention for highway workers: Long-term efficacy of UV photography and skin cancer information on men's protective cognitions and behavior. *Annals of Behavioral Medicine, 38*, 225-236.

Stryker, J. E., Solky, B. A., & Emmons, K. A. (2005). A content analysis of news coverage of skin cancer prevention and detection, 1979-2003. *Archives of Dermatology, 141*, 491-496.

Stryker, J. E., Emmons, K. M., Viswanath, K. (2007). Uncovering differences across the cancer control continuum: A comparison of ethnic and mainstream cancer newspaper stories. *Preventive Medicine, 44*, 20-25.

Team, V. & Markovic, M. (2006). Internet advertising of artificial tanning in Australia. *European Journal of Cancer Prevention, 15*, 371–376.

Tsao, H., Olazagasti, J. M., Cordoro, K. M., Brewer, J. D., Taylor, S. C., Bordeaux, J. S., … Begolka, W. S. (2015). Early detection of melanoma: Reviewing the ABCDEs. *Journal of the American Academy of Dermatology, 72*, 717-723.

U.S. Food and Drug Administration (May 29, 2014). FDA to require warnings on sunlamp products [press release]. Retrieved from http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm399222.htm

Vannini, P. & McCright, A. M. (2009). To die for: The semiotic seductive power of the tanned body. *Symbolic Interaction, 27*, 309-332.

Viswanath, K., Breen, N. Meissner, H., Moser, R. P., Nesse, B. Steel, W. R., & Rakowski, W. (2006). Cancer knowledge and disparities in the information age. *Journal of Health Communication, 11*, 1-17.

Weinstock, M. A. (2000). Early detection of melanoma. *Journal of the American Medical Association, 284*, 886-889.

Weldon, M. S. & Roediger, H.L. III (1987). Altering retrieval demands reverses the picture superiority effect. *Memory & Cognition, 15*, 269-280.

Wehner, M. R., Chren, M. M., Nameth, D., Choudhry, A., Gaskins, M., Nead, K. T., Boscardin, W. J., & Linos, E. (2014). International prevalence of indoor tanning: A systematic review and meta-analysis. *JAMA Dermatology, 150*, 390-400.

Witherspoon, J. N., Uchida, T., & Wagner, R.F. (2008). SPF lip protection advertising patterns in popular U.S. magazines. *Skin Cancer, 23*, 39-43.

Wolf, N. (1997). *The Beauty Myth*. Vintage Canada.

World Health Organization & IARC (2006). *Exposure to Artificial UV Radiation and Skin Cancer.* Lyon, France: IARC Working Group. Retrieved from http://www.iarc.fr/en/publications/pdfs-online/wrk/wrk1/ArtificialUVRad&SkinCancer.pdf

World Health Organization (2014). *Skin cancers: How common is skin cancer?* Retrieved from http://www.who.int/uv/faq/skincancer/en/index1.html

Yanovitzky, I. (2002). Effect of news coverage on the prevalence of drunk-driving behavior: Evidence from a longitudinal study. *Journal of Studies on Alcohol, 63*, 342–351.

Yanovitsky, I. & Bennett, C. (1999). Media attention, institutional response, and health behaviour change. *Communication Research, 26*, 429-453.

Yanovitzky, I. & Blitz, C. L. (2000). Effect of media coverage and physician advice on utilization of breast cancer screening by women 40 years and older. *Journal of Health Communication, 5*, 117-134.

Zillmann, D., Gibson, R., & Sargent, S. L. (1999). Effects of photographs in news-magazine reports on issue perception. *Media Psychology, 1*, 207-228.

CHAPTER 2: OBJECTIVES, RATIONALE, AND STUDY COMPONENTS

2.1 Objectives and Study Components

The objective of this doctoral thesis research was to describe how, and how often, the English-language mass print media (i.e., widely circulating magazines) convey visual and text information about skin cancer and tanning using a directed content analysis (Hsieh & Shannon, 2005). Skin cancer is the most common cancer in North America (Canadian Cancer Society, 2015a, 2015b; American Cancer Society, 2015). It is also highly preventable and, when detected early, often curable (Kirsner, Wilkinson, Ma, Pacheco, & Federman, 2005), making it is an important issue for health communication and health education.

The doctoral research consists of six related studies. In Study 1 and Study 2 (Chapters 3 and 4, respectively), changes in the volume and nature of skin cancer and tanning coverage in popular North American magazines relative to the 2006 International Agency for Research on Cancer (IARC) report on indoor tanning and skin cancer and the 2009 classification by the WHO of tanning beds as carcinogenic are considered, respectively. Study 3 (Chapter 5) compares skin cancer and tanning coverage based on content type (images vs. text) and target audience (women vs. men). Study 4 (Chapter 6) breaks out Canadian magazine data reporting on skin cancer and tanning and offers a transnational comparison with U.S. coverage. Study 5 (Chapter 7) contains findings about the reporting of skin cancer and tanning in magazines aimed at teenage girls, and compares these findings to how adult women's magazines report on the same issues. Studies 1 to 5 (Chapters 3 through 7) focus on reporting frequency and on skin cancer

risk factors, UV-related exposure, protection, and avoidance behaviours, and early detection information in popular magazines. These studies are empirical in focus and use standard directed content analytical methodology; however, the media theoretical perspective of Agenda Setting Theory (AST) is embedded in the public health content results. Study 6 (Chapter 8) presents theory-driven findings and frames the work in a larger conceptual model of how constructs of the Health Belief Model are conveyed in skin cancer and tanning coverage. Finally, Chapter 9 offers an overall summary of this thesis research and a discussion of the findings, as well as limitations, implications, and directions for future research. These study components are shown in Figure 1.

2.2 Theoretical Orientation

This doctoral thesis research has been guided by two theories: Agenda Setting Theory (AST) and the Health Belief Model (HBM). Studies 1 to 5 are predominately informed by AST, while Study 6 is focused on the HBM. With one exception (Cho et al., 2010) virtually all research in the area of skin cancer coverage in the mass media has lacked a clear theoretical perspective.

Agenda Setting Theory (AST) suggests that the mass media's reporting on issues influences public concerns and policy agendas (McCombs & Shaw, 1972; Kosicki, 1993). AST is often used to understand the persuasive role of the media. The more frequent and prominent the media coverage is of an issue, the more important audiences will believe the issue to be. Rogers and Dearing (1988) identify three types of agenda setting: public agenda setting, media agenda setting, and policy agenda setting. In Roger and Dearing's typology, what the mass media reports on (media agenda) influences the

public agenda, which in turn influences the policy agenda; however, the media agenda can also influence the policy agenda directly and vice versa. Media agenda setting focuses on precursors that influence what topics are reported on, and how they are reported on, in the mass media (Kosicki, 1993). For example, health news sources, resources, and priorities are influenced by news organization structure and individual characteristics of journalists (Wallington, Blake, Taylor-Clark, & Viswanath, 2010). Nevertheless, it is recognized that the directionality of AST with regard to media, policy, and the public can be problematic to identify.

In this doctoral research, AST has been used to inform an investigation into whether public health reports and decisions (i.e., 2006 IARC report linking indoor tanning and skin cancer, and the 2009 WHO/IRAC classification of indoor tanning devices as carcinogenic) have resulted in increased media coverage around skin cancer and tanning (media agenda setting). AST is also used to justify the investigation into the general frequency of coverage of skin cancer and tanning in popular magazines, as well as the extent to which related risk factors, UV behaviours, and early detection information are covered. The rationale for consideration of AST is that frequent coverage of these issues will persuade readers to consider them as significant. This may, in turn, inform readers' knowledge, attitudes, and behaviours (public agenda setting). There is empirical support that the media plays an important agenda-setting role regarding attitudes and beliefs about skin cancer and tanning among the public (Dixon, Warne, Scully, Dobbinson, & Wakefield, 2014).

The Health Belief Model (HBM) (Rosenstock, 1974) is a social psychological model that attempts to explain and predict health behaviours by focusing on people's

attitudes and beliefs. This theory assumes that people will perform health behaviours if they perceive they are susceptible to the disease or condition, if they expect that taking action will help them to avoid the negative health event or condition, and if they believe they can successfully perform the action. The HBM consists of six core constructs which are influential towards whether a person engages in a health behaviour or not: perceived susceptibility (beliefs about chances of getting the condition), perceived severity (beliefs about the seriousness of the condition or its consequences), perceived benefits (beliefs about effectiveness of taking action to reduce risk or severity), perceived barriers (beliefs about the costs of taking action), cues to action (factors that activate readiness to change), and self-efficacy (confidence in one's ability to take action) (Glanz, Rimer, & Lewis, 2008).

The HBM is often applied to preventative health behaviours (both health-promoting behaviours and health-risk behaviours) (Conner & Norman, 1996). The HBM has been widely used to develop successful health communication interventions (Sohl & Moyer, 2007); when the constructs of the HBM are included in the messages of an intervention, the health behaviours of interest are changed more successfully than if the HBM constructs are not targeted within health intervention messaging. For example, interventions promoting mammography for breast cancer screening that include at least one HBM construct have resulted in significant positive effects on screening (Allen & Bazargan-Hejazi, 2005; Lipkus, Rimer, Halabi, & Strigo, 2000).

In this doctoral research, the HBM was utilized in two ways. First, as a compliment theory to AST, the HBM served to explain at a "macro" level why it is important to examine mass print media content. Generally, the "cues to action" construct

of the HBM refers to information that will motivate or facilitate individual action towards a behaviour that will reduce the chance of getting a particular disease (Glanz et al., 2008). Cues to action can refer to the "media as a whole" and how it reports on a health issue (Glanz et al., 2008). Mass media content may collectively serve as a cue to action for the population regarding UV exposure and skin cancer and thus, from the perspective of the HBM, is an important source of information to investigate. Cues to action have also been operationalized as information occurring within mass print media content whereby specific "prompts" can engage readers to act on cancer information (Hoffman-Goetz & MacDonald, 1999). The primary way this doctoral research used the HBM was to investigate to what extent the HBM constructs (susceptibility, severity, benefits, barriers, cues to action, self-efficacy) were present in popular magazines in connection to skin cancer and tanning (Study 6).

2.3 Rationale

Widely circulating Canadian and U.S. magazines geared towards women, men, and girls served as the data set for the research. It was important to focus on the mass print media because it is a significant and influential source of health information (Hofstetter, Schultze, & Mulvihill, 1992; Meissner, Potosky, & Convissor, 1992; Chapman, McLeod, Wakefield, & Holding, 2005), including for skin cancer (Eadie & MacAskill, 2006). Magazines, specifically, were chosen as the mass print media source for several reasons. Magazines are widely read: over 90% of adults and adolescents read magazines and the highest circulating magazines have even greater reach than primetime television (The Association of Magazine Media, 2011). Magazines are an important

source of health information (Moyer, Vishnu, & Sonnad, 2001). Furthermore, magazines may report more in a more in-depth way about issues of skin cancer and tanning than other forms of mass print media (Slater, Long, Bettinghaus, & Reineke, 2008). The targeted readership of magazines also allows for comparisons and disaggregation by gender and age that may not be possible with more generic mass media sources, such as national newspapers.

2.3.1 Skin Cancer and Tanning Content Rationale

Central to this thesis on media coverage of skin cancer and tanning has been to characterize the extent to which key information around risks and behaviours are reported on by the popular media. Specifically, skin cancer risk factors, UV avoidance, exposure, and protection behaviours, and information about early detection were considered.

UV avoidance and protection are important to preventing skin cancer (American Academy of Dermatology, 2015). These include avoiding both solar and artificial UV exposure, and, when it cannot be avoided, protecting oneself by wearing sunscreen, protective clothing, and a wide-brimmed hat, and seeking shade. Early detection of skin cancer, including through skin self-examination (SSE) and physician-led skin examination, are important for good prognosis and survival. These are recommended behaviours by leading cancer control agencies, including the Canadian Cancer Society, the American Cancer Society, and the American Academy of Dermatology. (Details of these recommendations have been presented in Chapter 1.) Given the importance of these behaviours in connection to skin cancer prevention and early detection, it is timely to investigate the extent to which they are reported on in popular magazine coverage.

2.3.2 Rationale for IARC Report and Carcinogen Classification Investigation

The IARC report published in 2006 provided a compelling argument on the dangers of indoor tanning (i.e., its presumed causation of melanoma) and the WHO/IARC classification of indoor tanning devices as carcinogenic in 2009 was hailed by the cancer research and prevention community as ground-breaking. Both of these reports/decisions may have influenced the specific information appearing in mass print media about skin cancer and tanning, and how often magazines published that information.

The rationale for focusing on the 2006 IARC report and the 2009 IARC classification comes from theory and research evidence. Based on AST, and the media agenda setting component specifically, it was hypothesized that the release of the 2006 IARC report – a landmark health report about the dangers of UV exposure, especially artificial UV exposure – helped to shape the skin cancer reporting agenda of the mass print media. It is possible that the IARC report served as a precursor to media coverage of skin cancer in mass print media. It was expected that the IARC report would lead to an increase in the volume of coverage about skin cancer and tanning risks (as measured by greater number of articles and images dealing with these issues) and to more thorough coverage of these issues (as measured by occurrence of reporting on risk factors, UV behaviours, and early detection information). In this way, the IARC report may have been a triggering factor to an increase in mass print media coverage related to skin cancer and tanning, especially indoor tanning. As noted earlier, mass media content can influence public and political agendas around indoor tanning (Jalleh, Donovan, Lin, & Slevin, 2008; Sinclair & Makin, 2008).

Support for the anticipated influence of the IARC report on media reporting of skin cancer and tanning risks also follows from how other major health reports correlated with increased media coverage of an issue and the resultant changes in the health behaviours of the population. The U.S. Surgeon General's report (1964) was widely regarded as the definitive review of research causally linking smoking cigarettes to lung cancer; it was at this time that public health officials began campaigning against smoking in the U.S. (U.S. Department of Health and Human Services, 1964; 1989). After examining magazine coverage of smoking and health between 1950 and 1983, Pierce and Gilpin (2001) found that the largest spike in articles published occurred around the time of the 1964 Surgeon General's report; this also represented the highest number of articles published in a single year over the 33 year time span.

2.3.3 Rationale for Image vs. Text Comparison

The data set consists of images and text from editorial content on skin cancer and tanning. Traditionally, content analysis of mass print media health coverage has been largely text-based; however, images can influence health attitudes, intentions, and behaviours (Houts, Doak, Doak, & Loscalzo, 2006), including those connected to skin cancer and tanning (Mahler, Kulik, Gibbons, & Gerrard, 2003; Dixon, Warne, Scully, Wakefield, & Dobbinson, 2011; McWhirter & Hoffman-Goetz, 2013a; McWhirter & Hoffman-Goetz, 2013b). The inclusion of both images and text will help to expand the limited knowledge about visual health communication in the mass print media. Given that images can sway a reader's interpretation of an article's text content (Gibson &

Zillman, 2000), comparisons will be important to make between what information is conveyed in the text of articles and in the images that accompany them.

Studying how skin cancer and tanning information is visually communicated and comparing this to the text-based content are important areas to study for several reasons. It is important theoretically because Visual Persuasion and the Pictorial Superiority Effect (PSE) indicate that images are likely to be attended to and remembered by the reader. Research evidence has demonstrated the positive impact images have on understanding health information and health behaviours (Houts et al., 2006). Images also influence the meaning of accompanying text in the mass media (Gibson & Zillman, 2000; Zillman, Gibson, & Sargent, 1999). Thus, the PSE, Visual Persuasion, and the research evidence showing that photographs influence how mass print media articles are perceived by readers makes visual images accompanying skin cancer and tanning magazine articles appropriate to examine.

Based on previous research about breast cancer in the media, and one study on skin cancer in the media, it was expected that the visual and text content about skin cancer and tanning in the magazines collected for this research would convey contradictory or discordant health messages relative to text. Prior research has indicated that visual images accompanying magazine articles about breast cancer do not accurately portray risk or true severity of the disease, nor do they portray prevention and early detection (Andsager, Hurst, & Powers, 2000; Clarke et al., 1999a; McWhirter, Hoffman-Goetz, & Clarke, 2012). Simultaneously, breast cancer imagery in the media has been found to emphasize an attractive appearance in contrast to some of the physical realities of the disease described in the text (Clarke et al., 1999a; McWhirter et al., 2012; Phillips,

2009). The findings of a previous study on breast cancer coverage in Canadian magazines suggest that images and text convey very different themes (McWhirter et al., 2012). For example, the most common theme in article text about breast cancer was medical issues while the most common theme in the accompanying images was beauty/fashion. Such discordance is important to document because the visual image may "sway" the reader to take away a different message from the article than what the text intends. Much less is known about how skin cancer is visually depicted in mass media content. Cho and colleagues (2010) found that while magazine article text promoted sun protection, the visual imagery accompanying the text did not always convey messages of UV protection. In fact, the images contained mixed messages about sun protection or even promoted UV exposure. Hence, it was important to investigate potential differences in visual and text coverage of skin cancer and tanning in popular magazines.

2.3.4 Rationale for Women's vs. Men's Magazines Comparison

Men's and women's attitudes and intentions about tanning are influenced by the mass media (Dixon et al., 2011; Cho & Choi, 2011). Women use magazines as a source of cancer information (Gerlach, Marino, Weed, & Hoffman-Goetz, 1997; Hoffman-Goetz, Gerlach, Marino, & Mills, 1997) and their attitudes and beliefs about skin cancer and tanning are influenced by media content (Dixon et al., 2014). Focusing on women's magazines is important because women are the primary users of indoor tanning beds (Wehner et al., 2014) and are frequently targeted by their advertising (Team & Markovic, 2006). Moreover, young women have a higher incidence of melanoma compared to men the same age (National Cancer Institute, 2014). Hence, women are at high risk for the

disease, frequently engage in behaviours that put them at risk, and are influenced by related media content.

Prior research has primarily focused on women's mass print media content related to skin cancer and tanning communication; it has largely ignored men's mass print media sources (Cho, Hall, Kosmoski, Fox, & Mastin, 2010; Dixon, Dobbinson, Wakefield, Jamsen, & McLeod, 2008; Gamble et al., 2011). The examination of men's magazines for content related to skin cancer and tanning was important because men are also at increased risk for skin cancer and UV exposure is a risk factor for skin cancer (Canadian Cancer Society, 2012a, 2012b; Skin Cancer Foundation, 2012). Contributing to the increased risk of skin cancer among men is that they less frequently engage in UV protection behaviours than women (Coups, Manne, & Heckman, 2008; Lewis, Mayer, & Slymen, 2006). Moreover, although only a minority of men use indoor tanning beds (Choi, Lazovich, Southwell, Forster, Rolnick, & Jackson, 2010), men are at increased risk of skin cancer because they are more likely to have occupations where they work outdoors (at least traditionally), which contributes to their greater lifetime solar UV exposure compared to women (Ramirez, Federman, & Kirsner, 2005). Therefore, there may be a role for the mass print media to play regarding informing men of their increased risk of skin cancer and conveying effective skin cancer prevention and early detection practice information. The extent to which men's magazines provide this information has not been previously studied.

It was also important to compare skin cancer and tanning coverage in magazines with different gender audiences, as there may be important differences in this regard. There are broad difference in how cancer is portrayed in the mass print media for men

and women (Cartwright, 1998; Clarke, 1999a, 1999b; Clarke & Robinson, 1999; Reagan, 1997; Seale, 2002). Gender has also been a key organizing principle in popular cancer discourse; cancer education has taught women and men different things about the disease (Reagan, 1997). Lung cancer, for example, was historically emphasized in the mass media as a men's cancer and presented as a disease about which women ought not to be concerned (Reagan, 1997). However, the reason men were affected more by lung cancer was because of their higher smoking rates. No prior research has investigated differences in skin cancer and tanning coverage in mass print media targeted towards women compared to men.

2.3.5 Rationale for Canadian Magazines

Skin cancer is the most common type of cancer among Canadians and the incidence is growing (National Skin Cancer Prevention Committee, 2010). In 2014, there were an estimated 6,500 cases of melanoma and 76,100 cases on non-melanoma skin cancer (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014). Despite a northern climate, Canadians still receive significant UV exposure, the most important risk factor for skin cancer. Canadians frequently vacation in the sun and do not adequately protect themselves from the sun (National Skin Cancer Prevention Committee, 2010). Artificial UV exposure is also an issue, with one-quarter of young Canadian women using indoor tanning devices (National Skin Cancer Prevention Committee, 2010). It is surprising that there has been no rigorous investigation of how Canadian media covers skin cancer and tanning.

2.3.6 Rationale for Teenage Girls' Magazines

Magazines are an important source of health information during the adolescent years (Brown, 2002; Harrison, 2000). Adolescence is a critical period during which UV damage to the skin increases cancer risk (Whiteman, Whiteman, & Green, 2001) and a significant amount of lifetime UV exposure occurs before 18 years of age (Godar, Wengratis, Shreffler, & Sliney, 2001). Not only is melanoma the second most common cancer for young adults aged 15 to 34 in Canada (Cancer Care Ontario, 2006), there has been a steady increase in the incidence of melanoma among young women in the U.S. (Purdue, Freeman, Anderson, & Tucker, 2008).

Exposure to UV radiation through indoor tanning is a particularly significant public health issue among teenage girls. Young women are the primary users of tanning beds (Choi et al., 2010), with adolescent girls using tanning beds at a much higher rate than adolescent boys (rates of use are as high as 40% for teenage girls aged 17 to 18 years compared to 11% for teenage boys of the same age) (Cokkinides, Weinstock, O'Connell, & Thun, 2002). Although progress has been made with implementing youth access laws to tanning beds in several provinces and states, tanning salons are often non-compliant with these laws (Hester, Heilig, D'Amrosia, Drake, Schilling, & Dellavale, 2005; Pichon et al., 2009). Moreover, the tanning industry primarily targets young women with their advertisements (Team & Markovic, 2006; Greenman & Jones, 2009; Freeman, Francis, Lundahl, Bowland, & Dellavalle, 2006). Despite the importance of magazines as a health information source, the growing incidence of skin cancer among young women, and the issues around indoor tanning for teenagers, there has only been one previous study on editorial media coverage of skin cancer aimed at teenage girls; that study used data from

2006 and earlier (Cho et al., 2010) and took place prior to major policy changes regarding tanning salon access. Therefore, it was important to determine what information magazines aimed at adolescent girls conveyed about skin cancer and tanning more recently, as it may play a role in shaping their knowledge and behaviours related to UV exposure.

2.3.7 Rationale for Health Belief Model Constructs

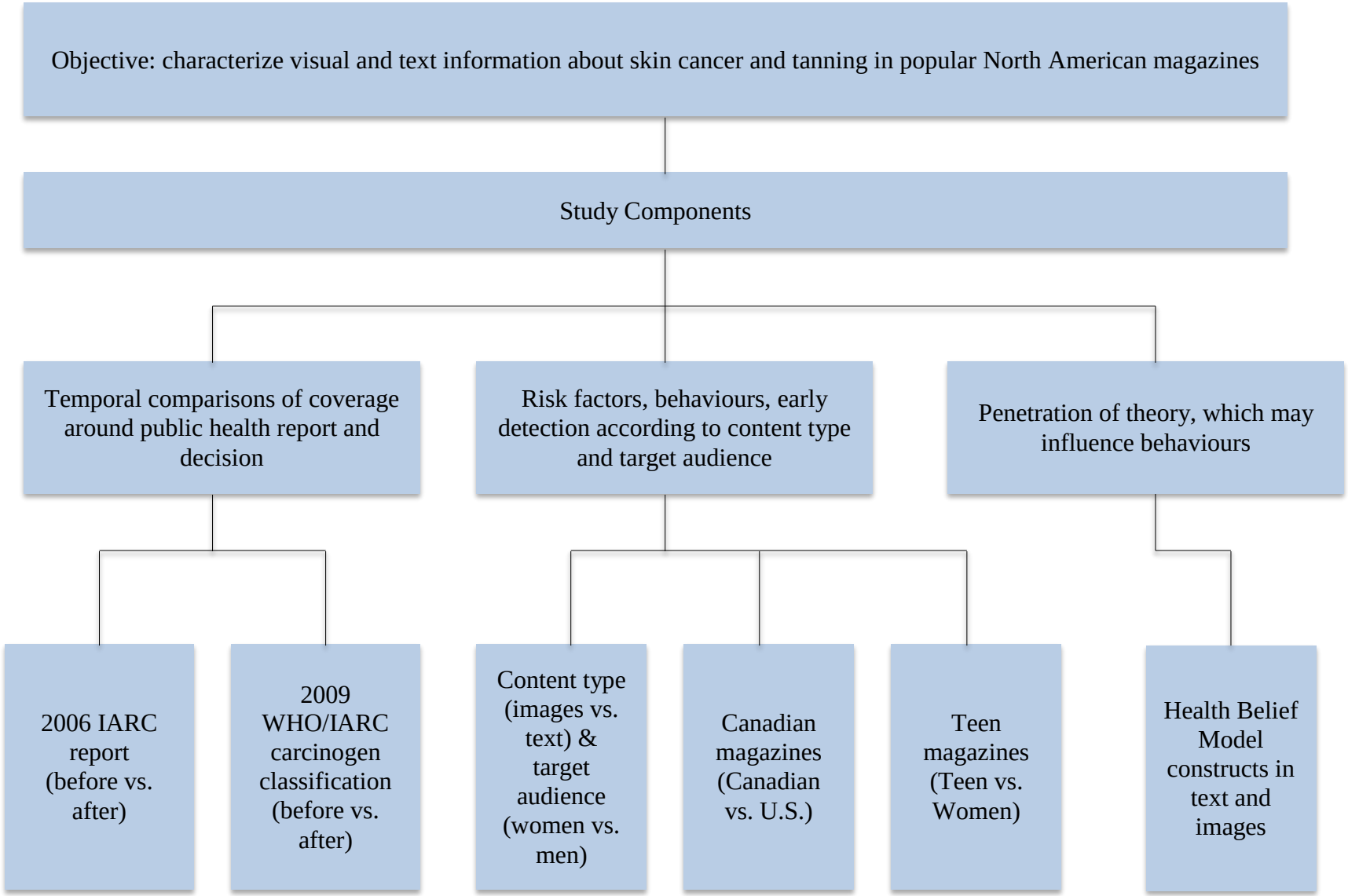
While examining popular magazine content for overall volume and emphasis of coverage regarding skin cancer and tanning, as well as for focus on risk factors, UV behaviours, and early detection information is important, there are other important ways to study the content to determine whether it may have a potential influence on readers, particularly in terms of their behaviour. To gauge whether coverage of skin cancer and tanning in magazines present skin cancer and tanning information in a way which might influence the health behaviours of the public, the extent to which constructs from the HBM were present in the text and images (i.e., perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, self-efficacy), and the nature of those (e.g., the type of severity information present), were examined.

The HBM has not previously been applied to research on mass media coverage of skin cancer and tanning. Nevertheless, several HBM constructs have been linked to skin cancer-related prevention intentions and behaviours (Jackson & Aiken, 2006; Mahler et al., 2003; Mahler, Fitzpatrick, Parker, & Lapin, 1997; Carmel, Shani, & Rosenberg, 1994). Consider the following examples. Perceived susceptibility to skin cancer and photoaging were associated with sun-protective intentions and behaviours (Mahler et al.,

1997; Mahler et al., 2003), perceived benefits of sun protection were also connected to sun-protection intentions and behaviours (Mahler et al., 1997; Mahler et al., 2003), and perceived barriers of sun protection were negatively correlated to sun protection (Carmel et al., 1994). Thus, it was important to determine whether constructs of the HBM are included in mass print media coverage of skin cancer and tanning as their subtle presence may help to determine message effectiveness.

Figure 1 shows the study components of this doctoral thesis research. The following chapters provide the findings from each of the components.

Figure 1. Study Components



2.4 References

Allen, B. Jr. & Bazargan-Hejazi, S. (2005). Evaluating a tailored intervention to increase screening mammography in an urban area. *Journal of the National Medical Association, 97,* 1350-1360.

American Academy of Dermatology (2015). *How do I prevent skin cancer?* Retrieved from https://www.aad.org/spot-skin-cancer/understanding-skin-cancer/how-do-i-prevent-skin-cancer

American Cancer Society (2015). *Skin Cancer.* Retrieved from http://www.cancer.org/cancer/skincancer/

Andsager, J. L., Hurst, S. J. T., & Powers, A. (2000). Patient-blaming and representation of risk factors in breast cancer images. *Women & Health, 31,* 57-79.

Brown, J. D. (2002). Mass media influences on sexuality. *Journal of Sex Research, 39,* 42-45.

Canadian Cancer Society (2015a). *Risk factors for non-melanoma*. Retrieved from http://www.cancer.ca/en/cancer-information/cancer-type/skin-non-melanoma/risks/?region=on

Canadian Cancer Society (2015b). *Risk factors for melanoma*. Retrieved from http://www.cancer.ca/en/cancer-information/cancer-type/skin-melanoma/risks/?region=on

Canadian Cancer Society (2015c). *Reducing your risk for melanoma*. Retrieved from http://www.cancer.ca/en/cancer-information/cancer-type/skin-melanoma/risks/reducing-your-risk/?region=on

Canadian Cancer Society (2015d). *Reducing your risk for non-melanoma skin cancer*. Retrieved from http://www.cancer.ca/en/cancer-information/cancer-type/skin-non-melanoma/risks/reducing-your-risk/?region=on

Canadian Cancer Society's Advisory Committee on Cancer Statistics. Canadian Cancer Statistics 2014. Chapter 7: Special Topic: Skin cancers. Toronto, ON: Canadian Cancer Society. Retrieved from http://www.cancer.ca/~/media/cancer.ca/CW/cancer%20information/cancer%20101/Canadian%20cancer%20statistics/Canadian-Cancer-Statistics-2014-EN.pdf

Cancer Care Ontario. (2006). *Cancer in Young Adults in Canada*. Retrieved from http://www.cancercare.ns.ca/site-cc/media/cancercare/Skin_Cancer_Statistics.pdf

Carmel, S., Shani, E., & Rosenberg, L. (1994). The role of age and an expanded health belief model on predicting skin cancer protective behavior. *Health Education Research, 9,* 433-447.

Cartwright, L. (1998). Community and the public body in breast cancer media activism. *Cultural Studies, 12*, 117-138.

Chapman, S., McLeod, K., Wakefield, M., & Holding, S. (2005). Impact of news of celebrity illness on breast cancer screening: Kylie Minogue's breast cancer diagnosis. *Medical Journal of Australia, 183*, 247-250.

Cho, H. & Choi, J. (2011). Television, gender norms, and tanning attitudes and intentions of young men and women. *Communication Studies, 62*, 508-530.

Cho, H., Hall, J. G., Kosmoski, C., Fox, R. L., & Mastin, T. (2010). Tanning, skin cancer risk, and prevention: a content analysis of eight popular magazines that target female readers: 1997-2006. *Health Communication, 25*, 1-10.

Choi, K., Lazovich, D., Southwell, B., Forster, J., Rolnick, S. J., & Jackson, J. (2010). Prevalence and characteristics of indoor tanning use among men and women in the United States. *Archives of Dermatology, 146*, 1356-1361.

Clarke, J. N. (1999a). Breast cancer in mass circulating magazines in the USA and Canada 1974-1995. *Women & Health, 28*, 113-130.

Clarke, J. N. (1999b). Prostate cancer's hegemonic masculinity in select print mass media depictions (1974-1995). *Health Communication*, 11, 59-74.

Clarke, J. N. & Robinson, J. (1999). Testicular cancer: Medicine and machismo in the media 1980 – 1994. *Health, 3*, 263-282.

Cokkinides, V. E., Weinstock, M. A., O'Connell, M. C., & Thun, M. J. (2002). Use of indoor tanning sunlamps in US youth, ages 11-18 years, and by their parent or guardian caregivers: prevalence and correlates. *Pediatrics, 109*, 1124-1130.

Conner, M. & Norman, P. (1996). *Predicting Health Behavior: Research and Practice with Social Cognition Models.* Maidenhead, BRK, England: Open University Press.

Coups, E. J., Manne, S. L., & Heckman, C. J. (2008). Multiple skin cancer risk behaviors in the U.S. population. *American Journal of Preventative Medicine, 34*, 87-93.

Dixon, H. G., Warne, C. D., Scully, M. L., Wakefield, M. A., & Dobbinson, S. J. (2011). Does the portrayal of tanning in Australian women's magazines relate to real women's tanning beliefs and behavior? *Health Education & Behavior, 38*, 132-142.

Dixon, H., Warne, C., Scully, M., Dobbinson, S., & Wakefield, M. (2014). Agenda-setting effects of sun-related news coverage on public attitudes and beliefs about tanning and skin cancer. *Health Communication, 29,* 173-181.

Dixon, H., Dobbinson, S., Wakefield, M., Jamsen, K., & McLeod, K. (2008). Portrayal of tanning, clothing fashion and shade use in Australian women's magazines, 1987-2005. *Health Education Research, 23*, 791-802.

Eadie, D. & MacAskill, S. (2007). Results from an exploratory study of sun protection practice: implications for the design of health promotion messages. *Health Education, 107,* 250- 260.

Freeman, S., Francis, S., Lundahl, K., Bowland, T., & Dellavalle, R. P. (2006). UV tanning advertisements in high school newspapers. *Archives of Dermatology, 142*, 460-462.

Gamble, R. G., Fuller, E. N., Dymek, P. M., Walkosz, B. J., Jensen, J. D., Duke, J. K., et al. (2011). Tanning and sun-protection portrayal in magazine images. *Archives of Dermatology, 147*, 983-984.

Gerlach, K. K., Marino, C., Weed, D. L., & Hoffman-Goetz, L. (1997). Lack of colon cancer coverage in seven women's magazines. *Women & Health, 26*, 57-68.

Gibson, R. & Zillmann, D. (2000). Reading between the photographs: The influence of incidental pictorial information on issue perception. *Journalism and Mass Communication Quarterly, 77*, 355-366.

Glanz, K., Rimer, B. K., & Lewis, F. M. (2008). *Health Behavior and Health Education. Theory, Research and Practice. Fourth Edition*. San Francisco, CA: Wiley & Sons.

Godar, D. E., Wengraitis, S. P., Shreffler, J., & Sliney, D. H. (2001). UV doses of Americans. *Photochemistry and Photobiology*, *73*, 621-629.

Greenman, J. & Jones, D. A. (2009). Comparison of advertising strategies between the indoor tanning and tobacco industries. *Journal of the American Academy of Dermatology, 62*, 685e1-685e18.

Harrison, K. (2000). The body electric: Thin-ideal media and eating disorders in adolescents. *Journal of Communication, 50,* 119-143.

Hester, E. J., Heilig, L. F., D'Amrosia, R., Drake, A. L., Schilling, L. M., & Dellavalle, R. P. (2005). Compliance with youth access regulations for indoor UV tanning. *Archives of Dermatology, 141*, 959-962.

Hoffman-Goetz, L. & MacDonald, M. (1999). Cancer coverage in mass-circulating Canadian women's magazines. *Canadian Journal of Public Health, 90,* 55-59.

Hoffman-Goetz, L., Gerlach, K. K., Marino, C., & Mills, S. L. (1997). Cancer coverage and tobacco advertising in African-American women's popular magazines. *Journal of Community Health, 22,* 261-269.

Hofstetter, C. R., Schultze, W. A., & Mulvihill, M. M. (1992). Communication media, public health, and public affairs: Exposure in a multimedia communication. *Health Communication, 4,* 259-271.

Houts, P. S., Doak, C. C., Doak, L. G., & Loscalzo, M. J. (2006). The role of pictures in improving health communication: A review of research on attention, comprehension, recall, and adherence. *Patient Education and Counseling, 61,* 173-190.

Hsieh, H-F. & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15,* 1277-1288.

Jackson, K. M., & Aiken, L. S. (2006). Evaluation of a multicomponent appearance-based sun-protective intervention for young women: Uncovering the mechanisms of program efficacy. *Health Psychology, 25,* 34-46.

Jalleh, G., Donovan, R. J., Lin, C., & Slevin, T. (2008) Changing perceptions of solaria and cancer risk: the role of the media. *Medical Journal of Australia, 188,* 735.

Kirsner, R. S., Wilkinson, J. D., Ma, F., Pacheco, H., & Federman, D. G. (2005). The association of Medicare health care delivery systems with stage at diagnosis and survival for patients with melanoma. *Archives of Dermatology, 141,* 753-757.

Kosicki, G. (1993). Problems and opportunities in agenda-setting research. *Journal of Communication, 43,* 100-127.

Lewis, E., Mayer, J. A., & Slymen, D. (2006). Postal workers' occupational and leisure-time sun safety behaviors (United States). *Cancer Causes & Control, 17,* 181-186.

Lipkus, I., Rimer, B., Halabi, S., & Strigo, T. (2000). Can tailored interventions increase mammography use among HMO women? *American Journal of Preventative Medicine, 18,* 1-10.

Mahler, H. I. M., Fitzpatrick, B., Parker, P., & Lapin, A. (1997). The relative effects of a health-based versus an appearance-based intervention designed to increase sunscreen use. *American Journal of Health Promotion, 11,* 426-429.

Mahler, H. I. M., Kulik, J. A., Gibbons, F. X., Gerrard, M., & Harrell, J. (2003). Effects of appearance-based interventions on sun protection intentions and self-reported behaviors. *Health Psychology, 22,* 199-209.

Mahler, H. I. M., Kulik, J. A., Gibbons, F. X., Gerrard, M., & Harrell, J. (2003). Effects of appearance-based interventions on sun protection intentions and self-reported behaviors. *Health Psychology, 22,* 199-209.

McCombs, M. E., & Shaw, D. L. (1972). The agenda-setting function of mass media. *Public Opinion Quarterly, 36 (Summer),* 176-187

McWhirter, J. E., Hoffman-Goetz, L., & Clarke, J. N. (2012). Can you see what they are saying? Breast cancer images and text in Canadian women's and fashion magazines. *Journal of Cancer Education, 27,* 383-391.

McWhirter, J. E. & Hoffman-Goetz, L. (2013a). Systematic review of population-based studies on the impact of images on UV attitudes and behaviours. doi: 10.1093/heapro/dat031

McWhirter, J. E. & Hoffman-Goetz, L. (2013b). Visual images for patient skin self-examination and melanoma detection: A systematic review of published studies. *Journal of the American Academy of Dermatology, 69,* 47-55.

Meissner, H. I., Potosky, A. L., & Convissor, R. (1992). How sources of health information relate to knowledge and use of cancer screening exams. *Journal of Community Health, 17,* 153-165.

Moyer, C. A., Vishnu, L. O., & Sonnad, S. S. (2001). Providing health information to women: the role of magazines. *International Journal of Technology Assessment in Health Care, 17,* 137-145.

National Cancer Institute. SEER Stat Fact Sheets: Melanoma of the Skin. Retrieved from http://seer.cancer.gov/statfacts/html/melan.html.

National Skin Cancer Prevention Committee. (2010). *Exposure to and Protection from the Sun in Canada: A Report Based on the 2006 Second National Sun Survey*. Toronto, ON: Canadian Partnership Against Cancer. Retrieved from http://www.partnershipagainstcancer.ca/wp-content/uploads/Exposure-to-and-Protection-from-the-Sun-in-Canada.pdf

National Skin Cancer Prevention Committee. (2010). *Exposure to and Protection from the Sun in Canada: A Report Based on the 2006 Second National Sun Survey*. Toronto, ON: Canadian Partnership Against Cancer. Retrieved from http://www.partnershipagainstcancer.ca/wp-content/uploads/Exposure-to-and-Protection-from-the-Sun-in-Canada.pdf

Phillips, C. (2009). Images, femininity and cancer: An analysis of an international patient education programme. *Health, 13,* 67-85.

Pichon, L. C., Mayer, J. A., Hoerster, K. D, Woodruff, S. I., Slymen, D. J., Belch, G. E., . . . Weinstock, M. A. (2009). Youth access to artificial UV radiation exposure: practices of 3647 US indoor tanning facilities. *Archives of Dermatology, 145*, 997-1002.

Pierce, J. P. & Gilpin, E. A. (2001). News media coverage of smoking and health is associated with changes in population rates of smoking cessation but not initiation. *Tobacco Control, 10,* 145-153.

Purdue, M. P., Freeman, L. E., Anderson, W. K., & Tucker, M. A. (2008). Recent trends in incidence of cutaneous melanoma among US Caucasian young adults. *Journal of Investigative Dermatology*, *128*, 2905-2908.

Ramirez, C. C., Federman, D. G., & Kirsner, R. S. (2005). Skin cancer as an occupational disease: the effect of ultraviolet and other forms of radiation. *International Journal of Dermatology*, *44,* 95-100.

Reagan, L. J. (1997). Engendering the dread disease: women, men, and cancer. *American Journal of Public Health. 87*, 1779-1787.

Rogers, E. M., & Dearing, J. W. (1988). Agenda-setting research: Where has it been? Where is it going? In: Anderson, J.A. (Ed.). *Communication Yearbook 11* (pp. 555-594). Newbury Park, CA: SAGE Publications.

Rosenstock, I. (1974). Historical Origins of the Health Belief Model. *Health Education Monographs, 2,* 328.

Seale, C. (2002). Cancer heroics: a study of news reports with particular reference to gender. *Sociology*, *36*, 107-126.

Sinclair, C. A. & Makin, J. K. (2008). Sometimes it takes a loss of life to make a difference. *British Medical Journal, 336,* 73.

Skin Cancer Foundation (2012). *Skin cancer facts*. Retrieved from http://www.skincancer.org/skin-cancer-information/skin-cancer-facts#men/women

Slater, M. D., Long, M. Bettinghaus, E. P., & Reineke, J. B (2008). News coverage of cancer in the United States: A national sample of newspapers, television, and magazines. *Journal of Health Communication, 13,* 523-537.

Sohl, S. J. & Moyer, A. (2007). Tailored interventions to promote mammography screening: A meta-analytic review. *Preventative Medicine*, *45*, 252–261.

Team, V. & Markovic, M. (2006). Internet advertising of artificial tanning in Australia. *European Journal of Cancer Prevention, 15*, 371–376.

The Association of Magazine Media (2011). *Magazine Media Factbook 2012/13*. Retrieved from http://www.magazine.org/insights-resources/research-publications/2012/2013-magazine-media-factbook

U.S. Department of Health and Human Services (1964). *Smoking and health. Report of the Advisory Committee to the Surgeon General of the Public Health Service*. U.S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control. PHS Pub. No. 1103.

U.S. Department of Health and Human Services (1989). *Reducing the health consequences of smoking: 25 years of progress*. A report of the Surgeon General 1989. Rockville, Maryland: Public Health Service, Centre for Disease Control, Office on Smoking and health. DHHS Publication No (CDC) 89-8411.

Wallington, S. F., Blake, K., Taylor-Clark, K., & Viswanath, K. (2010). Antecedents to agenda setting and framing in health news. *Journal of Health Communication, 15*, 76-94.

Wehner, M. R., Chren, M. M., Nameth, D., Choudhry, A., Gaskins, M., Nead, K. T., Boscardin, W. J., & Linos, E. (2014). International prevalence of indoor tanning: A systematic review and meta-analysis. *JAMA Dermatology, 150*, 390-400

Whiteman, D. C., Whiteman, C. A., & Green, A. C. (2001). Childhood sun exposure as a risk factor for melanoma: a systematic review of epidemiologic studies. *Cancer Causes & Control*, *12*, 69-82.

Zillmann, D., Gibson, R., & Sargent, S. L. (1999). Effects of photographs in news-magazine reports on issue perception. *Media Psychology, 1*, 207-228.

CHAPTER 3: COVERAGE OF SKIN CANCER AND RECREATIONAL TANNING IN NORTH AMERICAN MAGAZINES BEFORE AND AFTER THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER REPORT

The work in this chapter has been published as:

McWhirter, J. E. & Hoffman-Goetz, L. (2015). Coverage of skin cancer and recreational tanning in North American magazines before and after the landmark 2006 International Agency for Research on Cancer report. *BMC Public Health*, *15*, 169. doi:10.1186/s12889-015-1511-1

3.1 Research Questions

Do North American popular magazines contain more articles about skin cancer and tanning after compared to before the 2006 IARC report?

Do North American popular magazines contain a greater volume of articles and images covering skin cancer risk factors, UV behaviours, and early detection information after compared to before the 2006 IARC report?

3.2 Hypotheses

Popular North American magazines will contain more articles about skin cancer and tanning after the 2006 IARC report compared to before the 2006 IARC report.

Popular North American magazines will contain different information about skin cancer and tanning (i.e., risk factors, UV behaviours, and early detection information) in article text and images after the 2006 IARC report compared to before the 2006 IARC report.

3.3 Chapter Overview

Background: Skin cancer is an increasingly important global public health problem. Mass media is a key source of skin cancer information. *Objective:* We examined how media coverage of skin cancer has changed over time as a consequence of the release of a key public health report from the International Agency for Research on Cancer (IARC) in 2006, which linked ultraviolet (UV) radiation from indoor tanning and skin cancer. *Methods:* A directed content analysis of skin cancer and tanning coverage in 29 popular North American magazines (2001-2012) examined reporting of skin cancer risk factors, UV behaviours, and early detection in article text (n = 761) and images (n = 1267). Chi-square and correlational analyses were used determine whether coverage changed in relation to the 2006 IARC report. *Results:* The total volume of articles about skin cancer and tanning increased modestly after the IARC report ($\chi^2 = 4.57$, $df = 1$, $p < .05$); however, key IARC report messages (e.g., avoid indoor tanning, UV as a risk factor) were no more likely to be reported after compared to before the report. There were virtually no changes in the percentage of coverage for both risk factors and early detection information over time. There were some changes in the percentage of coverage about UV behaviours after the IARC report, but these variables were not directly related to the report. Magazines were more likely to encourage sunscreen use ($\chi^2 = 11.55$, $df = 1$, $p < .01$) and less likely to promote the tanned look as attractive ($\chi^2 = 9.72$, $df = 1$, $p < .01$) after the IARC report. It also became less common for magazines to promote sun avoidance ($\chi^2 = 6.82$, $df = 1$, $p < .01$) and use of sunless tanners ($\chi^2 = 7.46$, $df = 1$, $p < .01$) after the report. *Conclusions*: Despite a modest increase in volume of coverage post-IARC report, key messages from the report were not taken up by the media. While there

have been some improvements in magazine reporting, there is a need for more effective dissemination of public health messages about skin cancer and tanning.

3.4 Background

Skin cancer is a significant public health problem globally (World Health Organization, 2014), with incidence increasing in North America (American Cancer Society, 2014; Canadian Cancer Society, 2014). Skin cancer can often be prevented through modifiable behaviours (American Academy of Dermatology, 2014) and, when detected early, survival for melanoma and non-melanoma is as high as 90% (Ries et al., 2007).

Ultraviolet (UV) radiation exposure, either solar or artificial, is *the* major risk factor for skin cancer (American Academy of Dermatology, 2014; International Agency for Research on Cancer, 2006). UV exposure can be minimized through changes in behaviour, such as avoiding excessive exposure to the sun, not using indoor tanning beds, wearing protective clothing and a wide-brimmed hat, seeking shade, and wearing sunscreen (American Academy of Dermatology, 2014). Despite this, indoor tanning is popular, especially among young Caucasian women in the United States, Europe, and Australia (Heckman, Coups, & Manne, 2008; Wehner et al., 2014).

The mass media is an important source of health information for the public (Eadie & MacAskill, 2007), influencing people's attitudes and beliefs about skin cancer and tanning (Dixon, Warne, Scully, Dobbinson, & Wakefield, 2014). Moreover, media advocacy has a significant role in shaping the policy agenda around indoor tanning (Sinclair, Makin, Tang, Brozek, & Rock, 2014). A handful of studies have examined

temporal changes in media coverage of skin cancer and tanning, but the direction of changes over time has not been consistent. For example, between the 1997 and 2006, there was an increase in mentions of the consequences of UV exposure, but also an increase in coverage of the presumed "health" benefits of tanning in American women's magazines (Cho, Hall, Kosmoski, Fox, & Mastin, 2010). In contrast, there was no change in media attention to skin cancer in American newspapers between 1986 and 2003 (Stryker, Solky, & Emmons, 2005). Still another study found a slight upward trend in news coverage between 1980 and 2004, but with considerable fluctuation from year to year; the largest increases in coverage occurred in the early and mid-1980s when several national skin cancer programs were established (Heneghan, Hazan, Halpern, & Oliveria, 2007). More recently, researchers found there was no change in the frequency of articles focusing on UV protection issues in Australian news media between 2001 and 2012 and an increase in articles focusing on sunbed issues between 2001 and 2005 (Scully, Makin, Maloney, & Wakefield, 2014). While these studies make important contributions to knowledge about mass media reporting on skin cancer and tanning, research gaps remain: there has been no research on North American magazine coverage on skin cancer and tanning since 2006; prior studies typically focused on a limited number of publications; and the timeframe analyses were not linked to major public health reports or decisions.

In 2006 the International Agency for Research on Cancer (IARC), the cancer research arm of the World Health Organization (WHO), responded to the alarming increase in skin cancer incidence and the rising popularity of tanning beds by producing a landmark evidence-synthesis report on the dangers of artificial UV exposure and skin cancer (International Agency for Research on Cancer, 2006a). The working group which

authored the 2006 IARC report concluded that there was convincing evidence to link indoor tanning bed use and skin cancer (melanoma and squamous cell), a conclusion supported by subsequent systematic reviews (Boniol, Autier, Boyle, & Gandini, 2012). There has been no investigation of the impact of this key report on media coverage of the issues of skin cancer and tanning.

In this study, we analyzed the frequency of coverage of skin cancer and recreational tanning (indoor and outdoor) in popular North American magazines over time (2001 to 2012). In addition to examining volume of coverage, we investigated temporal changes in coverage of skin cancer risk factors, UV behaviours, and early detection information relative to the 2006 IARC report. Based on the significant impact public health reports have had on media coverage of other types of cancer (Pierce & Gilpin, 2012), we hypothesized that the effect of the IARC report would be a large increase in the volume of coverage of skin cancer and tanning in popular magazines and corresponding increases in article and image content conveying information about risk factors for skin cancer, encouraging UV protection and UV avoidance, and supporting the importance of early detection.

3.5 Methods

We conducted a directed content analysis on skin cancer and tanning coverage (article text and accompanying images) in 29 high-circulating popular North American magazines between 2001 and 2012. We chose this timeframe because it provided an equal number of years for comparison before and after the 2006 IARC report and was of sufficient duration to allow reliable identification of media reporting patterns. The

inclusion of visual data was important because images influence people's knowledge, attitudes, and behaviours related to their health (Houts, Doak, Doak & Loscalzo, 2006), including skin cancer and tanning (McWhirter & Hoffman-Goetz, 2013a; McWhirter & Hoffman-Goetz, 2013b).

Magazines were selected based on circulation numbers, target readership, genre of focus, and whether they were published consecutively during the timeframe of interest. These details were obtained from the *Audit Bureau of Circulations*, *Canadian Advertising Rates and Data*, and magazine media kits. The magazines included in the analysis were women's (n=15), men's (n=10), female youth (n=1), and news (n=3); magazine names and circulation sizes are shown in Table 1. Male youth magazines were not available for the timeframe of interest. Only English language magazines were included.

Magazines were searched electronically for skin cancer and tanning content through the *Canadian Periodical Index*, *Reader's Guide to Periodical Literature*, *LexisNexis*, *Factivia*, and *ProQuest Research Library* – and manually using the table of contents for those not indexed online – from January 2001 to December 2012 inclusive. The search terms were: skin cancer, melanoma, basal cell carcinoma, squamous cell carcinoma, (tan* or indoor tan* or outdoor tan* or suntan*), sunburn, sunscreen, and sunblock, together with Boolean operators. Advertisements, articles outside of the date range, or articles which did not have skin cancer and tanning as the main focus were excluded. Magazine article text was retrieved electronically; images were obtained through library archives. Our data (articles and images) came from publicly available archived magazines and, as such, the study did not require university research ethics approval.

Table 1. Magazine genre, circulation, and number of skin cancer and tanning articles published (2001-2012)

Country	Magazine	Type/Focus of Magazine	Circulation (2012)	Number (Mean/year, *SD*)
United States	*Good Housekeeping*	Women's general interest	4,346,747	46 (3.8, 2.7)
	Family Circle	Women's general interest	4,100,977	12 (1.0, 0.6)
	Ladies Home Journal	Women's general interest	3,205,302	22 (1.8. 1.8)
	Cosmopolitan	Women's beauty/fashion	3,017,834	65 (5.4, 2.7)
	Glamour	Women's beauty/fashion	2,374,291	25 (2.1, 2.1)
	Vogue	Women's beauty/fashion	1,222,373	16 (1.3, 1.2)
	Elle U.S.	Women's beauty/fashion	1,121,529	48 (4.0, 2.3)
	Shape	Women's health/fitness	1,635,933	112 (9.3,4.6)
	Self	Women's health/fitness	1,528,583	48 (4.0, 3.7)
	GQ	Men's general interest	963,507	3 (0.3, 0.5)
	Esquire	Men's general interest	721,399	10 (0.8, 1.1)
	Details	Men's general interest	461,937	2 (0.2, 0.4)
	Sports Illustrated	Men's sport/science	3,204,945	1 (0.1, 0.3)
	Golf Digest	Men's sport/science	1,678,538	13 (1.1, 0.7)
	Popular Science	Men's sport/science	1,350,685	7 (0.6, 1.2)
	Field and Stream	Men's sport/science	1,252,833	1 (0.1, 0.3)
	Men's Health	Men's health/fitness	1,918,387	72 (6.0, 2.6)
	Men's Fitness	Men's health/fitness	585,265	24 (2.0, 2.0)
	Muscle and Fitness	Men's health/fitness	325,000	17 (1.4, 1.1)
	Seventeen	Teen girls' general interest	2,025,299	33 (2.8. 1.5)
	Time	News	3,276,822	16 (1.3, 1.2)
	Newsweek	News	1,527,156	15 (1.3, 1.7)
Canada	*Chatelaine*	Women's general interest	550,613	23 (1.9, 1.3)
	Canadian Living	Women's general interest	511,817	20 (1.7, 1.4)
	Homemakers	Women's general interest	300,764	11 (0.9, 1.1)
	FASHION	Women's beauty/fashion	141,760	32 (2.7, 2.0)
	Elle Canada	Women's beauty/fashion	131,365	18 (1.5, 1.1)
	Flare	Women's beauty/fashion	127,341	43 (3.6, 2.5)
	Maclean's	News	321,095	6 (0.5, 0.9)

Magazines are listed by type/focus (e.g., news magazine) and showing highest to lowest circulation numbers for that type/focus for the year 2012.

We developed a codebook based on skin cancer risk factors, prevention guidelines, and screening information set forth by the American Association of Dermatology, Canadian Dermatology Association, American Cancer Society, Canadian Cancer Society, the WHO, and the IARC. We noted key messages from the 2006 IARC report: UV exposure is linked to skin cancer, people with light skin/hair/eyes are especially at risk, indoor tanning should be avoided, there is a 75% increased risk of melanoma associated with tanning bed use, and sunburn is a risk factor for skin cancer (International Agency for Research on Cancer, 2006a). We also included information about the presence of tanned beauty ideals and tanning behaviours. The presence of tanned beauty ideals was determined based on information in text or images that conveyed a tanned appearance to be attractive or desirable. For text, this meant examining the article for language which promoted a tan (e.g., a tan will make you look better, a tan will give you that healthy glow). For images, we considered pictures of people depicted in favorable or desirable ways (i.e., attractive, to be held in high-regard) with visual evidence of tanned skin to be promoting the tanned beauty ideal. Evidence of a tan was judged on a variety of factors including, for example, visible tan lines and a mismatch between other phenotypic characteristics (light eye and hair colour) and skin tone (very bronzed-looking skin). Resulting variables, and a brief description of each, are provided in Table 2. We coded for article date, length, number of images accompanying each article, and the main focus (skin cancer, indoor tanning, outdoor tanning, both indoor and outdoor tanning, self-tanning with lotions/sprays/bronzers, sunscreen, post-sun care, or other). Main focus was determined by the title, by-line, introductory paragraph, and amount of space (at least 75%) within an article devoted to the subject.

Table 2. Risk factors, UV behaviours, and early detection variables

Variable	Text Description	Image Description
Risk Factors		
UV exposure	Mention of UV exposure (solar or artificial) as risk factor for skin cancer	Depiction of someone who has had skin cancer being exposed to UV radiation
Light skin/hair/eyes	Mention of having susceptible phenotype (light coloured hair, skin or eyes) as risk factor for skin cancer	Depiction of person who has had skin cancer with susceptible phenotype
Moles	Mention of increased risk of skin cancer with abnormal moles or more than 50 moles	Depiction of numerous or abnormal moles
History of skin cancer	Mention of having personal or family history of skin cancer as a risk factor	Depiction of recurrence of skin cancer or of family members affected by skin cancer
Sunburns	Mention of sunburn as risk factor for skin cancer	Depiction of someone with sunburn, with some connection to skin cancer
UV Behaviours		
Tanned look	Promotes tanned ideal or having a tanned look (a tan is beautiful, sexy, or healthy-looking)	Depiction of a person with tanned skin (i.e., image of person depicted in a favorable way who appears to have skin darkened by UV exposure)
Self-tanners	Promotes use of self-tanners (lotions or sprays applied topically to produce appearance of suntan)	Depiction of self-tanner, of someone applying self-tanner, or having a self-tan
Solar UV avoidance	Promotes sun avoidance	Depiction of a person either not exposed to the sun or without suntan
Discourages indoor tanning	Information discouraging the behaviour	Negative depiction of indoor tanning (e.g., picture of a tanning bed with an "x" over it)
Encourages indoor tanning	Information encouraging the behaviour (e.g., indoor tanning is good for you/provides vitamin D/prevents sunburns)	Positive depiction of someone indoor tanning (e.g., attractive, healthy-looking person in a tanning bed)
Promotes shade	Promotes seeking shade to avoid UV exposure	Depiction of someone seeking shade

Promotes hats	Promotes wearing a hat to protect the face from UV exposure	Depiction of a hat or of someone wearing a hat
Promotes clothes	Promotes use of protective clothing	Depiction of protective clothing or of someone wearing protective clothing
Promotes sunscreen	Promotes use of sunscreen	Depiction of sunscreen or of someone applying sunscreen
SPF level (30+)	Promotes or mentions SPF level of 30 or higher	Depiction of sunscreen visibly labelled with SPF 30 or higher
Early Detection		
ABCD criteria	Mention and/or description of the ABCD criteria	Depiction of moles which exhibit the ABCD criteria
Skin self-examination	Promotes skin self-checking for skin cancer	Depiction of someone conducting a skin self-examination or example images of dangerous mole characteristics to look for
Physician skin examination	Promotes seeking a physician to do a skin examination for skin cancer	Depiction of someone having a physician-led skin examination conducted

ABCD = asymmetry, border irregularity, colour, diameter

One researcher coded all text and images. To ensure coding reliability, a randomly selected subset of articles (~10%; n=86) and images (~10%; n=127) were independently coded by a second researcher and inter-coder reliability calculated; this is a standard methodology and acceptable sample size for establishing inter-coder reliability in media content analyses (Riffe, Lacy, & Fico, 2013). Cohen's kappa scores ranged from 0.83 to 1.00. There were minor discrepancies in how frequently the two researchers coded some of the risk factors for skin cancer. After discussion, it was determined that the discrepancy existed because of differences in interpreting what it meant for an article to state risk. The resolution agreed upon was that risk factors had to be explicitly stated and linked to the disease (e.g., sun exposure increases the chances of getting skin cancer); vague indications of risk without mention of the disease were excluded (e.g., sun exposure is dangerous). The codebook was updated to reflect this decision, which was then used to inform the full dataset.

Data were analyzed (SPSS v22, SPSS Inc., Chicago, IL) using descriptive statistics, including two-way chi-square tests and Pearson correlation coefficients. All statistical tests were two-tailed. We considered statistical results with $p < .05$ to be statistically significant.

3.6 Results

There were 761 articles on skin cancer and recreational tanning published in 29 U.S. and Canadian magazines between 2001 and 2012. Data retrieval was high, with 98% of article text (n = 755) and 95% of article images (n = 1267) obtained. Articles ranged from 0.25 to 10 pages (M = 1.2, SD = 1.4) and contained 16 to 4706 words (M = 516.1,

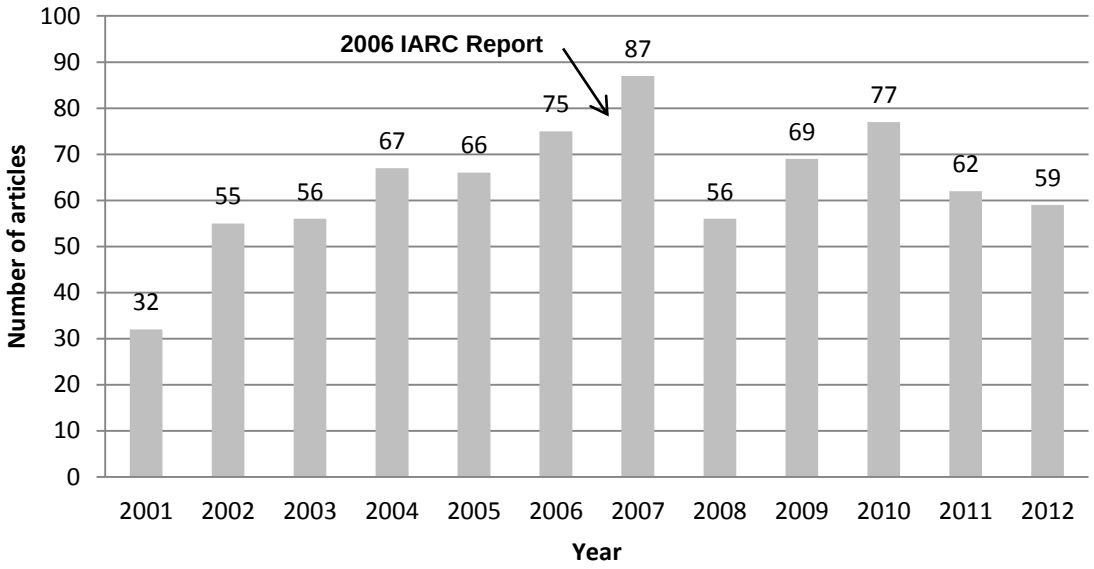
SD = 634.5). Each article had between 0 and 18 accompanying images (*M* = 1.7, *SD* = 1.8). (Note: Analyses on the overall volume of coverage are based on 761 articles. Because six of these articles could not be obtained, analyses involving article content, e.g., risk factor variables, are based on the 755 articles which were retrieved.)

Approximately 80% of articles (*n* = 608) came from U.S. magazines and the remaining 20% (*n* = 153) from Canadian magazines. Articles were from women's (71%), men's (20%), female youth (4%), and news (5%) magazines. Table 1 shows the 12 year total and mean number of articles on skin cancer and tanning published each year for each magazine included in the study. The main focus of the articles was: sunscreen use (38%), skin cancer (22%), self-tanning (18%), indoor tanning (6%), outdoor tanning (5%), post-sun care (2%), both indoor and outdoor tanning (2%), or other (< 1%).

There were significantly more articles published after (*n* = 410; 54%) compared to before (*n* = 351; 46%) the IARC report ($\chi^2 = 4.57$, *df* = 1, $p < .05$). Figure 1 depicts the frequency of articles about skin cancer and recreational tanning published in the magazines for each year of the study (*M* = 63.4, *SD* = 13.9). The largest volume of articles (*n* = 87) occurred in 2007, the year immediately after the IARC report. Compared to the year immediately preceding the IARC report, this represents an increase of 16% from 2006 to 2007, which was followed by a subsequent drop-off of 36% from 2007 to 2008. As shown in Figure 2, there is a linear increase in the volume of articles on skin cancer and tanning leading up to the IARC report (2001 to 2007), which did not occur in the years after the report (2007 to 2012).

Of the articles published after the IARC report, 3% (n = 12) mentioned the IARC report specifically and 7% (n = 28) mentioned a key IARC statistic (i.e., risk of melanoma is increased by 75% when the use of tanning devices starts before age 30).

Figure 2. Skin cancer and tanning articles published per year (2001 to 2012) in 29 magazines



Note: The numbers of articles published on skin cancer and tanning in 29 popular magazines during each year of the study (2001 to 2012) are represented by the bars.

Table 3 outlines the frequency of article text and images conveying each risk factor for skin cancer before vs. after the IARC report. There were no statistically significant differences in the frequency of articles mentioning any of the risk factors for skin cancer before relative to after the IARC report. With respect to images, only susceptible phenotype (light skin/hair/eyes) appeared in a greater percentage of images after compared to before the IARC report.

The findings were mixed for changes in the frequency of articles which mentioned, and images which depicted, UV behaviours before compared to after the IARC report (Table 3). After the IARC report there was an increase in the percentage of articles encouraging the use of sunscreen as well as articles and images encouraging the use of high SPF sunscreens (SPF 30 or more). There were decreases in the percentage of articles encouraging solar UV avoidance, articles and images promoting self-tanners, and articles and images promoting the tanned look as desirable after compared to before the IARC report.

There were no significant differences in the percentage of content focusing on any of the early detection or screening variables (i.e., mention/depiction of ABCD criteria, encouraging skin self-exams, or encouraging physician-led skin exams) before compared to after the IARC report (Table 3).

Table 3. Risk factors, UV behaviours, and early detection in magazines before vs. after 2006 IARC report

Variable	Content Type	Before IARC Report		After IARC Report		χ^2 (*df*=1) and significance
	Text (755)	%	(No./349)[a]	%	(No./406)[a]	
	Image (1267)	%	(No./553)[a]	%	(No./714)[a]	
Skin Cancer Risk Factors						
UV exposure	Text	39	(137)	40	(163)	0.06, $p = .803$
	Image	4	(21)	3	(21)	0.71, $p = .398$
Light skin	Text	15	(51)	12	(50)	0.86. $p = .355$
	Image	11	(62)	15	(109)	4.39, $p = .036$*
Moles	Text	10	(33)	13	(52)	2.11, $p = .146$
	Image	6	(31)	5	(35)	0.31, $p = .576$
History of Skin Cancer	Text	8	(28)	10	(41)	0.97, $p = .324$
	Image	0	(0)	0	(0)	n/a
Sunburns	Text	10	(34)	11	(44)	0.24, $p = .622$
	Image	<1	(3)	1	(9)	1.71, $p = .191$
UV Behaviours						
Tanned look	Text	36	(125)	25	(103)	9.72, $p = .002$*
	Image	45	(250)	37	(262)	9.38, $p = .002$*
Self-tanners	Text	31	(107)	22	(89)	7.46, $p = .006$*
	Image	21	(116)	13	(89)	16.65, $p < .001$*
Solar UV avoidance	Text	19	(65)	12	(48)	6.82, $p = .009$*
	Image	12	(64)	14	(104)	1.82, $p = .177$
Discourages indoor tanning	Text	16	(54)	18	(71)	0.55, $p = .458$
	Image	1	(5)	1	(7)	0.02, $p = .889$
Promotes indoor tanning	Text	2	(6)	2	(7)	0.00, $p = .996$
	Image	2	(10)	3	(14)	0.04, $p = .843$
Promotes shade	Text	8	(28)	8	(33)	0.00, $p = .958$
	Image	8	(46)	7	(48)	1.16, $p = .282$
Promotes hats	Text	16	(54)	14	(58)	0.21, $p = .647$
	Image	10	(53)	9	(61)	0.41, $p = .521$
Promotes clothes	Text	14	(48)	13	(52)	0.15, $p = .702$
	Image	9	(48)	8	(54)	0.53, $p = .469$
Promotes sunscreen	Text	57	(199)	69	(280)	11.55, $p < .001$*
	Image	19	(104)	22	(154)	1.47, $p = .226$
SPF level (30+)[b]	Text	39	(69)	60	(127)	15.65, $p < .001$*
	Image	61	(45)	82	(90)	9.99, $p = .002$*

Early Detection						
ABCD criteria	Text	5	(19)	7	(30)	1.17, $p = .279$
	Image	2	(10)	2	(11)	0.13, $p = .724$
Skin self-examination	Text	16	(54)	19	(75)	1.19, $p = .287$
	Image	6	(35)	6	(45)	0.02, $p = .903$
Physician-led skin examination	Text	18	(62)	21	(85)	1.20, $p = .311$
	Image	1	(6)	1	(6)	0.20, $p = .656$

* = Statistically significant ($p < .05$); n/a = not applicable

[a] Denominator = total number of articles or images on skin cancer and tanning published in the six years before (2001-2006) or after (2007-2012) the IARC report in 29 popular magazines

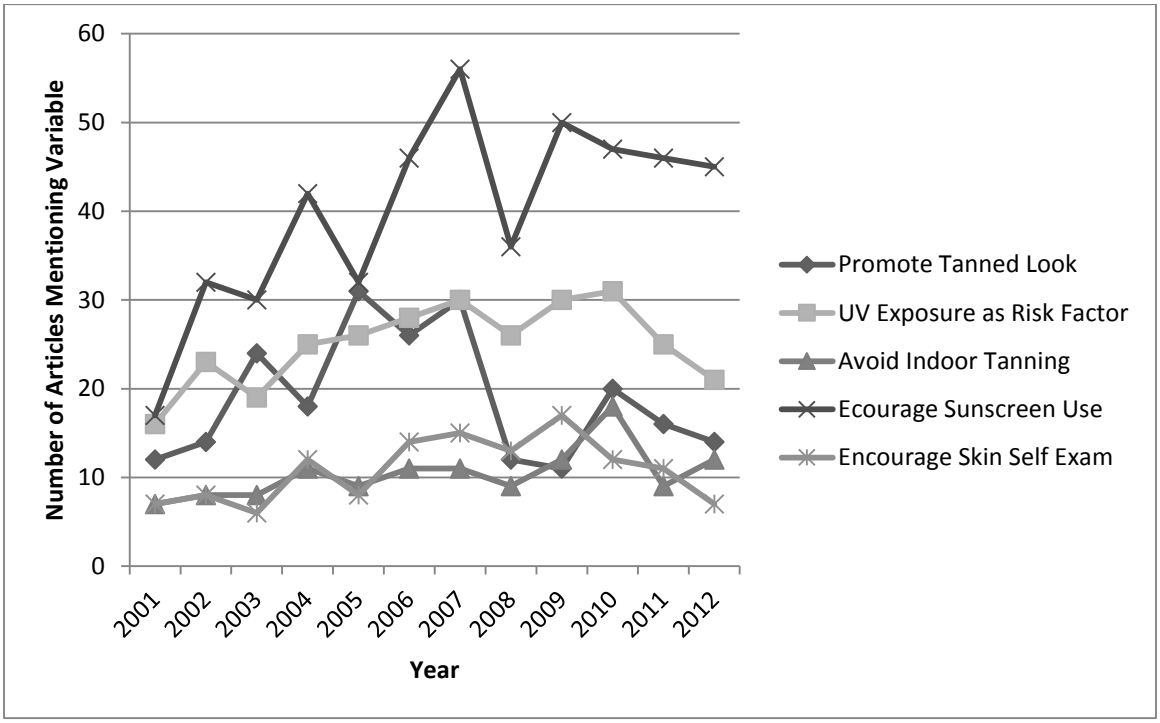
[b] Articles and images not indicating a specific SPF level were excluded

ABCD = asymmetry, border irregularity, colour, diameter

We conducted correlation analyses between the years and the volume (number) of articles reporting on each of the variables of interest in order to look for patterns in coverage over time. No significant relationships between year and any of the risk factor or early detection variables in article text were found; in contrast, significant patterns of coverage over time were detected for three UV behaviour variables. As the years progressed, the number of articles discouraging indoor tanning bed use increased ($r(12) = 0.603$, $p < .05$), articles encouraging sunscreen use ($r(12) = 0.710$, $p < .01$) and promoting high sun protection factor (SPF) sunscreen ($r(12) = 0.860$, $p < .01$) also increased.

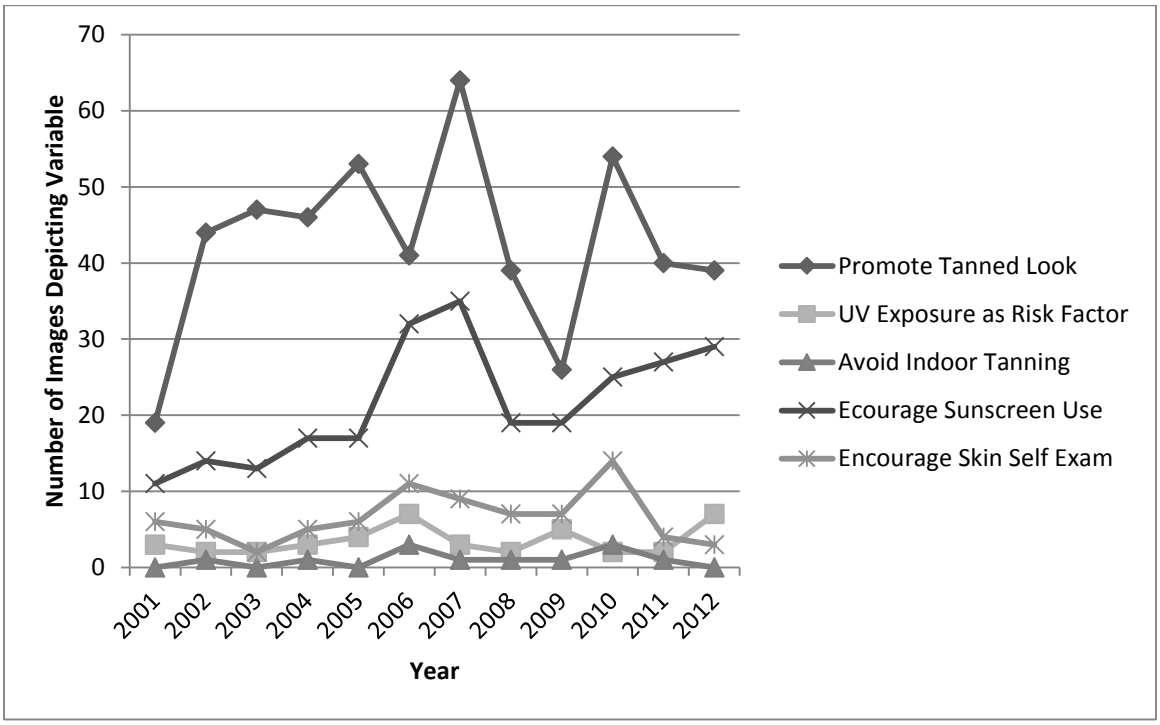
Similar to text, there were also no significant correlations between year and number of images on risk factor or early detection variables. For UV behaviour variables, however, images more frequently promoted sunscreen use ($r(12) = 0.669$, $p < .05$) and higher SPF sunscreens ($r(12) = 0.892$, $p < .01$) over the course of the study timeframe. Figures 3 and 4 illustrate the relationships between the number of articles reporting, and images depicting, representative skin cancer and tanning variables (UV exposure as a risk factor for skin cancer, encouraging sunscreen use, discouraging indoor tanning, promoting the tanned look, and encouraging skin self-examination) over the 12 years of data included the study.

Figure 3. Representative study variables mentioned in article text (2001-2012)



Note: Five representative study variables were selected to be displayed: one risk factor variable (UV exposure); three UV behaviour-related variables (promotes tanned look, discourages indoor tanning, encourages sunscreen use); and one early detection variable (encourages skin self-examination). These variables were selected based on: their significance to skin cancer risk, prevention, and early detection; their specific mention in the IARC report; and, in the case of "tanned look", because a tanned appearance is a primary reason for indoor tanning bed use.

Figure 4. Representative study variables depicted in article images (2001-2012)



Note: Five representative study variables were selected to be displayed: one risk factor variable (UV exposure); three UV behaviour-related variables (promotes tanned look, discourages indoor tanning, encourages sunscreen use); and one early detection variable (encourages skin self-examination). These variables were selected based on: their significance to skin cancer risk, prevention, and early detection; their specific mention in the IARC report; and, in the case of "tanned look", because a tanned appearance is a primary reason for indoor tanning bed use.

3.7 Discussion

This is the largest and most comprehensive study to date on popular North American magazine coverage of skin cancer and tanning. It is also the first to examine temporal comparisons relative to a key global public health document on skin cancer. Consistent with our hypothesis, the volume of skin cancer and recreational tanning coverage in popular magazines increased, albeit modestly, after the 2006 IARC report. In the year following this report, there was a small spike in coverage (16%) followed by a subsequent drop-off. This suggests that the report had a temporary and only modest impact on the amount of coverage immediately following its release. This is consistent with the idea that heightened attention to an issue in the media is infrequently sustained for a significant amount of time – a phenomenon known as the "issue attention cycle" (Downs, 1972). The fairly steady increase in the number of articles on skin cancer and tanning between 2001 and 2007 may have reflected a growing public health interest in, and knowledge about, the issue of skin cancer and the dangers of UV exposure. The 2006 IARC report is an evidence-synthesis report and thus, it is possible that leading up to it, there was accumulating research evidence and heightened concern by public health professionals, which was picked up by the media. The lack of a linear increase in the volume of articles from 2007 to 2012 (post-IARC report) may be related to other public health reports or decisions relevant to skin cancer, or other factors not examined in the present study.

Contrary to our second hypothesis, we found little focus on the important messages from the 2006 IARC report in articles and accompanying images published in 29 popular North American magazines. Few articles mentioned the report by name or

stated the key report statistic (i.e., 3% mentioned the report, 7% mentioned the key IARC statistic) which was highlighted in the report press release. The only skin cancer risk factor which appeared to be affected by the report was susceptible phenotype, which was present in images to a greater extent after the report. The evidence synthesized in the report pertained to light-skinned populations, so this is potentially a positive sign. Nevertheless, article text was not influenced in the same way about susceptible phenotype, suggesting uptake of this message was limited and the message was mixed (no substantial increase in reporting in text but a greater depiction in images). Further, there was no change in the percentage of articles mentioning UV exposure as a risk factor and no change in the percentage of articles or images discouraging indoor tanning, even though these were primary messages of the report.

There were inconsistent changes in magazine coverage for UV behaviours over time, despite our hypothesis of an increase for all behavioural variables. On the positive side, there was a greater percentage of content encouraging sunscreen use and promoting higher SPF sunscreens after the 2006 IARC report. Indeed, sunscreen use was the only skin cancer prevention strategy reported more frequently over the study timeframe. While generally positive that magazines encourage sunscreen use, as it is a recommended method for prevention of skin cancer (American Academy of Dermatology, 2014), IARC identifies sunscreen as a *secondary* form of protection against skin cancer, *after* sun avoidance, shade-seeking, and protective clothing (Vainio & Bianchini, 2001). We speculate that the report was not the impetus for the increase in images and articles encouraging sunscreen, but rather may reflect a growing commercial market for sunscreen products. It would be interesting to know if the message about sunscreen use in

article content was associated with a simultaneous increase in sunscreen advertisements, as advertising and editorial content in magazines are often related (Warner, Goldenhar, & McLaughlin, 1992). This will be an important area for future research. While the promotion of sunscreen use increased, the percentage of articles discouraging artificial UV exposure did not change and the percentage discouraging solar UV exposure decreased. Taken together, our results suggest that the magazines included in this study shifted from the "message" of UV avoidance to one of promotion of UV protection.

It is encouraging that the percentage of articles and images promoting the tanned look as desirable in popular magazines decreased after the 2006 IARC report. People are especially influenced by images accompanying media articles (Messaris & Abraham, 2001) and images of attractive people with suntans increase the social desirability of a suntan and encourage UV exposure (Dixon, Warne, Scully, Wakefield, & Dobbinson, 2011), so this is a positive change. The data also show that the number of articles and images encouraging the use of self-tanners decreased after the report. The reason for this decrease in coverage for self-tanners is not evident from our data but may reflect the lesser emphasis on the tanned look. At the same time, however, it suggests readers were less frequently messaged about alternatives to achieving a tan through recreational UV exposure. Although the promotion of the tanned look as ideal decreased after 2006, it still was common throughout the study timeframe. This may partly explain why researchers have found magazine use to be associated with reduced behavioural control to avoid unprotected UV exposure (Lovejoy, Riffe, & Lovejoy, 2015).

There were no changes in the percentage of articles or images with content about early detection after the 2006 IARC report. Given the report does not specifically focus

on early detection, this is not surprising. Nevertheless, the report emphasized the increased risk of skin cancer from indoor tanning and those exposed should be especially mindful of screening. If people are not receiving information about the importance of early detection from the popular media, it is unclear where or how they might receive this information.

The small impact of the IARC report on the proportion of text and image messages in leading popular magazines about recreational UV exposure as a risk factor for skin cancer, on discouraging indoor tanning, and on other skin cancer risk factors and behaviours, is puzzling and alarming. The limited influence of this seminal skin cancer and recreational tanning report on frequency of popular magazine coverage of related health issues is in stark contrast to the enormous effect of the analogous U.S. Surgeon General's (U.S. Department of Health, Education, and Welfare, 1964) report linking tobacco smoking and lung cancer. In a study examining coverage of smoking and health in magazines between 1950 and 1983, the largest spike in magazine coverage occurred in the year immediately following the 1964 Surgeon General's report, when the volume of coverage increased by approximately 107% (Pierce & Gilpin, 2001). The increased media coverage was associated with smoking cessation (Alamar & Glantz, 2006).

It is challenging to interpret why there was only a very modest impact of the IARC report on skin cancer coverage in popular mass magazines, given that recreational tanning leads to more cases of skin cancer than smoking does to lung cancer (Wehner et al., 2014). The lack of skin cancer coverage relative to lung cancer coverage after milestone reports could relate to a number of factors including: social stigma around smoking (Alamar & Glantz, 2006) which is not present for tanning; the status of the tan

as a Western beauty ideal (Hunt, Augustson, Rutten, Moser, & Yaroch, 2012); tobacco companies being large multi-national corporations and thus easier for the media to target as the "bad guy" compared to small-business tanning salons (Indoor Tanning Working Group, 2011); or possible differences in the reach or influence of Surgeon General's reports compared to IARC reports in setting the North American news agenda. Thus, it will be important to follow up the current study with an evaluation of the frequency and types of skin cancer and tanning messages in popular magazines relative to the newly released 2014 U.S. Surgeon General's report on skin cancer prevention (U.S. Department of Health and Human Services, 2014).

Another possible explanation for the lack of change in media coverage could relate to the press release for the 2006 IARC report (International Agency for Research on Cancer, 2006b), which stated "sunbed use in youth unequivocally associated with skin cancer" but also that "studies do not provide consistent evidence that use of indoor tanning facilities in general is associated with […] skin cancer." Although there were explanations for these conclusions, they may have been interpreted as contradictory by journalists and confusing for the public who receive skin cancer risk messages through popular media outlets. This highlights the challenge of balancing scientifically accurate information and readily comprehensible skin cancer information packaged for public dissemination.

This study is not without limitations. Our data consisted of high-circulating magazines with considerable reach; however, we did not include other types of print media, such as newspapers, which may have been influenced differently by the IARC report. Additional types of information about skin cancer and UV exposure, such as

promoting UV exposure for Vitamin D production, could also be collected in future work. We also did not investigate magazine advertisements, but this is worthy of study in further research. While every effort was made to be objective in the analysis by clearly operationalizing each variable in the codebook and performing inter-rater reliability checks, there is an inherent subjectivity with analyzing visual content. This was especially true regarding coding for whether a person was depicted with tanned skin or not. Other studies have also coded images for similar variables and share the same limitations (Chapman, Marks, & King, 1992). We used the 2006 IARC report as the focus of the comparison and noted relationships; however, we do not know that this report had a causal effect on the changes in the article text and images noted in the findings. Finally, we did not assess whether readers' knowledge and behaviour are influenced by this magazine content.

3.7.1 Conclusions

The 2006 IARC report appears to have had a small and limited impact on the frequency of coverage on skin cancer and recreational tanning as topics in popular North American magazines; key messages from the IARC report were not picked up by popular magazines (e.g., UV exposure as a risk factor, avoid indoor tanning). There were no changes in terms of magazine reporting on skin cancer risk factors or early detection strategies. A few behavioural variables changed over the 12 years of study, including an increased emphasis on sunscreen use and a decreased emphasis on the attractiveness of a tanned appearance. Magazine coverage of most of the other behavioural variables was flat over time. Public health educators will need to consider ways to improve or

supplement the dissemination of skin cancer information from public health reports into the mass media, including developing partnerships with magazine journalists and editors in social marketing of this important public health issue.

3.8 References

Alamar, B. & Glantz, S. (2006). Effect of increase social unacceptability of cigarette smoking on reduction in cigarette consumption. *American Journal of Public Health, 96,* 1359-1362.

American Academy of Dermatology. (2014). *How do I prevent skin cancer?* Retrieved from http://www.aad.org/spot-skin-cancer/understanding-skin-cancer/how-do-i-prevent-skin-cancer

American Cancer Society. (2014). *What are the key statistics about melanoma skin cancer?* Retrieved from http://www.cancer.org/cancer/skincancer-melanoma/detailedguide/melanoma-skin-cancer-key-statistics

Boniol, M., Autier, P., Boyle, P., & Gandini, S. (2012). Cutaneous melanoma attributable to sunbed use: review and meta-analysis. *British Medical Journal, 345,* e4757

Canadian Cancer Society. (2014). *Canadian Cancer Statistics*. Retrieved from http://www.cancer.ca/en/cancer-information/cancer-101/canadian-cancer-statistics-publication/?region=on

Chapman, S., Marks, R., & King, M. (1992). Trends in tans and skin protection in Australian fashion magazines, 1982 through 1991. *American Journal of Public Health, 82,* 1677-1680.

Cho, H., Hall, J. G, Kosmoski, C., Fox, R.L., & Mastin, T. (2010). Tanning, skin cancer risk, and prevention: a content analysis of eight popular magazines that target female readers: 1997-2006. *Health Communication, 25,* 1-10.

Dixon, H. G., Warne, C. D., Scully, M. L., Wakefield, M. A., & Dobbinson, S.J. (2011). Does the portrayal of tanning in Australian women's magazines relate to real women's tanning beliefs and behaviour? *Health Education and Behaviour, 38,* 132-142.

Dixon, H., Warne, C., Scully, M., Dobbinson, S., & Wakefield, M. (2014). Agenda-setting effects of sun-related news coverage on public attitudes and beliefs about tanning and skin cancer. *Health Communication, 29,* 173-181.

Downs, A. (1972). Up and down with ecology: the issue attention cycle. *The Public Interest, 28,* 38-40.

Eadie, D. & MacAskill, S. (2007). Results from an exploratory study of sun protection practice: implications for the design of health promotion messages. *Health Education, 107,* 250-260.

Heckman, C. J., Coups, E. J., & Manne, S. L. (2008). Prevalence and correlates of indoor tanning among US adults. *Journal of the American Academy of Dermatol*ogy, *58*, 769-780.

Heneghan, M. K., Hazan, C., Halpern, A. C., & Oliveria, S. A. (2007). Skin cancer coverage in a national newspaper: a teachable moment. *Journal of Cancer Education, 22*, 99-104.

Houts, P. S., Doak, C. C., Doak, L. G., & Loscalzo, M. J. (2006). The role of pictures in improving health communication: A review of research on attention, comprehension, recall, and adherence. *Patient Education and Counselling, 61*, 173-190.

Hunt, Y., Augustson, E., Rutten, L., Moser, R., & Yaroch, A. (2012). History and Culture of Tanning in the United States. In C. J. Heckman & S. L. Manne (Eds.), *Shedding Light on Indoor Tanning*. New York, NY: Springer Science+Business Media. Retrieved from http://www.springer.com/biomed/cancer/book/978-94-007-2047-3

Indoor Tanning Working Group. (2011). *Report of the Indoor Tanning Working Group*. Vancouver: British Columbia Ministry of Health. Retrieved from http://www.health.gov.bc.ca/library/publications/year/2011/ITWG-Report.pdf

International Agency for Research on Cancer (2006b). Sunbed use in youth unequivocally associated with skin cancer [press release]. Retrieved from http://www.iarc.fr/en/media-centre/pr/2006/pr171.html

International Agency for Research on Cancer. (2006a). *IARC Working Group Reports Volume 1: Exposure to Artificial UV Radiation and Skin Cancer*. Lyon, France: World Health Organization and IARC. Retrieved from http://www.iarc.fr/en/publications/pdfs-online/wrk/wrk1/ArtificialUVRad&SkinCancer.pdf

Lovejoy, J., Riffe, D., & Lovejoy, T. I. (2015). An examination of indirect effects of exposure and attention to health media on intentions to avoid unprotected sun exposure. *Health Communication, 30*, 261-270.

McWhirter, J. E. & Hoffman-Goetz, L. (2013a). Systematic review of population based studies on the impact of images on UV attitudes and behaviours. *Health Promotion International.* doi: 10.1093/heapro/dat031.

McWhirter, J. E. & Hoffman-Goetz, L. (2013b). Visual images for patient skin self-examination and melanoma detection: A systematic review of published studies. *Journal of the American Academy of Dermatology*, *69*, 47-55.

Messaris, P. & Abraham, L. (2001). The role of images in framing news stories. In S. Reese, O. Gandy, & A. Grant (Eds.), *Framing Public Life* (pp. 215-226). Mahwah,

NJ: Erlbaum.

Pierce, J. P. & Gilpin, E.A. (2001). News media coverage of smoking and health is associated with changes in population rates of smoking cessation but not initiation. *Tobacco Control, 10*, 145-143.

Ries, L. A. G., Melbert, D., Krapcho, M., Mariotto, A., Miller, B. A., Feuer, E. J., Clegg, L., Horner, M. J., Howlader, N., Eisner, M. P., Reichman, M., & Edwards, B. K. (eds) (2007). *SEER Cancer Statistics Review, 1975-2004*. Bethesda, MD: National Cancer Institute. Retrieved from http://seer.cancer.gov/csr/1975_2004/

Riffe, D., Lacy, S., & Fico, F. (2013). *Analyzing Media Messages: Using Quantitative Content Analysis in Research*. 3rd edition. New York, NY: Routledge.

Scully, M., Makin, J., Maloney, S., & Wakefield, M. (2014). Changes in coverage of sun protection in the news: threats and opportunities for emerging issues. *Health Education Research, 29*, 378-387.

Sinclair, C. A., Makin, J. K., Tang, A., Brozekm I., & Rock, V. (2014). The role of public health advocacy in achieving an outright ban on commercial tanning beds in Australia. *American Journal of Public Health, 104*, e7.

Stryker, J. E., Solky, B. A., & Emmons, K.M. (2005). A content analysis of news coverage of skin cancer prevention and detection, 1979 to 2003. *JAMA Dermatol*ogy, *141*, 491-496.

U.S. Department of Health and Human Services. (2014). *The Surgeon General's Call to Action to Prevent Skin Cancer*. Washington, DC: U.S. Department of Health and Human Services, Office of the Surgeon General. Retrieved from http://www.surgeongeneral.gov/library/calls/prevent-skin-cancer/call-to-action-prevent-skin-cancer.pdf

U.S. Department of Health, Education, and Welfare. (1964). *Smoking and Health: Report of the Advisory Committee of the Surgeon General of the Public Health Service.* Washington, DC: Public Health Service, U.S. Government Print Office. Retrieved from http://www.surgeongeneral.gov/library/reports/index.html

Vainio, H. & Bianchini, F. (2001). *Handbook of cancer prevention.* Lyon, France: International Agency for Research on Cancer.

Warner, K. E., Goldenhar, L. M., & McLaughlin, C. G. (1992). Cigarette advertising and magazine coverage of the hazards of smoking. A statistical analysis. *New England Journal of Medicine, 326*, 305-309.

Wehner, M. R., Chren, M. M., Nameth, D., Choudhry, A., Gaskins, M., Nead, K.T., Boscardin, W.J., & Linos, E. (2014). International prevalence of indoor tanning: A systematic review and meta-analysis. *JAMA Dermatology, 150*, 390-400.

World Health Organization. (2014). *Skin cancers*. Retrieved from http://www.who.int/uv/faq/skincancer/en/index1.html

CHAPTER 4: NORTH AMERICAN MAGAZINE COVERAGE OF SKIN CANCER AND RECREATIONAL TANNING BEFORE AND AFTER THE WHO/IARC CLASSIFICATION OF INDOOR TANNING DEVICES AS CARCINOGENIC

The work presented in this chapter has been published as:

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4.1 Research Questions

Do North American popular magazines contain more articles about skin cancer and tanning after compared to before the 2009 classification of indoor tanning devices as carcinogenic?

Do North American popular magazines contain a greater volume of articles and images covering skin cancer risk factors, UV behaviours, and early detection information after compared to before the 2009 classification of indoor tanning devices as carcinogenic?

4.2 Hypotheses

Magazines will contain more articles about skin cancer and tanning after the 2009 carcinogen classification compared to before the 2009 carcinogen classification.

Magazines will contain different information about skin cancer and tanning (i.e., risk factors, UV behaviours, and early detection information) in article text and images after the 2009 carcinogen classification compared to before the 2009 carcinogen classification.

4.3 Chapter Overview

Background: The mass media is an influential source of skin cancer information for the public. In 2009, the World Health Organization's International Agency for Research on Cancer classified UV radiation from tanning devices as carcinogenic. *Objective*: Our objective was to determine if media coverage of skin cancer and recreational tanning increased in volume or changed in nature after this classification. *Methods*: We conducted a directed content analysis on 29 North American popular magazines (2007-2012) to investigate the overall volume of articles on skin cancer and recreational tanning and, more specifically, the presence of skin cancer risk factors, UV behaviours, and early detection information in article text (n = 410) and images (n = 714). *Results:* The volume of coverage on skin cancer and recreational tanning did not increase significantly after the 2009 classification of tanning beds as carcinogenic. Key related messages, including that UV exposure is a risk factor for skin cancer and that indoor tanning should be avoided, were not reported on more frequently after the classification, but the promotion of the tanned look as attractive was conveyed more often in images afterwards ($p < .01$). Content promoting high-SPF sunscreen use increased after the classification ($p < .01$), but there were no significant positive changes in the frequency of coverage of skin cancer risk factors, other UV behaviours, or early detection information over time. *Conclusion*: The classification of indoor tanning beds as carcinogenic had no significant impact on the volume or nature of skin cancer and recreational tanning coverage in magazines.

4.4 Introduction

Skin cancer is a significant cancer burden for North Americans. For 2014, an estimated 76,100 new cases of melanoma and more than 3.5 million cases of non-melanoma will occur in the United States (American Cancer Society, 2014); in Canada for the same year, 6,500 new cases of melanoma and 76,100 of non-melanoma are projected (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014). The mass media is an influential source of skin cancer information for the public (Dixon, Warne, Scully, Dobbinson, & Wakefield, 2014). Although it is the most common type of cancer and its incidence is increasing (American Cancer Society, 2014), skin cancer receives less media attention than other cancers (Slater, Long, Bettinghaus, & Reineke, 2008). This is concerning, especially given the popularity of the tanned beauty ideal in North American culture, and the widespread use of indoor tanning beds to achieve this "look" (Choi, Lazovich, Southwell, Forster, Rolnick, & Jackson, 2010; Wehner et al., 2014). In fact, 36% of adults, 55% of university students, and 19% of adolescents report having used indoor tanning beds in the past (Wehner et al., 2014). Certain events, such as the release of cancer-related reports and celebrities with cancer, have been associated with increases in related media coverage and subsequent changes in the public's cancer risk and screening behaviours (Pierce & Gilpin, 2001; Cram, Fendrick, Inadomi, Cowen, Carpenter, & Vijan, 2003).

The International Agency for Research on Cancer (IARC), the cancer research arm of the World Health Organization (WHO), produces the "IARC Monographs on the Evaluation of Carcinogenic Risks to Humans." These monographs identify environmental factors which increase the risk of cancer and are updated as new research evidence becomes available. In the latter half of 2009, an update of the IARC Monograph on radiation as a human carcinogen was

published as a special report in *Lancet Oncology* (El Ghissassi et al., 2009). This report indicated that UV-emitting tanning devices were classified as Group 1 carcinogens ("known human carcinogens") – the highest cancer risk category. This reinforced recommendations by the WHO to avoid indoor tanning (International Agency for Research on Cancer, 2009). In the monograph, solar UV radiation, originally classified as carcinogenic in 1992, was reaffirmed as a Group 1 carcinogen.

While previous research has examined skin cancer coverage in the media over time (Heneghan, Hazan, Halpern, & Oliveria, 2007), the possible impact of the classification of indoor tanning beds as carcinogenic on media content has not been investigated. Based on Agenda Setting Theory (McCombs & Shaw, 1972), we hypothesized that the classification of tanning beds as carcinogenic by the WHO's IARC in 2009 would lead to a significant increase in the coverage of skin cancer and recreational tanning in popular magazines. We also hypothesized that there would be an increase in articles and images conveying skin cancer risk factors, encouraging UV protection and discouraging UV exposure, and encouraging early detection of skin cancer after 2009.

4.5 Methods

We used a directed content analysis to examine skin cancer and tanning coverage in 29 popular North American magazines between 2007 and 2012. The U.S. magazines included in the study were: *Good Housekeeping, Family Circle, Ladies Home Journal, Cosmopolitan, Glamour, Vogue, Elle U.S., Shape, Self, Esquire, Details, GQ, Sports Illustrated, Popular Science, Golf Digest, Field and Stream, Men's Health, Men's Fitness, Seventeen, Time,* and *Newsweek.*

Circulation rates ranged from 1.1 to 4.4 million. The Canadian magazines included: *Canadian Living, Chatelaine, Homemaker's, FASHION, Elle Canada, Flare,* and *Maclean's.* Circulation rates ranges from approximately 127,000 to 512,000.

Magazines were searched electronically though the *Canadian Periodical Index*, *Reader's Guide to Periodical Literature*, *LexisNexis*, *Factivia*, and *ProQuest Research Library* using relevant search terms (i.e., skin cancer, melanoma, basal cell carcinoma, squamous cell carcinoma, tan*, indoor tan*, outdoor tan*, suntan*, sunburn, sunscreen, sunblock). Magazines not indexed by the electronic databases were search manually using the table of contents.

We coded the number of articles published in each year of the six-year study time frame. Articles and images were coded for the presence or absence of variables related to risk factors for skin cancer, information about UV behaviours, and early detection information. These variables are listed in Table 1 and were operationalized in a codebook developed by the researchers based on information from the WHO's IARC Monograph report, the American Academy of Dermatology, and the Canadian Cancer Society. The detailed codebook is available from the authors upon request. A 10% sample of articles and images was checked for inter-coder reliability, calculated to be an appropriate sample size for this purpose (Riffe, Lacy, & Fico, 2013). Cohen's kappa scores were high, ranging from 0.83 to 1.00. Discrepancies in coding were resolved by discussion and consensus.

We used chi-square analyses (and where applicable Fisher's exact test) to compare the volume and nature of skin cancer and tanning coverage before and after the 2009 WHO/IARC classification. Statistical results were analyzed using SPSS v21.

4.6 Results

We investigated whether there was a significant difference in the frequency or nature of media coverage around skin cancer and tanning in the three years before (2007-2009) compared to the three years after (2010-2012) the 2009 WHO/IARC classification of UV exposure from indoor tanning devices as carcinogenic. Between 2007 and 2012, there were 410 articles published containing 714 images.[1] There were 212 articles (51.7%) articles published in the three years prior to the classification of tanning beds as carcinogenic, compared to 198 (48.3%) in the three years afterwards; this difference was not statistically significant ($\chi^2 = 0.48$, $df = 1$, $p = .49$).

The number of articles on skin cancer or tanning published in each year of the study was as follows: 2007 ($n = 87$), 2008 ($n = 56$), 2009 ($n = 69$), 2010 ($n = 77$), 2011 ($n = 62$), and 2012 ($n = 59$). There was a small (16%) increase in coverage the year following the classification relative to the year preceding that classification. Because the largest number of articles occurred in 2007, which was prior to the classification of tanning beds as carcinogenic, we ran the analysis again using a tighter time frame to exclude this year. There was still no significant difference in the volume of coverage on skin cancer and tanning in the magazines in the two years before compared to the two years after ($\chi^2 = 0.74$, $df = 1$, $p = .39$).

The results from the comparisons of reporting/depiction of skin cancer risk factors, UV behaviours, and early detection information before and after the 2009 WHO/IARC classification of tanning beds as Group 1 carcinogens are presented in Table 4. The number of articles which mentioned light skin as a risk factor for skin cancer decreased significantly after the 2009 WHO/IARC classification. There were no significant changes in the volume of articles reporting

[1] Analyses on the overall volume of coverage are based on 410 articles. Four of these articles could not be obtained. Thus, analyses involving article content (e.g., risk factors) are based on the 406 articles which were retrieved.

on other skin cancer risk factors, and no changes in images depicting skin cancer risk factors before compared to after the 2009 classification.

There were mixed findings for UV behaviours before and after the 2009 WHO/IARC classification. Positive changes included an increase in the number of images promoting sunscreen use and an increase in the number of articles and images promoting the use of sunscreens with SPF 30 or higher after compared to before the classification. However, there were significantly more images promoting the tanned look and promoting indoor tanning after compared to before the classification of tanning beds as carcinogenic.

There were no significant changes in the volume of articles or images conveying early detection information (e.g., ABCD criteria) before compared to after the 2009 WHO/IARC classification.

Table 4. Comparison of skin cancer risk factors, UV behaviours, and early detection information in 29 popular North American magazines before vs. after 2009 WHO/IARC classification of tanning beds as carcinogenic

Variable	Content Type	Before	After	χ^2 or Fisher's Exact, *p* value
Risk Factors				
UV exposure	Text	41.3% (86)	38.9% (77)	0.26, *df* = 1, *p* = .61
	Image	2.6% (10)	3.4% (11)	0.39, *df* = 1, *p* = .53
Light skin	Text	16.3% (34)	8.1% (16)	6.42, *df* = 1, *p* < .01
	Image	17.0% (66)	13.2% (43)	2.00, *df* = 1, *p* = .16
Moles (>50 or abnormal)	Text	13.9% (29)	11.6% (23)	0.49, *df* = 1, *p* = .48
	Image	4.9% (19)	4.9% (16)	0.00, *df* = 1, *p* = 1.00
History of skin cancer	Text	10.6% (22)	9.6% (19)	0.11, *df* = 1, *p* = .74
	Image	0.0% (0)	0.0% (0)	n/a
Sunburns	Text	13.5% (28)	18.5% (16)	3.04, *df* = 1, *p* = .08
	Image	1.8% (7)	0.6% (2)	2-sided Fisher's, *p* = .19
UV Behaviours				
Promotes tanned look	Text	25.5% (53)	25.3% (50)	0.00, *df* = 1, *p* = .96
	Image	33.2% (129)	40.8% (133)	4.35, *df* = 1, *p* < .05
Promotes self-tanners	Text	21.6% (45)	22.2% (44)	0.20, *df* = 1, *p* = .89
	Image	11.6% (45)	13.5% (44)	0.59, *df* = 1, *p* = .44
Promotes solar UV avoidance	Text	13.0% (27)	10.6% (21)	0.55, *df* = 1, *p* = .50
	Image	14.4% (56)	13.8% (45)	0.06, *df* = 1, *p* = .81
Discourages indoor tanning	Text	15.4% (32)	19.7% (39)	1.31, *df* = 1, *p*=.25
	Image	0.8% (3)	1.2% (4)	2-sided Fisher's, *p* = .71
Promotes indoor tanning	Text	1.9% (4)	1.5% (3)	2-sided Fisher's *p* = 1.00
	Image	1.0% (4)	3.1% (10)	3.82, *df* = 1, *p* < .05
Promotes shade	Text	7.7% (16)	8.6% (17)	0.11, *df* = 1, *p* = .74
	Image	7.5% (29)	5.8% (19)	0.77, *df* = 1, *p* = .38
Promotes hats	Text	17.3% (36)	11.1% (22)	3.18, *df* = 1, *p* = .08
	Image	9.3% (36)	7.7% (25)	0.59, *df* = 1, *p* = .44
Promotes clothes	Text	13.9% (29)	11.6% (23)	0.49, *df* = 1, *p* = .48
	Image	8.2% (32)	6.7% (22)	0.57, *df* = 1, *p* = .45
Promotes sunscreen	Text	68.3% (142)	69.7% (138)	0.10, *df* = 1, *p* = .76
	Image	18.8% (73)	24.8% (81)	3.81, *df* = 1, *p* < .05
SPF level (30+)[a]	Text	47.7% (53)	72.5% (74)	13.58, *df* = 1, *p* < .01
	Image	69.4% (34)	91.8% (56)	14.29, *df* = 1, *p* < .01

Early Detection				
ABCD criteria	Text	9.6% (20)	5.1% (10)	3.09, *df* = 1. *p* = .08
	Image	2.1% (8)	0.9% (3)	1.75, *df* = 1, *p* = .42
Skin self-examination	Text	21.6% (45)	15.2% (30)	2.83, *df* = 1, *p* = .09
	Image	5.9% (23)	6.4% (21)	0.08, *df* = 1, *p* = .78
Physician-led skin examination	Text	24.0% (50)	17.7% (35)	2.58, *df* =1, *p* = .12
	Image	0.5% (2)	1.2% (4)	2-sided Fisher's, *p* = .42

[a] Articles or images not mentioning or depicting a specific SPF level were excluded from these analyses

n/a = not available

ABCD = asymmetry, border irregularity, colour, and diameter

Values in parenthesis are number of articles or images

4.7 Discussion

Our findings suggest the 2009 classification of indoor tanning devices as carcinogenic by the WHO's IARC had little impact on magazine coverage of skin cancer and tanning. The volume of coverage on skin cancer and tanning in popular magazines did not change significantly in the years after compared to before the 2009 classification. Moreover, key messages related to the classification – that UV exposure is a risk factor for skin cancer and that tanning bed use should be discouraged – did not appear in magazine articles more frequently after the classification. This came as a surprise, especially given the special report on the classification was published in such a high-impact journal and was accompanied by press releases (International Agency for Research on Cancer, 2009; The Lancet Oncology, 2009), which tend to drive media coverage (Chapman & Dominello, 2001). It is unclear why magazine skin cancer coverage was not sensitive to the WHO/IARC classification of tanning beds as carcinogenic, but may be related to: discounting skin cancer as a serious disease; that monographs are the domain of scientists and physicians and not journalists; or because journalists may have felt tanning beds had already been established as dangerous and thus the classification was not deemed newsworthy.

Unfortunately, and surprisingly, more images promoted the tanned look and depicted indoor tanning in a positive light after compared to before the 2009 classification. This finding supports previous research suggesting the media promotes the tanned beauty ideal (McWhirter & Hoffman-Goetz, 2012), which is a driver of dangerous UV exposure behaviours (Mahler, Beckerley, & Vogel, 2010). This is worrying because it suggests media images may be encouraging dangerous tanning behaviours by having certain types of images accompany articles.

The only positive change with respect to skin cancer prevention coverage was that the number of images promoting sunscreen use increased after 2009 as did the number of images and articles promoting high-SPF sunscreens. While emphasis on sunscreen use is important for skin cancer prevention, it is not related to indoor tanning. A press release sent out regarding the 2009 classification emphasized protecting oneself from overexposure to the sun (International Agency for Research on Cancer, 2009), and the report in *The Lancet* (El Ghissassi et al., 2009) also stated that solar radiation was still considered carcinogenic. These statements may have contributed to the increased content around sunscreen use, although other protection behaviours did not increase.

This study is the first to compare skin cancer and tanning media coverage relative to the classification of tanning beds as Group 1 carcinogens, but it is not without limitations. Articles from magazines were included, but other print media or online content were not utilized. Although steps were taking to be as objective as possible, there is an inherent subjectivity in coding visual images; however, we felt it was important to include visual data given the influence of images on skin cancer knowledge, attitudes, and behaviours (McWhirter & Hoffman-Goetz, 2013). We also did not separate out article content on indoor tanning from outdoor tanning. Finally, this was a content analysis of print materials and the impact on readers' knowledge, attitudes, and behaviours about skin cancer and UV exposure was not measured.

These findings suggest minimal impact of the public health decision to classify indoor tanning beds as carcinogenic on related media content in popular magazines. The dissemination of cancer information through the mass media is an affordable way to educate the public about cancer and has the potential to change behaviours and catalyze issues onto the policy agenda. As cancer educators, we must consider how to better disseminate important cancer research findings

and policy decisions to the public via the mass media in order to ensure the public is well-informed about skin cancer and the dangers of indoor tanning.

4.8 References

American Cancer Society. (2014). *Cancer Facts & Figures 2014*. Atlanta, GA: American Cancer Society. Retrieved from http://www.cancer.org/acs/groups/content/@research/documents/webcontent/acspc-042151.pdf

Canadian Cancer Society's Advisory Committee on Cancer Statistics. (2014). *Canadian Cancer Statistics 2014*. Chapter 7: Special Topic: Skin cancers. Toronto, ON: Canadian Cancer Society. Retrieved from http://www.cancer.ca/~/media/cancer.ca/CW/cancer%20information/cancer%20101/Canadian%20cancer%20statistics/Canadian-Cancer-Statistics-2014-EN.pdf

Chapman, S. & Dominello, A. (2001). A strategy for increasing news media coverage of tobacco and health in Australia. *Health Promotion International, 16*, 137-143.

Choi, K., Lazovich, D., Southwell, B., Forster, J., Rolnick, S. J., & Jackson J. (2010). Prevalence and characteristics of indoor tanning use among men and women in the United States. *Archives of Dermatology, 146*, 1356-1361.

Cram, P., Fendrick, A. M., Inadomi, J., Cowen, M. E., Carpenter, D., & Vijan, S. (2003.) The impact of a celebrity promotional campaign on the use of colon cancer screening – the Katie Couric effect. *Archives of Internal Medicine, 163*, 1601-1605.

Dixon, H., Warne, C., Scully, M., Dobbinson, S., Wakefield, M. (2014). Agenda-setting effects of sun-related news coverage on public attitudes and beliefs about tanning and skin cancer. *Health Communication, 29*, 173-181.

El Ghissassi, F., Baan, R., Straif, K., Grosse, Y., Secretan, B., Bouvard, V., Benbrahim-Talla, L., Guha, N., Freeman, C., & Galichet, L., on behalf of the WHO International Agency for Research on Cancer Monograph Working Group. (2009). A review of human carcinogens—Part D: radiation. *Lancet Oncology, 10*, 751-752.

Heneghan, M. K., Hazan, C., Halpern, A. C., & Oliveria, S. A. (2007). Skin cancer coverage in a national newspaper: A teachable moment. *Journal of Cancer Education, 22*, 99-104.

International Agency for Research on Cancer. (2009). Sunbeds and UV Radiation [press release]. Retrieved from http://www.iarc.fr/en/media-centre/iarcnews/2009/sunbeds_uvradiation.php

Mahler, H. I. M., Beckerley, S. E., Vogel, M.T. (2010). Effects of media images on attitudes toward tanning. *Basic and Applied Social Psychology, 32*, 188-127.

McCombs, M.E. & Shaw, D.L. (1972). The agenda-setting function of mass media. *Public Opinion Quarterly, 36* (Summer), 176-187.

McWhirter, J. E. & Hoffman-Goetz, L. (2013). Systematic review of population based studies on the impact of images on UV attitudes and behaviours. *Health Promotion International.* DOI: 10.1093/heapro/dat031.

McWhirter, J. E. & Hoffman-Goetz, L. (2012). Visual images for skin cancer prevention: A systematic review of qualitative studies. *Journal of Cancer Education, 27,* 202-216.

Pierce, J. P. & Gilpin, E.A. (2001). News media coverage of smoking and health is associated with changes in population rates of smoking cessation but not initiation. *Tobacco Control, 10,* 145-143.

Riffe, D., Lacy, S., & Fico, F. (2013). *Analyzing Media Messages: Using Quantitative Content Analysis in Research*. 3rd edition. New York, NY: Routledge.

Slater, M. D., Long, M., Bettinghaus, E. P., Reineke, J. B. (2008). News coverage of cancer in the United States: A national sample of newspapers, television, and magazines. *Journal of Health Communication, 13,* 523-537.

The Lancet Oncology. (2009). Sunbeds (UV Tanning Beds), and UV Radiation Moved Up to Highest Cancer Risk Category by International Agency for Research on Cancer (IARC) [press release]. Retrieved from https://app06.ottawa.ca/calendar/ottawa/citycouncil/occ/2009/10-28/cpsc/02%20-%20ACS2009-CCS-CPS-0023%20Document5.htm

Wehner, M. R., Chren, M-M., Nameth, D., Choudhry, A., Gaskins, M., Nead, K.T., Boscardin, W.J., & Linos, E. (2014). International prevalence of indoor tanning: A systematic review and meta-analysis. *JAMA Dermatology, 150,* 390-400.

CHAPTER 5: SKIN CANCER RISK FACTORS, UV BEHAVIOURS, AND EARLY DETECTION INFORMATION IN POPULAR U.S. WOMEN'S AND MEN'S MAGAZINES

The work present in Part One of this chapter has been accepted for publication as:

McWhirter, J. E. & Hoffman-Goetz, L. (2015) Skin cancer risk factors and UV behaviors in popular U.S. magazines from 2000-2012. *Journal of Cancer Education.* doi: 10.1007/s13187-015-0808-1

The work presented in Part Two of this chapter has been accepted for publication (Research Letter) as:

McWhirter, J. E. & Hoffman-Goetz, L. (2015). Skin cancer early detection information in popular U.S. magazines (2000-2012). *Journal of the American Academy of Dermatology* (in press).

5.1 Research Questions

To what extent do U.S. popular men's and women's magazines report on skin cancer and recreational tanning (i.e., how many articles are published on these topics)?

To what extent are skin cancer risk factors, UV-related behaviours, and early detection information covered in skin cancer and recreational tanning content in U.S. popular women's and men's magazines?

Do visual images accompanying article text in popular U.S. magazines convey similar or different information (i.e., risk factors, UV behaviours, and early detection information) about skin cancer and tanning?

Do women's and men's U.S. popular magazines convey similar or different information (i.e., risk factors, UV behaviours, and early detection information) about skin cancer and tanning?

5.2 Hypotheses

Magazines article text will convey discordant information about skin cancer and tanning (i.e., risk factors, UV behaviours, and early detection information) compared to accompanying visual images.

U.S. women's magazines will contain more articles and different information about skin cancer and tanning (i.e., risk factors, UV behaviours, and early detection information) compared to U.S. men's magazines.

PART ONE

5.3 Chapter Overview (Part One)

Background: Mass media is an influential source of skin cancer and tanning information for the public, but we know little about its content or emphasis. *Objective*: The objective of this research was to describe the volume and nature of skin cancer and tanning messages in 20 popular U.S. men's and women's magazines (2000-2012). *Methods*: We used a directed content analysis to determine frequency information about risk factors and ultra-violet (UV) behaviours in 608 articles and 930 images. Chi-square and Fisher's exact tests determined coverage differences based on content type (text vs. image) and target audience (women vs. men). *Results*: UV exposure was the most common risk factor mentioned (37.7%) and sunscreen use the most common behaviour encouraged (60.0%); other risk factors and protective behaviours were uncommon. Both articles (25.2%) and images (36.9%) promoted the tanned look as attractive. In most cases, images infrequently contained helpful information on skin cancer risk factors and prevention, except for high SPF sunscreens. Women's magazines published more articles

on skin cancer and tanning than men's magazines (456 vs. 159, $\chi^2 = 143.43$, $p < .01$) and the nature of the messages differed between them. *Conclusion*: Magazine skin cancer and tanning content may contribute to inaccurate public understanding of risks and prevention. These findings are relevant to cancer educators, who may wish to counter potentially harmful messages, and enhance positive ones, through cancer education efforts.

5.4 Introduction

Skin cancer prevention has been identified as a key public health priority for Americans (U.S. Department of Health and Human Services, 2014). Mass media is an influential source of skin cancer information for the public (Dixon, Warne, Scully, Dobbinson, & Wakefield, 2014). Media coverage of skin cancer and tanning increases knowledge about the dangers of ultraviolet (UV) exposure (Jalleh, Donovan, Lin, Slevin, 2008), influences attitudes and beliefs about skin cancer and tanning (Dixon et al., 2014; Dixon, Dobbinson, Wakefield, Jamsen, & McLeod, 2008), and has played a role in indoor tanning legislation (Makin & Dobbinson, 2009).

Despite how common and preventable skin cancer is, and the role the media plays, challenges remain for cancer educators: the public's knowledge about skin cancer is poor (Buster, You, Fouad, & Elmets, 2010); and risk behaviours, such as use of indoor tanning devices or not wearing sunscreen, are prevalent (Wehner et al., 2014; Buller et al., 2011). This may be partly due to how the mass media covers skin cancer.

Visual health communication (McWhirter & Hoffman-Goetz, 2014a) has an important role in skin cancer education. Visual images influence patients' knowledge,

attitudes, and behaviours related to UV protection and exposure (McWhirter & Hoffman-Goetz, 2013a). Images are pervasive in mass media content and affect reader's interpretation of media stories (Zillmann, Gibson, & Sargent, 1999). Thus, visuals are an important medium to examine regarding information conveyed about skin cancer and tanning in the mass media.

While both men and women are at risk for skin cancer, related risks and behaviours differ between them. For example, young women have a higher incidence of melanoma; however, with age men have both a higher incidence, and a higher mortality rate, from the disease (National Cancer Institute, 2014). Women are the primary users of indoor tanning devices (Wehner et al., 2014), but men are more likely to accumulate greater lifetime solar UV exposure (Ramirez, Federman, & Kirsner, 2005). Hence, it is important to determine if, and how, skin cancer information is differentially conveyed to women and men, something which has not been addressed in previous research (Dixon et al., 2008; Cho, Hall, Kosmoski, Fox, & Mastin, 2010).

We examined the extent to which articles and accompanying images about skin cancer and tanning in popular U.S. women's and men's magazines conveyed information about skin cancer risk factors and UV behaviours. We sought to determine if the reporting differed according to content type (text vs. image) and gender of target audience (women vs. men).

5.5 Methods

Using directed content analysis (Riffe, Lacy, & Fico, 2013) we examined popular U.S. women's (n = 10) and men's (n = 10) magazines (Table 5) from 2000 to 2012 for

information about risk factors and UV behaviours in articles (and accompanying images) about skin cancer and tanning. The large number of magazines and substantive time frame were selected to infer general trends in media reporting on this important cancer prevention issue.

5.5.1 Data Selection and Retrieval

Magazines were selected based on high circulation, target readership (men and women), and genre of focus (general interest, fashion/beauty, sport/science, or health/fitness). This information (Table 5) was obtained from the Audit Bureau of Circulations and magazine media kits. All magazines were available for the full time frame except *Women's Health Magazine*, which was only archived for 2006 to 2012. We have adjusted for this in the analyses.

Magazines were searched for articles about skin cancer and tanning using electronic databases (*Reader's Guide to Periodical Literature, LexisNexis, Factivia, ProQuest Research Library*) and the table of contents. Example search terms include: skin cancer, melanoma, basal cell carcinoma, squamous cell carcinoma, tan*, indoor tan*, outdoor tan*, suntan*, sunburn, sunscreen, and sunblock. (The asterisk represents variant endings: e.g., tan, tanning, tanned.) Articles were included if they were: English-language, editorial content, focused on skin cancer and tanning (title, by-line, introductory paragraph, and ≥ 75% of article space) were devoted to the issues), indexed in a database or table of contents, and published between 2000 and 2012. Advertisements were excluded. All images accompanying relevant articles were included. Articles and

images were retrieved from electronic databases and library archives. Data retrieval of identified articles (n = 615) was 98.9% (n = 608).

Table 5. Magazine genre, circulation, and number of skin cancer and tanning articles published (2000-2012)

Magazine	Type/Focus of Magazine	Circulation (2012)	Number of Articles
Good Housekeeping	Women's general interest	4,346,747	48
Family Circle	Women's general interest	4,100,977	14
Ladies Home Journal	Women's general interest	3,205,302	23
Cosmopolitan	Women's beauty/fashion	3,017,834	67
Glamour	Women's beauty/fashion	2,374,291	25
Vogue	Women's beauty/fashion	1,222,373	16
Elle U.S.	Women's beauty/fashion	1,121,529	52
Women's Health	Women's health/fitness	1,617,737	50
Shape	Women's health/fitness	1,635,933	112
Self	Women's health/fitness	1,528,583	49
GQ	Men's general interest	963,507	3
Esquire	Men's general interest	721,399	10
Details	Men's general interest	461,937	2
Sports Illustrated	Men's sport/science	3,204,945	1
Golf Digest	Men's sport/science	1,678,538	17
Popular Science	Men's sport/science	1,350,685	7
Field and Stream	Men's sport/science	1,252,833	1
Men's Health	Men's health/fitness	1,918,387	75
Men's Fitness	Men's health/fitness	585,265	26
Muscle and Fitness	Men's health/fitness	325,000	17

5.5.2 Coding

Articles and images were coded for the presence or absence of 16 variables related to risk factors for skin cancer and UV protection, exposure, and avoidance behaviours. Variables were operationalized in a codebook developed from skin cancer information provided by the American Academy of Dermatology and the American Cancer Society. We coded for two further variables in images only: whether images were graphic in nature (e.g., depicted unsightly scars or advanced skin cancers) and whether images were UV photographs (i.e., black and white photographs depicting skin damage normally invisible to the naked eye. These types of images are effective toward encouraging UV protection and avoidance behaviours (McWhirter & Hoffman-Goetz, 2013a).

5.5.3 Analysis

The codebook (Appendix B) was applied to all article text and images by one researcher. Based on established content analysis methodology (Riffe et al., 2013), a subsample of articles (n = 61) and images (n = 93) were coded independently by a second researcher as a consistency check. Inter-coder reliability was very good (kappa scores 0.83 to 1.00). Discrepancies in coding were resolved through iterative discussion.

Descriptive statistics were used to summarize the volume and nature of skin cancer and tanning coverage: Chi-square and Fisher's exact tests were used to compare the presence of variables by content type (text vs. image) and target audience (women vs. men). Results with $p < .05$ were considered statistically significant. We used SPSS v21 for statistical analyses and NVivo 10 to capture quotes and image descriptions.

5.6 Results

In total, 608 articles and 930 accompanying images about skin cancer and tanning published in 20 popular U.S. magazines between 2000 and 2012 were analyzed. Results are presented in Table 6 (overall coverage and content type comparisons), and Table 7 (target audience comparisons).

5.6.1 General Characteristics of Data

Articles were 0.25 to 10 pages (M = 1.13, SD = 1.44) and 19 to 4706 words (M = 487.57, SD = 667.37) in length. Article focus was on: skin cancer (26.5%), indoor tanning (6.3%), outdoor tanning (5.1%), both indoor and outdoor tanning (1.7%), self-tanning (15.3%), sunscreen use (38.2%), post-sun care (1.7%), or multiple (5.2%).

There were 0 to 18 images per article (M = 1.59, SD = 1.81). Images were smaller than text (44.0%), equal in size to text (29.1%), or greater in size than text (26.9%). They were mostly photographs (95.1%), with some illustrations or diagrams (4.9%), and typically in color (98.7%) compared to black and white (1.3%). Ethnicity of people depicted in images was as follows: Caucasian (92.9%), African American (2.9%), Hispanic (1.2%), and mixed or other ethnicities (3.1%). There were few graphic images (0.9%) and UV photographs (0.4%).

5.6.2 Overview of Coverage

Risk factors: The most frequently conveyed risk factor was UV exposure (37.7% Articles). Other risk factors were infrequently mentioned or depicted (< 14% in Articles and Images).

UV behaviours: The most commonly emphasized UV behaviours were sunscreen use (60.0% Articles, 19.2% Images) and the tanned look (36.9% Images, 25.2% Articles). Solar and artificial UV avoidance, and other methods of UV protection, were infrequently mentioned.

5.6.3 Content Type: Text vs. Image

Risk factors: Identified risk factors appeared in a greater proportion of articles compared to images: e.g., sunburns: Text 8.6%, Image 1.2%, $\chi^2 = 50.83$, $p < .0001$; e.g., UV exposure: Text 37.7%, Image 3.1%, $\chi^2 = 314.28$, $p < .0001$, with the exception of susceptible phenotype.

UV behaviours: Text conveyed a wider variety and larger volume of information about healthy UV behaviours compared to images. Text more often promoted the use of self-tanners (Text 22.5%, Image 12.9%, $\chi^2 = 24.50$, $p < .0001$), discouraged indoor tanning (Text 14.1%, Image 1.0% $\chi^2 = 110.15$, $p < .0001$), and promoted wearing of hats (Text 15.6%, Image 10.0%, $\chi^2 = 10.84$, $p = .001$), clothes (Text 12.3%, Image 7.8%, $\chi^2 = 8.51$, $p = .004$), and sunscreen use (Text 60.0%, Image 19.6%, $\chi^2 = 262.66$, $p < .0001$). Images more frequently promoted unhealthy UV behaviours including the tanned look as desirable (Image 36.9%, Text 25.2%, $\chi^2 = 23.10$, $p < .0001$) and indoor tanning (Image 1.5%, Text 0.3%, $\chi^2 = 4.94$, $p = .026$).

Table 6. Comparison of skin cancer risk factors and UV behaviours in popular U.S. magazines by content type (text vs. image)

Variable	Text		Image		χ^2 (*df* = 1), *p* value
	%	(*n*/608)	%	(*n*/930)	
Risk Factors					
UV exposure	37.7	(229)	3.1	(29)	314.28, $p < .0001$*
Light skin	12.7	(77)	14.1	(131)	0.64, $p = .425$
Moles (>50 or abnormal)	10.5	(64)	5.8	(54)	11.56, $p = .001$*
History of skin cancer	8.9	(54)	0.0	(0)	85.60, $p < .0001$*
Sunburns	8.6	(52)	1.2	(11)	50.83, $p < .0001$*
Medication/immune suppression	3.0	(18)	0.4	(4)	16.70, $p < .0001$*
UV Behaviours					
Promotes tanned look	25.2	(153)	36.9	(343)	23.10, $p < .0001$*
Promotes self-tanners	22.5	(137)	12.9	(120)	24.50, $p < .0001$*
Promotes solar UV avoidance	14.1	(86)	13.1	(122)	0.33, $p = .565$
Discourages indoor tanning	14.1	(86)	1.0	(9)	110.15, $p < .0001$*
Promotes indoor tanning	0.3	(2)	1.5	(14)	4.94, $p = .026$*
Promotes shade	7.9	(48)	8.1	(75)	0.014, $p = .904$
Promotes hats	15.6	(95)	10.0	(93)	10.84, $p = .001$*
Promotes clothes	12.3	(75)	7.8	(73)	8.51, $p = .004$*
Promotes sunscreen	60.0	(365)	19.6	(182)	262.66, $p < .0001$*
SPF level (30+)[a]	47.1	(136)	66.4	(87)	13.56, $p < .0001$*

* = statistically significant

[a] Articles or images not mentioning or depicting a specific SPF level were excluded from these analyses

5.6.4 Target Audience: Women's vs. Men's Magazines

There were significantly more articles published in women's (n = 456) compared to men's (n = 125) magazines (χ^2 = 188.57, p < .0001). (We excluded *Men's Health Magazine* content published from 2000 to 2006 in order to match the fact that for the same years, content from *Women's Health Magazine* was unavailable.)

Risk factors: There were no significant differences for risk factors in text in men's and women's magazines. However, a smaller percentage of images in women's magazines depicted UV exposure (Women 1.7%, Men 12.2%, Fisher's exact, p < .0001) and sunburns (Women 0.9%, Men 3.3%, Fisher's exact, p = .050) as risk factors.

UV behaviours: Women's magazines more often promoted the tanned look (Text: Women 27.8%, Men 17.7%, χ^2 = 4.14, p = .023) and encouraged self-tanners (Text: Women 26.4%, Men 12.1%, χ^2 = 11.18, p = .001). Women's magazines also emphasized UV avoidance (Images: Women 14.6%, Men 6.5%, χ^2 = 5.94, p = .015) whereas men's magazines encouraged UV protection through the use of protective clothing (Images: Women 6.9%, Men 13.8%, χ^2 = 7.03, p = .008) and sunscreen (Images: Women 17.9%, Men 30.1%, χ^2 = 10.02, p = .002). When sunscreen use was encouraged, women's magazines more often promoted the use of sunscreens with an SPF of 30 or higher (Text: Women 51.2%, Men 34.3%, χ^2 = 6.03, p = .014; Images: Women 72.2%, Men 39.1%, χ^2 = 9.31, p = .002).

Table 7. Comparison of skin cancer risk factors and UV behaviours in popular U.S. magazines by genre (women's vs. men's magazines)

Variable	Content Type	Women		Men		χ^2 (*df* = 1) or Fisher's Exact, *p* value
	Text	%	(*n*/450)	%	(*n*/124)	
	Image	%	(*n*/782)	%	(*n*/123)	
Risk Factors						
UV exposure	Text	38.4	(173)	33.9	(42)	0.87, *p* = .352
	Image	1.7	(13)	12.2	(15)	Fisher's, *p* < .0001*
Light skin	Text	12.9	(58)	13.7	(17)	0.06, *p* = .810
	Image	13.7	(107)	18.7	(23)	2.17, *p* = .140
Moles (>50 or abnormal)	Text	11.6	(52)	9.7	(12)	0.35, *p* = .556
	Image	5.6	(44)	6.5	(8)	0.15, *p* = .697
History of skin cancer	Text	10.4	(47)	4.8	(6)	3.65, *p* = .056
	Image	0.0	(0)	0.0	(0)	n/a
Sunburns	Text	9.3	(42)	8.1	(10)	0.19, *p* = .663
	Image	0.9	(7)	3.3	(4)	Fisher's, *p* = .050*
Medication/immune suppression	Text	3.1	(14)	2.4	(3)	Fisher's, *p* = 1.000
	Image	0.5	(4)	(0)	(0)	Fisher's, *p* = 1.000
UV Behaviours						
Promotes tanned look	Text	27.8	(125)	17.7	(22)	4.14, *p* = .023*
	Image	38.0	(297)	31.7	(39)	1.79, *p* = .181
Promotes self-tanners	Text	26.4	(119)	12.1	(15)	11.18, *p* = .001*
	Image	13.3	(104)	12.2	(15)	0.11, *p* = .736
Promotes solar UV avoidance	Text	13.6	(61)	16.1	(20)	0.53, *p* = .466
	Image	14.6	(114)	6.5	(8)	5.94, *p* = .015*
Discourages indoor tanning	Text	15.8	(71)	11.3	(14)	1.55, *p* = .213
	Image	0.9	(7)	1.6	(2)	Fisher's, *p* = .351
Promotes indoor tanning	Text	0.2	(1)	0.8	(1)	Fisher's, *p* = .386
	Image	1.4	(11)	1.6	(2)	Fisher's, *p* = .693
Promotes shade	Text	8.7	(39)	7.3	(9)	0.25, *p* = .616
	Image	9.0	(70)	4.1	(5)	3.34, *p* = .068
Promotes hats	Text	16.4	(74)	16.1	(20)	0.01, *p* = .933
	Image	10.0	(78)	10.6	(13)	0.04, *p* = .838
Promotes clothes	Text	12.7	(57)	14.5	(18)	0.29, *p* = .588
	Image	6.9	(54)	13.8	(17)	7.03, *p* = .008*
Promotes sunscreen	Text	60.0	(270)	64.5	(80)	0.83, *p* = .361
	Image	17.9	(140)	30.1	(37)	10.02, *p* = .002*

SPF level (30+)[a]	Text	51.2	(108)	34.3	(24)	6.03, p = .014*
	Image	72.2	(78)	39.1	(9)	9.31, p = .002*

* = statistically significant
n/a = not applicable
[a] Articles or images not mentioning or depicting a specific SPF level were excluded from these analyses

5.7 Discussion

5.7.1 Overall Coverage

Overall, there was little information on risk factors aside from UV exposure in these 20 popular U.S. women's and men's magazines. Behavioural messages focused on sunscreen, but not on other sun protection methods, and there was little focus on UV avoidance. Simultaneously, magazines promoted the tanned look.

The public health message that UV exposure is the most important risk factor for skin cancer was prominent in the magazines. The lesser coverage of other important risk factors (e.g., susceptible phenotype, prior sunburns) suggests the public may be relatively uninformed in these areas. If readers are not messaged about being at high risk (e.g., susceptible phenotype), they may be less inclined to act on behavioural recommendations. The most common ethnicity in images was Caucasian. Visually, thus, the magazines were communicating some information about susceptible phenotype. However, this may perpetuate the myth that dark-skinned individuals are not susceptible to skin cancer.

There was a larger focus on UV protection, especially sunscreen use, relative to UV avoidance, a finding consistent with prior research (Cho et al., 2010; Cokkinides, Kirkland, Andrews, Sullivan, & Lichtenfeld, 2012). The promotion of sunscreen use is positive in that it reduces the risk for squamous cell and basal cell carcinoma and melanoma (Green et al., 1999; Green, Williams, Logan, & Strutton, 2011). However, there was also an emphasis on the attractiveness of the tanned "look" (appearance) in the magazines; this finding suggests sunscreen use may be presented as a tanning aid rather

than a skin cancer prevention behaviour. Moreover, the lack of reporting on other protection behaviours (shade, hats, clothing) may promote the "take away" message for readers that *by itself* sunscreen use is sufficient for skin cancer prevention.

Although magazines frequently reported UV exposure as a risk factor for skin cancer, there was a lack of parallel messaging about UV exposure avoidance behaviours. The lack of emphasis on discouraging indoor tanning is especially disturbing in the magazines geared toward women: women are the primary users of carcinogenic indoor tanning devices and the behaviour remains popular (Wehner et al., 2014).

The emphasis on sunless tanning products could be seen as positive, enabling people to achieve the tanned look without UV exposure. Indeed, the use of "sunless tanning products" is associated with decreased UV exposure (Sahn, McIlwain, Magee, Velefar, & Chen, 2012). However, sunless tanners could also be considered as complementary to, rather than as a replacement behaviour for, UV exposure. Indeed, some articles suggested that readers use sunless tanners *before* they arrive at the beach.

5.7.2 Text vs. Image

The lack of risk factors in images suggests visually there was little to be learned about what increases a person's chances of getting skin cancer from popular magazines. The potential reasons for this are likely complex including the difficulty of visually conveying certain risks, such as personal or family history of the disease, or because editors of popular magazines may feel photographs of moles or sunburned skin are unpleasant and potentially offensive to readers and advertisers.

A significantly greater proportion of images promoted the tanned look and images were less likely to encourage seeking shade, wearing protective clothing, using sunscreen, or avoiding indoor tanning compared to article text. Images may promote the unhealthy behaviours that text discouraged. Indeed, the promotion of the tanned look in magazine images is consistent with previous research findings (Dixon et al., 2008; Cho et al., 2010). "Image norms" of suntans influence intentions to suntan (Jackson & Aiken, 2006). Visuals of attractive people with tanned skin increase desire and intention to tan, but images depicting attractive people without a suntan have the opposite effect (McWhirter & Hoffman-Goetz, 2013a). Utilizing images celebrating untanned skin as attractive could potentially have a positive impact on the public's skin cancer behaviours.

Images were also less likely to promote the use of self-tanners compared to text. Images of attractive people with "sunless" tans have been associated with decreased tanning, fewer sunburns, and increased use of sunless tanners (Pagoto, Schneider, Oleski, Bodenlos, & Ma, 2010). When an image of a tanned model is depicted, however, the message should be explicit: the tan depicted is from a self-tanning product and not UV exposure.

5.7.3 Women's vs. Men's Magazines

The lack of coverage of skin cancer and tanning issues in men's magazines is exacerbated by the fact that they have lower circulation numbers compared to women's magazines. This may contribute to behavioural and knowledge gaps around skin cancer and UV exposure and protection. Men are more likely to have negative attitudes about cancer prevention (Keeney, McKenna, Fleming, & McIlfatrick, 2010) and are less likely

to engage in UV protection compared to women (Coups, Manne, & Heckman, 2008; Lewis, Mayer, & Slymen, 2006).

The promotion of protective clothing in men's magazines may reflect the tendency for media to present women in less clothing (American Psychological Association, 2007) as well as the trend toward more revealing women's swimwear (Chang et al., 2014). Images in men's magazines may have encouraged sunscreen use to a greater extent because of a heavy emphasis on sport and outdoor recreation (common themes for men's magazines) (Malkin, Wornian, & Chrisler, 1999) which often involve solar UV exposure. Women's magazines, in contrast, emphasize physical appearance (Malkin et al., 1999) which may explain the greater emphasis on the tanned look, the use of sunless tanners, and higher SPF levels for prevention of premature aging. Regardless of the reasons, the focus on sunscreen in images aimed at men was encouraging because men are less targeted by sunscreen advertisements (Lee et al., 2006). While women's magazines emphasized the tanned look, research has shown that men are also frequently depicted with suntans (Chapman, Marks, & King, 1992; Basch, Hillyet, Ethan, Berdnik, & Basch, 2014).

5.7.4 Limitations

There were limitations in this study. First, we included only English-language magazines and excluded magazines targeting specific racial or ethnic groups and younger age groups (e.g., teen girls). Second, only articles retrieved by the search strategy were included. Third, temporal changes in coverage were not determined, as these have been investigated in previous research (McWhirter & Hoffman-Goetz, 2014b; McWhirter &

Hoffman-Goetz, 2015). Finally, we did not assess whether readers' skin protection knowledge and behaviours were influenced by this content.

5.7.5 Conclusions

This study – one of the largest, most comprehensive content analyses on U.S. magazine coverage of skin cancer and tanning to date – showed that magazines focused narrowly on UV exposure as a risk factor and sunscreen for protection, with little attention to other risk factors and other UV protection and avoidance behaviours. Content also promoted the tanned look as attractive. Men's magazines contained significantly fewer messages around skin cancer and tanning compared to women's magazines, and there were striking differences in the way coverage appeared in images compared to article text. It is important for cancer educators to be aware of mediated information about skin cancer as this information likely plays a vital role in shaping the attitudes, knowledge, and behaviours of both patients and the general public.

PART TWO

5.8 Chapter Overview (Part Two)

Early detection of skin cancer is important for good prognosis and survival. The mass media is an influential source of skin cancer information for the public, but little is known about reporting on early detection. We examined a 13-year timeframe of skin cancer and tanning articles and images in 20 popular U.S. magazines. There was little emphasis on early detection and there were few visual examples of skin cancers to guide skin-self-examination or encourage patients to seek physician-led skin examination.

5.9 Early Detection Information

Early detection of skin cancer contributes to better prognosis and survival (Mayer, Swetter, Fu, & Geller, 2014). The popular media is an important source of skin cancer information for the public (Dixon, Warne, Scully, Dobinson & Wakefield, 2014). Media articles are often accompanied by images, and images influence patient knowledge and behaviours related to early detection (McWhirter & Hoffman-Goetz, 2013b). Little is known about how, and how often, early detection for skin cancer is reported in the media.

Using a directed content analysis, we examined popular U.S. men's (n = 10) and women's (n = 10) magazines based on high circulation numbers (2012) for information about early detection in skin cancer and tanning articles (n = 608) and accompanying images (n = 930) published from 2000-2012 (inclusive). Magazines included: *Good Housekeeping*, *Family Circle*, *Ladies Home Journal*, *Cosmopolitan*, *Glamour*, *Vogue*, *Elle*, *Women's Health*, *Shape*, *Self*, *GQ*, *Esquire*, *Details*, *Sports Illustrated*, *Golf Digest*, *Popular Science*, *Field and Stream*, *Men's Health*, *Men's Fitness*, and *Muscle and*

Fitness. We looked for information about skin self-examination, physician-led skin examination, and the ABCD (asymmetry, border irregularity, color, diameter) criteria. Chi-square and Fisher's exact tests determined coverage differences.

During the 13-year study timeframe, there was little information about early detection published in articles and images about skin cancer and tanning (Table 8). Articles, compared to images, more often encouraged early detection through skin self-examination (18.3% vs. 7.0%, $\chi^2 = 46.06$, $p < .0001$), physician-led examination (21.1% vs. 1.2%, $\chi^2 = 176.56$, $p < .0001$), and the ABCD criteria (7.1% vs. 2.0%, $\chi^2 = 24.04$, $p < .0001$). In addition, 3.0% of images depicted other visual examples of skin cancers (e.g., "ugly duckling"). Example images of skin cancer are important tools for frequent and accurate melanoma detection by patients; text descriptors alone are often ineffective (McWhirter & Hoffman-Goetz, 2013b). The absence of these images in magazines is troubling.

There were no statistically significant differences in early detection coverage between men's and women's magazines (Table 9). While the proportions of women's vs. men's content covering early detection did not differ significantly, the absolute numbers did. For example, 87 articles in women's magazines encouraged skin self-examination vs. 22 in men's magazines. Similarly, 98 articles encouraged physician-led skin examination in women's vs. 28 in men's magazines. This suggests men may be receiving less information about early detection for skin cancer compared to women.

Table 8. Early detection information in popular U.S. magazines (text vs. image)

Variable	Text		Image		χ^2 (*df* = 1), *p* value
	%	(*n*/608)	%	(*n*/930)	
Skin self-examination	18.3	(111)	7.0	(65)	46.06, $p < .0001$*
Physician-led skin examination	21.1	(128)	1.2	(11)	176.56, $p < .0001$*
ABCD criteria	7.1	(43)	2.0	(19)	24.04, $p < .0001$*

Content from *Women's Health Magazine* was unavailable for 2000 through 2006 and was therefore not included in these results.
*Statistically significant
ABCD, asymmetry, border irregularity, color, and diameter
df = degrees of freedom

Table 9. Early detection information in popular U.S. magazines (women's vs. men's magazines)

Variable	Content Type	Women		Men		χ^2 (*df*=1) or Fisher's Exact, *p* value
	Text	%	(*n*/450)	%	(*n*/124)	
	Image	%	(*n*/782)	%	(*n*/123)	
ABCD criteria	Text	6.9	(31)	8.9	(11)	0.56, $p = .453$
	Image	1.9	(15)	3.3	(4)	Fisher's, $p = .312$
Skin self-examination	Text	19.3	(87)	17.7	(22)	0.16, $p = .689$
	Image	7.0	(55)	7.3	(9)	0.01, $p = .909$
Physician-led skin examination	Text	21.8	(98)	22.6	(28)	0.04, $p = .848$
	Image	1.0	(8)	1.6	(2)	Fisher's, $p = .634$

Total article and image counts are lower than in Table I because content from *Men's Health Magazine* for 2000 through 2006 was excluded for the target audience comparison in order to match the fact that content from *Women's Health Magazine* for the same period of time was unavailable.
ABCD = asymmetry, border irregularity, color, and diameter
df = degrees of freedom

Despite the established importance of early detection for melanoma, rates of physician and patient skin examination are low (Mayer et al., 2014). The lack of magazine content about early detection noted here and elsewhere (Stryker, Solky, & Emmons, 2005) may contribute to low rates of patient skin self-examination and requests by patients for physician-led skin examination.

This research has limitations. We included only a subset of English-language U.S. popular magazines; other magazines may have had different results. Only articles retrieved by the search strategy were included; we did not track excluded articles. Temporal changes in coverage were not determined, but these have been reported elsewhere (McWhirter & Hoffman-Goetz, 2014b). We did not assess whether reader's early detection behaviours were influenced by the content.

It is important for dermatologists to be aware that mediated information about skin cancer contains little information about early detection in article text and especially in images. This may influence patients' knowledge, attitudes, and behaviours regarding important screening behaviours.

5.10 References

American Psychological Association. (2007). *Report of the APA Task Force on the Sexualization of Girls*. Washington, DC: APA.

Basch, C. H., Hillyer, G. C., Ethan, D., Berdnik, A., & Basch, C.E. (2014). Tanning shade gradations of models in mainstream fitness and muscle enthusiast magazines: implications for skin cancer prevention in men. *American Journal of Men's Health*. doi: 10.1177/1557988314543511

Buller, D. B., Cokkinides, V., Hall, H. I., Hartman, A. M., Saraaiya, M., Miller, E., & Glanz, K. (2011). Prevalence of sunburn, sun protection, and indoor tanning behaviours among Americans: Review from national surveys and case studies of 3 states. *Journal of the American Academy of Dermatology, 65,* S114-S123.

Buster, K. J., You, Z., Fouad, M., & Elmets, C. (2012). Skin cancer risk perceptions: a comparison across ethnicity, age, education, gender, and income. *Journal of the American Academy of Dermatology, 66*, 771-779.

Chang, C., Murzaku, E. C., Penn, L., Abbasi, N. R., Davis, P. D., Berwick, M., & Polsky, D. (2014). More skin, more sun, more tan, more melanoma. *American Journal of Public Health, 104*, e92-e99.

Chapman, S., Marks, R., & King, M. (1992). Trends in tans and skin protection in Australian fashion magazines, 1982 through 1991. *American Journal of Public Health, 82*, 1677-1680.

Cho, H., Hall, J. G., Kosmoski, C., Fox, R. L., & Mastin, T. (2010). Tanning, skin cancer risk, and prevention: a content analysis of eight popular magazines that target female readers: 1997-2006. *Health Communication, 25*, 1-10.

Cokkinides, V., Kirkland, D., Andrews, K., Sullivan, K., & Lichtenfeld, J.L. (2012). A profile of skin cancer prevention media coverage in 2009. *Journal of the American Academy of Dermatology, 67*, 570-575.

Coups, E. J., Manne, S. L., & Heckman, C. J. (2008). Multiple skin cancer risk behaviors in the U.S. population. *American Journal of Preventative Medicine, 34*, 87-93.

Dixon, H., Dobbinson, S., Wakefield, M., Jamsen, K., & McLeod, K. (2008). Portrayal of tanning, clothing fashion and shade use in Australian women's magazines, 1987-2005. *Health Education Research, 23*, 791-802.

Dixon, H., Warne, C., Scully, M., Dobbinson, S., & Wakefield, M. (2014). Agenda-setting effects of sun-related news coverage on public attitudes and beliefs about tanning and skin cancer. *Health Communication, 29*, 173-181.

Green, A., Williams, G., Neale, R., Hart, V., Leslie, D., Parsons, P., . . . Russell, A. (1999). Daily sunscreen application and betacarotene supplementation in prevention of basal-cell and squamous-cell carcinomas of the skin: a randomised controlled trial. *The Lancet, 354*, 723-729

Green, A. C., Williams, G. M., Logan, V., & Strutton, G. M. (2011). Reduced melanoma after regular sunscreen use: randomized trial follow-up. *Journal of Clinical Oncology, 29*, 257-263.

Jackson, K. M. & Aiken, L. S. (2006). Evaluation of a multicomponent appearance-based sun-protective intervention for young women: uncovering the mechanisms of program efficacy. *Health Psychology, 25*, 34-46.

Jalleh, G., Donovan, R.J., Lin, C., & Slevin, T. (2008). Changing perceptions of solaria and cancer risk: the role of the media. *Medical Journal of Australia, 188*, 735.

Keeney, S., McKenna, H., Fleming, P., & McIlfatrick, S. (2010). Attitudes to cancer and cancer prevention: what do people aged 35-54 years think? *European Journal of Cancer Care, 19*, 769-777.

Lee, E. T., O'Riordan, D., Swetter, S. M., Demierre, M. F., Brooks, K., & Geller, A. C. (2006). Sun care advertising in popular U.S. magazines. *American Journal of Health Promotion, 20*, 349-352.

Lewis, E. C., Mayer, J. A., & Slymen, D. (2006). Postal workers' occupational and leisure-time sun safety behaviors (United States). *Cancer Causes and Control, 17*, 181-186.

Makin, J. K. & Dobbinson, S. J. (2009). Changes in solarium numbers in Australia following negative media and legislation. *Australia and New Zealand Journal of Public Health, 33*, 491-494.

Malkin, A. R., Wornian, K., & Chrisler, J. C. (1999). Women and weight: Gendered messages on magazine covers. *Sex Roles, 40*, 647-655.

Mayer, J. E., Swetter, S. M., Fu, T., & Geller, A.C. (2014). Screening, early detection, education, and trends for melanoma: Current status (2007-2013) and future directions. Part II. Screening, education, and future directions. *Journal of the American Academy of Dermatology, 71*, 611.e1-611.e10.

McWhirter, J. E. & Hoffman-Goetz, L. (2015). Coverage of skin cancer and recreational tanning in North American magazines before and the landmark 2006 International Agency for Research on Cancer report. *BMC Public Health, 15*, 169. doi:10.1186/s12889-015-1511-1

McWhirter, J. E. & Hoffman-Goetz, L. (2013a). Systematic review of population-based studies on the impact of images on UV attitudes and behaviours *Health Promotion International*. doi: 10.1093/heapro/dat031

McWhirter, J. E. & Hoffman-Goetz, L. (2014b.) North American magazine coverage of skin cancer and recreational tanning before and after the WHO/IARC 2009 classification of indoor tanning devices as carcinogenic. *Journal of Cancer Education*. doi: 10.1007/s13187-014-0726-7

McWhirter, J. E. & Hoffman-Goetz, L. (2013b). Visual images for patient skin self-examination and melanoma detection: A systematic review of published studies. *Journal of the American Academy of Dermatol*ogy, *69*, 47-55.

McWhirter, J. E. & Hoffman-Goetz, L. (2014a). A systematic review of visual image theory, assessment, and use in skin cancer and tanning research. *Journal of Health Communication, 19*, 738-757.

National Cancer Institute. (2014). *SEER Stat Fact Sheets: Melanoma of the Skin*. Retrieved from http://seer.cancer.gov/statfacts/html/melan.html

Pagoto, S. L., Schneider, K. L., Oleski, J., Bodenlos, J. S., & Ma, Y. (2010). The sunless study: a beach randomized trial of skin cancer prevention intervention promoting sunless tanning. *Archives of Dermatology, 146*, 979-984.

Ramirez, C. C., Federman, D. G., & Kirsner, R. S. (2005). Skin cancer as an occupational disease: the effect of ultraviolet and other forms of radiation. *International Journal of Dermatology, 44*, 95-100.

Riffe, D., Lacy, S., & Fico, F. (2013). *Analyzing Media Messages: Using Quantitative Content Analysis in Research*. 3rd Edition. New York, NY: Routledge.

Sahn, R. E., McIlwain, M. J., Magee, K. H., Velefar, E., & Chen, S. C. (2012). A cross-sectional study examining the correlation between sunless tanning product use and tanning beliefs and behaviors. *Archives of Dermatology, 148*, 448-454.

Stryker, J. E., Solky, B. A., & Emmons, K. M. (2005). A content analysis of news coverage of skin cancer prevention and detection, 1979 to 2003. *Archives of Dermatology, 141*, 491-496.

U.S. Department of Health and Human Services. (2014). *The Surgeon General's Call to Action to Prevent Skin Cancer*. Washington, DC: U.S. Department of Health and Human Services, Office of the Surgeon General. Retrieved from http://www.surgeongeneral.gov/library/calls/prevent-skin-cancer/call-to-action-prevent-skin-cancer.pdf

Wehner, M. R., Chren, M. M., Nameth, D., Choudhry, A., Gaskins, M., Nead, K. T, Boscardin, W. J., & Linos, E. (2014). International prevalence of indoor tanning: A systematic review and meta-analysis. *JAMA Dermatology, 150*, 390-400.

Zillmann, D., Gibson, R., & Sargent, S. L. (1999). Effects of photographs in news-magazine reports on issue perception. *Media Psychology, 1*, 207-228.

CHAPTER 6: COVERAGE OF SKIN CANCER AND RECREATIONAL TANNING IN CANADIAN WOMEN'S MAGAZINES (2000-2012)

The work presented in this chapter has been accepted for publication as:

McWhirter, J. E. & Hoffman-Goetz, L. (2015). Skin deep: Coverage of skin cancer and recreational tanning in Canadian women's magazines (2000-2012). *Canadian Journal of Public Health.*

6.1 Research Questions

To what extent do Canadian women's magazines report on skin cancer and recreational tanning (i.e., how many articles are published on these topics)?

To what extent are skin cancer risk factors, UV-related behaviours, and early detection information covered in skin cancer and recreational tanning content in Canadian women's magazines?

Do Canadian magazines differ quantitatively in information about skin cancer and tanning (i.e., risk factors, UV behaviours, and early detection information) compared to U.S. magazines?

6.2 Hypothesis

Canadian women's magazines will contain fewer articles and different information about skin cancer and tanning (i.e., risk factors, UV behaviours, and early detection information) in article text and images compared to U.S. women's magazines.

6.3 Chapter Overview

Background: Skin cancer is a significant public health problem among Canadians. Knowledge and attitudes about health are informed by mass media. *Objective*: Describe volume and nature of coverage of skin cancer and recreational tanning in English-language Canadian women's magazines. *Methods*: Directed content analysis on article text and images in six popular Canadian women's magazines (*Chatelaine, Canadian Living, Homemakers, Flare, Fashion, Elle Canada*) from 2000-2012 with attention to risk factors, UV exposure and protection behaviours, and early detection. Six popular U.S. women's magazines were used for a between-country comparison. *Results*: There were 154 articles (221 images) about skin cancer and tanning published over 13 years. Volume of coverage did not increase in a linear fashion over time. The most common risk factor reported on was UV exposure (39%), with other risk factors less frequently identified. Although 72% of articles promoted sunscreen use, little content encouraged other protection behaviours. Only 15% of articles and 1% of images discouraged indoor tanning; yet 41% of articles and 53% of images promoted the tanned look as attractive. Few articles (< 11%) reported on early detection. Relative to U.S. magazines, Canadian magazines had a greater proportion of content that encouraged sunscreen use and promoted the tanned look and a lesser proportion of content on risk factors and early detection. *Conclusion*: Skin cancer and tanning messages in Canadian women's magazines had a narrow focus and provided limited information on risk factors or screening. Conflicting messages about prevention (text vs. images) may contribute to harmful UV behaviours among Canadian women.

6.4 Introduction

Skin cancer is the most common type of cancer among Canadians (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014). It is such a significant and growing public health problem that the Canadian Cancer Society made skin cancer a special focus of the 2014 annual cancer statistics report (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014), with 6,500 new cases of melanoma (1,050 deaths) and 76,100 cases of non-melanoma (440 deaths) skin cancers estimated. Both the incidence of, and mortality from, melanoma – the most dangerous type of skin cancer – have increased significantly in Canada over the past 25 years. Indeed, the incidence of melanoma among Canadian women is 13.0 per 100,000 and has risen by 1.5% per year from 1986 to 2010 (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014). In 2004, the cost of skin cancer care in Canada was $532 million; by 2031, this is expected to increase to $922 million per year (Krueger, William, Chomiak, & Trenman, 2010).

Ultraviolet (UV) radiation exposure is the most important cause of melanoma and non-melanoma skin cancers (International Agency for Research on Cancer 2012). In Canada, UV radiation accounts for 90% of melanoma cases (Armstron & Kricker, 1993). Sources of UV radiation include the sun (most commonly) and indoor tanning equipment. The World Health Organization recognizes UV exposure – both from the sun and indoor tanning beds – as carcinogenic (El Ghissassi et al., 2009). Intermittent intense sun exposure, history of sunburn, susceptible phenotype (light hair, skin, or eyes), indoor tanning bed use, and multiple or atypical moles are associated with melanoma (Canadian Cancer Society, 2014).

National surveys suggest that the sun behaviours of Canadians may increase their risk of skin cancer. More Canadians are taking winter vacations in sunny locales, spending more time in the sun while vacationing or doing leisure activities, and fewer Canadians report wearing protective clothing or hats (National Skin Cancer Prevention Committee, 2010). Artificial UV exposure is also a public health problem. Over 25% of Canadian women ages 16 to 24, and 15% of women ages 25 to 44, use indoor tanning equipment (National Skin Cancer Prevention Committee, 2010). There are over 5,000 tanning salons in Canada (Guo, Hawkins, Quantz, & Kalisiak, 2013), far more than the number of McDonald's (1,400) and Tim Hortons (3,000) restaurants (McDonald's Canada, 2014; Tim Hortons, 2014).

The mass media, including print magazines, are an important source of information about skin cancer for the public (Dixon, Warne, Scully, Dobbinson, & Wakefield, 2014). Previous research on cancer coverage in Canadian magazines has focused on cervical cancer (Abdelmutti & Hoffman-Goetz, 2010), breast cancer (McWhirter, Hoffman-Goetz, & Clarke, 2012), and, more broadly, on attention to different cancer types (Hoffman-Goetz & MacDonald, 1999). Investigating media coverage of cancer, including skin cancer, is supported by theory. According to Agenda Setting Theory, the media is persuasive toward influencing public and policy agendas: the more frequent and prominent the media coverage of an issue is, the more important audiences will believe this issue to be (McCombs & Shaw, 1972). It is, thus, important to investigate the frequency and nature of skin cancer and tanning coverage as a way of understanding the contribution of media effects on skin cancer behaviours by the public.

Despite the growing incidence of skin cancer and the importance of media to position health issues on the policy agenda and influence the public's health knowledge, attitudes, and behaviours, there has been no published research on the coverage of skin cancer and tanning in Canadian mass media. In an effort to address this surprising research gap, we examined 13 years of skin cancer and tanning content (both article text and accompanying images) in six popular Canadian women's magazines, with a focus on risk factors, UV protection and exposure behaviours, and early detection or screening information. We also assessed magazine reporting on skin cancer and tanning in Canadian compared to U.S. women's magazines because U.S. magazines have considerable reach in Canada (Magazines Canada, 2012). We hypothesized there would be no jurisdictional differences in reporting given the increased incidence of skin cancer among both countries (U.S. Cancer Statistics Work Group, 2014), similarities in each country's approach to indoor tanning restrictions (National Conference on State Legislatures, 2014), and general cultural similarities.

6.5 Methods

Using directed content analysis as our qualitative methodology, we examined coverage of skin cancer and recreational tanning in six popular English-language Canadian women's magazines from 2000 to 2012: *Canadian Living, Chatelaine, Homemaker's, FASHION, Elle Canada,* and *Flare* (2012 circulation rates: approximately 127,000 to 512,000). Although the focus of this study was on Canadian magazines, we also included six popular U.S. women's magazines to serve as a comparison group: *Good*

Housekeeping, Family Circle, Ladies Home Journal, Glamour, Elle U.S., and *Vogue* (2012 circulation rates: approximately 1.1 to 4.4 million).

We used electronic databases (*Canadian Periodical Index, Reader's Guide to Periodical Literature, LexisNexis, Factivia*, and *ProQuest Research Library)* and relevant search terms (skin cancer, melanoma, basal cell carcinoma, squamous cell carcinoma, tan*, indoor tan*, outdoor tan*, suntan*, sunburn, sunscreen, sunblock) to search the magazines for skin cancer and tanning content. Those magazines not indexed electronically were searched manually using the table of contents. A comprehensive list of the potential articles on skin cancer and tanning was created, which noted the title of the article, the periodical in which it was published, the date of publication, and the relevant page numbers (when available). Using this list, one researcher collected the data 1) by using electronic databases, 2) manually by visiting libraries (e.g., Toronto Reference Library), and 3) by co-ordinating with the university inter-library loan specialist to facilitate the collection of data from other libraries (e.g., Vancouver Public Library).

We determined whether articles focused on skin cancer and tanning by examining the title, by-line, introductory paragraph, and amount of space (> 75%) devoted to the issues. To examine the nature of skin cancer and tanning coverage, we coded articles and their accompanying images for the presence or absence of variables related to mentioning specific risk factors for skin cancer, promoting UV protection and exposure avoidance behaviours, and encouraging early detection through self or physician-led skin examination. These variables are listed in Table 10 and were operationalized in a codebook developed by the researchers based on information from the Canadian and

American academies of dermatology and cancer societies. A description of these variables appears in Table 10. For each article and image, the variables were coded as being present (1) or absent (0), which was entered into a spreadsheet in SPSS v 21. NVivo 10 software was used to capture quotes and create image descriptions for each variable. The reading grade level for text of each article was determined using an online SMOG calculator (The University of Nottingham and the Education Development Innovation Technologies Lab, no date).

One researcher coded all articles and images for the study. To ensure reliability of coding and reduce bias, a sample of articles (n = 32) and images (n = 53) were independently coded by a second researcher. Each researcher kept separate notes on variables where descriptions or images were ambiguous and on other questions or concerns which arose during coding. After independently coding the sample of data, the results were compared: inter-coder reliability was very good with kappa scores ranging from 0.83 to 1.00. Discrepancies in coding were resolved through discussion until consensus was reached; to address discrepancies, the codebook was revised to include more detailed descriptions and examples.

We used SPSS v 21 for descriptive statistics to summarize the volume and nature of skin cancer and tanning coverage in Canadian women's magazines. We used chi-square and Fisher's exact tests to compare the presence of variables by content type (text vs. images) and country (Canada vs. U.S.) and Pearson correlation co-efficient to examine whether the volume of coverage changed over time. Statistical results with $p < .05$ were considered statistically significant.

Table 10. Codebook of Variables of Interest

Variable	Text Description	Image Description
Risk Factors		
UV exposure	Mention of UV exposure (solar or artificial) as risk factor for skin cancer (e.g., UV rays from the sun cause skin cancer)	Depiction of someone who has had skin cancer being exposed to UV radiation (e.g., depiction of someone diagnosed with skin cancer outdoors in the sun)
Light skin, hair, or eyes	Mention of having susceptible phenotype (light coloured hair, skin, or eyes) as risk factor for skin cancer (e.g., people with very fair skin are more prone to skin cancer)	Depiction of person who has had skin cancer with susceptible phenotype (e.g., a scar from skin cancer treatment on the body of a person with fair skin)
Moles	Mention of increased risk of skin cancer with abnormal moles or more than 50 moles (e.g., people with many moles are more likely get skin cancer)	Depiction of numerous or abnormal moles (e.g., images of abnormal-looking moles or image of a person with a large number of moles on their skin)
History of skin cancer	Mention of personal or family history of skin cancer as a risk factor (e.g., having had skin cancer before, or having a relative with skin cancer, raises the chances you will get skin cancer)	Depiction of recurrence of skin cancer or of family members affected by skin cancer (e.g., image of siblings both diagnosed with skin cancer)
Sunburns	Mention of sunburn as risk factor for skin cancer (e.g., sunburns increase the chances you will get skin cancer)	Depiction of someone with sunburn (i.e., red, blistered, or peeling skin), with some connection to skin cancer
UV Behaviours		
Tanned look	Promotes tanned ideal or having a tanned look (e.g., a tan is beautiful, sexy, or healthy-looking)	Depiction of a person with tanned skin (i.e., image of person depicted in a favourable way who appears to have skin darkened by UV exposure)
Self-tanners	Promotes use of self-tanners (lotions or sprays applied topically to produce appearance of suntan) (e.g., try a sunless tanner to fake a healthy glow)	Depiction of self-tanner, of someone applying self-tanner, or having a self-tan (for images of skin, there must be evidence the tan is from a self-tanner)
Solar UV avoidance	Promotes sun avoidance (e.g., avoid the sun during certain times of day)	Depiction of a person either not exposed to the sun or without suntan (e.g., depiction of a pale person indoors)
Discourages indoor tanning	Information discouraging the behaviour (e.g., it is dangerous,	Negative depiction of indoor tanning (e.g., picture of a tanning

	should be avoided, can cause deleterious health effects)	bed with an "x" over it)
Encourages indoor tanning	Information encouraging the behaviour (e.g., it's good for you because it provides vitamin D, prevents sunburns, provides an attractive suntan, feels good)	Positive depiction of someone indoor tanning (e.g., attractive, healthy-looking person in a tanning bed)
Promotes shade	Promotes seeking shade to avoid UV exposure (e.g., bring a beach umbrella to provide protective shade)	Depiction of someone seeking shade (e.g., image of model sitting under the shade of a tree on the beach)
Promotes hats	Promotes wearing a hat to protect the face from UV exposure (e.g., a wide-brimmed hat will shield your face from the sun)	Depiction of a hat or of someone wearing a hat (e.g., image of person wearing a wide-brimmed hat)
Promotes clothes	Promotes use of protective clothing (e.g., protect your skin from the sun with long sleeves and long pants)	Depiction of protective clothing or of someone wearing protective clothing (e.g., long sleeved t-shirt, long pants)
Promotes sunscreen	Promotes use of sunscreen (e.g., use sunscreen daily, sunscreen can prevent skin cancer and skin aging)	Depiction of sunscreen or sunscreen application (e.g., image of a bottle of sunscreen, image of sunscreen being rubbed into skin)
SPF level (30+)	Promotes SPF level of 30 or higher (e.g., use sunscreen with an SPF of at least 30)	Depiction of sunscreen labelled with SPF 30 or higher (e.g., image of bottle of sunscreen with SPF 30 on label)
Early Detection		
ABCD criteria	Mention or description of the ABCD criteria (e.g., use the ABCD criteria to look for early signs of skin cancer)	Depiction of moles which exhibit the ABCD criteria (e.g., image of moles, each depicting one of the criteria)
Skin self-examination	Promotes skin self-checking for skin cancer (e.g., conduct a skin self-exam once per month, skin self-examination is important for detecting skin cancer early)	Depiction of someone conducting a skin self-exam or example images of dangerous mole characteristics to look for (e.g., image of a person looking at a mole on their skin)
Physician skin examination	Promotes seeking a physician to do a skin examination for skin cancer (e.g., those at high risk should see their doctor for a skin examination)	Depiction of someone having a physician-led skin examination conducted (e.g., image of a doctor looking at a mole on patient's skin)

ABCD = asymmetry, border irregularity, colour, diameter

6.6 Results

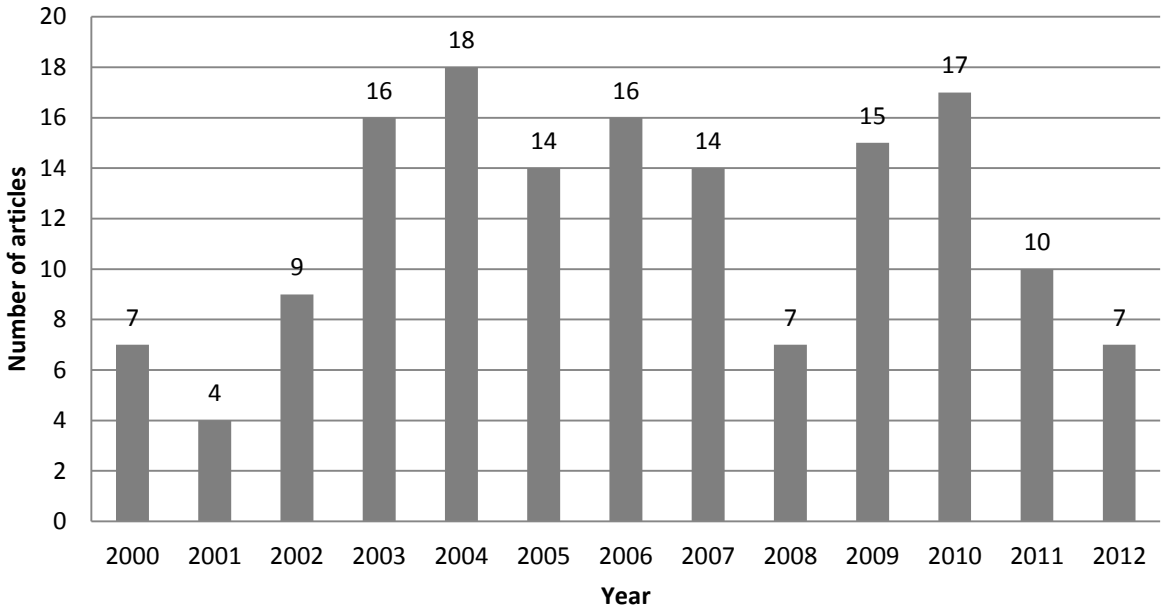
There were 154 articles (containing 221 images) published on skin cancer or tanning in six popular Canadian women's magazines between 2000 and 2012. Data retrieval was high (98.7%); just two articles could not be obtained. The number of articles published per year fluctuated considerably, ranging from 4 (in 2001) to 18 (in 2004) (Figure 5). The average number of articles published per year between 2000 and 2012 was 11.85 (*SD* = 4.67). There was no linear relationship for the volume of articles published over time (Figure 5).

Articles came from *Canadian Living* (*n* = 21, 13.6%), *Chatelaine, (n* = 24, 15.6%), *Homemakers* (*n* = 12, 7.8%), *Fashion* (*n* = 32, 20.8%), *Elle Canada* (*n* = 18, 11.7%), and *Flare* (*n* = 47, 30.5%). About 80% of articles were published between May and July (May, 6.5%; June, 55.2%; July, 18.8%).

Articles were accompanied by 0 to 6 images (*M* = 1.46, *SD* = 0.99). Articles were between 0.25 and 5 pages in length (*M* = 1.29, *SD* = 1.13) and ranged from 40 to 1967 words (*M* = 519.05, *SD* = 418.60). The average reading grade level of the articles as calculated using SMOG was high and at post-graduate levels (*M* = 16.34, *SD* = 1.79).

The number and percent of all articles reporting and images depicting skin cancer risk factors, UV behaviours, and early detection variables in Canadian women's magazines are presented in Table 11. Table 11 also presents chi-square tests (or Fisher's exact tests) for comparisons between how text vs. images conveyed these variables. Table 12 provides representative example quotes and image descriptions to illustrate each of the variables.

Figure 5. Skin Cancer and Tanning Articles Published per Year (2000 to 2012) in Six Canadian Women's Magazines



The most common skin cancer risk factor reported on was UV exposure (39% of articles). Light skin, moles, personal or family history, and sunburns were infrequently reported as risk factors: less than 12% of articles mentioned them. Although there was limited coverage in text about skin cancer risk factors, they were nevertheless more frequently described in text than depicted in images ($p < .01$ for all risk factor variables).

For UV behaviours, sunscreen use, self-tanners, and the suntanned look were the mostly frequently conveyed variables. Nearly 72% of articles promoted sunscreen use, but little content promoted other ways of UV radiation protection, including seeking shade (7%), wearing a hat (12%), or wearing protective clothing (14%). Articles which encouraged UV avoidance – avoiding the sun (16%) or indoor tanning (15%) – were in the minority. In fact, there were more articles (41%) and images (53%) which promoted the suntanned look as attractive compared to those which discouraged indoor tanning or sun exposure.

Text tended to have more messages about the importance of UV protection and avoidance compared to images: images more frequently promoted the tanned look as attractive, while text more frequently encouraged the use of self-tanners and sunscreens and discouraged indoor tanning more often than images.

Few articles (< 11%), and even fewer images (< 2%), focused on early detection (skin self-examination, physician-led skin examination, ABCD criteria) for skin cancer. For all three early detection variables, they were significantly more likely to be conveyed through article text compared to images (Table 11).

Table 11. Skin Cancer and Tanning Content in Canadian Women's Magazines from 2000 to 2012

Variable	Text		Image		χ^2 (*df* = 1) or Fisher's exact, *p* value
	%	(*n*/152)	%	(*n*/221)	
Risk Factors					
UV exposure	38.8%	(59)	0.0%	(0)	101.90, $p < .0001$*
Light skin, hair, eyes	11.2%	(17)	3.2%	(7)	9.61, $p = .002$*
Moles (>50 or abnormal)	7.2%	(11)	1.4%	(3)	8.62, $p = .003$*
History of skin cancer	5.3%	(8)	0.0%	(0)	Fisher's, $p = .001$*
Sunburns	10.5%	(16)	0.0%	(0)	24.31, $p < .0001$*
UV Behaviours					
Promotes tanned look	41.4%	(63)	53.4%	(118)	5.25, $p = .023$*
Promotes self-tanners	33.6%	(51)	20.8%	(46)	7.59, $p = .006$*
Promotes solar UV avoidance	16.4%	(25)	11.3%	(25)	2.05, $p = .153$
Discourages indoor tanning	14.5%	(22)	0.9%	(2)	27.54, $p < .0001$*
Promotes indoor tanning	3.3%	(5)	0.9%	(2)	Fisher's, $p = .126$
Promotes shade	6.6%	(10)	7.7%	(17)	0.17, $p = .683$
Promotes hats	11.8%	(18)	8.6%	(19)	1.06, $p = .303$
Promotes clothes	13.8%	(21)	10.0%	(22)	1.32, $p = .251$
Promotes sunscreen	71.7%	(109)	27.1%	(60)	72.17, $p < .0001$*
SPF level (30+)[a]	59.1%	(55)	86.0%	(37)	9.73, $p = .002$*
Early Detection					
Skin self-examination	10.5%	(16)	1.4%	(3)	15.66, $p < .0001$*
Physician-led skin examination	10.5%	(16)	0.5%	(1)	21.01, $p < .0001$*
ABCD criteria	3.9%	(6)	0.5%	(1)	Fisher's, $p = .020$*

[a] Articles or images not mentioning or depicting a specific SPF level were excluded from these analyses
n/a = not available
ABCD = asymmetry, border irregularity, colour, and diameter
*Statistically significant

Table 12. Example Quotes and Image Descriptions in Canadian Women's Magazines from 2000 to 2012

Variable	Example quote	Example image description
Risk Factors		
UV exposure	"Excessive exposure to UV rays before the age of 18 is a risk factor, as is frequent sunbathing or visits to tanning salons." (*Canadian Living*, No Safe Tan, August 2002)	n/a (depiction of someone who has had skin cancer being exposed to UV radiation)
Light skin, hair, or eyes	"...other risk factors include having fair or freckled skin, light coloured eyes, lots of moles, using tanning beds or having a family history of the disease." (*Canadian Living*, Skin Cancer, July 2007)	Photographic portrait of a blonde-haired, fair-skinned young woman in a fashionable dress and heals, who is a melanoma survivor. (*Flare*, Sun Smart, June 2008)
Moles	"With her platinum-blond locks, green eyes and fair skin sprinkled with moles, Stephanie Gionet, 23, knew she was at high risk for skin cancer." (*Flare*, Sun Smart, June 2008)	Circular photographs of five abnormal (cancerous) moles. (*Chatelaine*, Spot It, July 2009)
History of skin cancer	"Be especially careful if you have one or more of these risk factors: a family history of melanoma or other skin cancer..." (*Chatelaine*, 9 Suncare Secrets, June 2010)	n/a (depiction of recurrence of skin cancer or of family members affected by skin cancer)
Sunburns	"Numerous burns can also lead to leathery, blotchy and yellowing skin and up your chance of developing skin cancer." (*Homemakers*, Hat Tricks, June 2004)	n/a (depiction of someone with sunburn, with some connection to skin cancer)
UV Behaviours		
Tanned look	"Then fashion diva Coco Chanel turned the tan into a status symbol, and suddenly everyone wanted to be a posh golden girl." (*Elle Canada*, Ray of Light, June 2005)	Large photograph of an attractive, blond-haired, darkly tanned model wearing a fashion-forward white bathing suit. (FASHION, Bronze Ambition, June 2006)
Self-tanners	"'Spray-on tanning is a confidence builder because everyone feels better with a tan.'" (*Elle Canada*, Sunny Side	Photograph of six different self-tanning products (lotions, sprays, and wipes). (*Elle Canada*, Gold

	Up, June 2004)	Standard, April 2005)
Solar UV avoidance	"Stay out of the sun during peak hours (11am to 2pm)." (*FASHION*, Skin Care for Bad Girls, June 2004)	Photographic portrait of a model with very pale, youthful skin pictured in indoor lighting. (*FASHION*, Total Protection, January 2005)
Discourages indoor tanning	"75%: the increase in your risk of melanoma if you start using indoor tanning beds before 35." (*Flare*, Health News, June 2012)	Photograph of an attractive young woman in a tanning bed with the words "cancer is skin deep" printed over the photograph. (*Canadian Living*, Skin Deep, February 2004)
Encourages indoor tanning	"I can attest that soaking up the rays feels intoxicating – I craved the warmth, the glow, and the tranquil escape from reality. [...] feeling refreshing with a sun-kissed glow and a major confidence kick." (*Flare*, Confessions of a Former Tanoholic, June 2011)	Photograph of an attractive young woman in a tanning bed. (*Canadian Living*, Skin Cancer IQ, August 2010)
Promotes shade	"…the CDA recommends that you seek shade and minimize the amount of time you spend outdoors between 11am and 4pm." (*Canadian Living*, No Safe Tan, August 2002)	Photograph of a model on a sandy beach standing under a large palm tree frond, which is providing shade. (*Elle Canada*, Ray Ban, June 2006)
Promotes hats	"Wear a hat to help prevent sun spots." (*Flare*, Health: You Ask, October 2004)	Photograph of woman outside, sitting on a dock wearing a sun hat, tank top, and long pants. (*Elle Canada*, Shore Thing, July 2002)
Promotes clothes	"If you have to be out in the sun, wear long-sleeved shirts, long pants, a wide-brimmed hat..." (*Canadian Living*, No Safe Tan, August 2002)	Photograph of a model in a tropical location, on a beach, wearing a red wrap dress with long sleeves. (*Flare*, 21st Century Sun, May 2000)
Promotes sunscreen	"'If you plan on being in the sun, we recommend spreading at least two tablespoons of SPF 15 over your entire body..." (*Elle Canada*, Ray Ban, June, 2006)	Photograph of a red-haired woman generously applying sunscreen to her bare shoulders. (*Canadian Living*, Here Comes the Sun, June 2010)
SPF level (30+)	"Use at least a broad-spectrum SPF 30 (the minimum recommended by the	Full-page photograph of bottles of face and body sunscreens, each

	Canadian Dermatology Association).” (*Flare*, Screen Test, June 2012)	with a minimum SPF 30 marked on the bottle. (*FASHION*, Protection Plan, June 2010)
Early Detection		
ABCD criteria	“You might be familiar with the ABCDs of melanoma: Asymmetry, Borders, Colour and Diameter. Now doctors have added an E (for Evolving) […]” (*Canadian Living*, Summer Skin: What to Watch, June 2005)	Photographs of five moles, each exhibiting one of the criteria: asymmetry, border irregularity, colour, diameter, evolution. (*Chatelaine*, Spot It, July 2009)
Skin self-examination	“In addition to routine self-checks, she regularly sees a dermatologist.” (*Flare*, Sun Smart, June 2008)	Illustration of woman looking at photographs of her own moles as baseline images for performing a skin self-exam. (*Chatelaine*, Picture Yourself, July 2004)
Physician skin examination	“‘Avoiding the sun, wearing sunscreen and seeing your doctor for early detection are still your best strategies.’” (*Elle Canada*, Java Jolt, September 2010)	An illustrated pathway combining text and image showing the steps from a skin-check with a doctor, to biopsy, to diagnosis, and treatment. (*Chatelaine*, Mole Survivor, June 2006)

n/a = not available
ABCD = asymmetry, border irregularity, colour, and diameter

For country comparisons, six U.S. women's magazines with similar topic focus and target audience were selected. There were a total of 332 articles about skin cancer and tanning between the two sets of magazines, but eight were missing (two Canadian, six U.S.); the remaining comparison analyses were based on 324 articles (n = 152 Canadian articles; n = 172 U.S. articles) and 531 accompanying images (n = 221 Canadian images; n = 310 U.S. images). There was no statistically significant difference for the number of skin cancer and tanning articles published in the six Canadian (n = 154) vs. the six U.S. (n = 178) women's magazines ($\chi^2 = 1.74$, $df = 1$, $p = .188$) over the study timeframe. The jurisdictional comparisons by variable are summarized below and presented in detail in Table 13.

U.S. magazine article content was more likely to convey light skin (images), moles (text and images), and history of skin cancer (text) as risk factors. There were no significant differences in reporting frequency between the two countries for UV exposure or sunburns as risk factors for skin cancer.

For UV behaviours, text and images in Canadian magazines were more likely to promote the tanned look than those in U.S. magazines. Images in U.S. magazines more often promoted solar UV avoidance (18%) compared to images in Canadian magazines (11%). Articles in Canadian magazines were more likely to promote indoor tanning (3%) compared to U.S. magazines (0%). Articles in U.S. magazines were more likely to promote hat use (20% vs. 12%), but images in Canadian magazines were more likely to promote sunscreen use (27% vs. 18%) (Table 13).

Regarding early detection variables, a greater proportion of articles encouraged physician-led skin examination (U.S. = 24%; Canada = 11%) and a greater proportion of

both articles (U.S. = 22%; Canada = 11%) and images (U.S. = 8%; Canada = 1%) encouraged skin self-examination in the U.S. compared to Canadian magazines.

Table 13. Comparison of Skin Cancer and Tanning Content in Canadian vs. U.S. Women's Magazines from 2000 to 2012

Variable	Content Type	Canadian		U.S.		χ^2 (*df* = 1) or Fisher's Exact, *p* value
	Text	%	(*n*/152)	%	(*n*/172)	
	Image	%	(*n*/221)	%	(*n*/310)	
Risk Factors						
UV exposure	Text	38.8%	(59)	39.0%	(67)	0.00, *p* = .980
	Image	0.0%	(0)	1.3%	(4)	Fisher's, *p* = .145
Light skin, hair, eyes	Text	11.2%	(17)	17.4%	(30)	2.55, *p* = .110
	Image	3.2%	(7)	13.5%	(42)	16.60, *p* < .0001*
Moles (>50 or abnormal)	Text	7.2%	(11)	17.4%	(30)	7.60, *p* = .006*
	Image	1.4%	(3)	6.8%	(21)	8.77, *p* = .003*
History of skin cancer	Text	5.3%	(8)	13.4%	(23)	6.13, *p* = .013
	Image	0.0%	(0)	0.0%	(0)	n/a
Sunburns	Text	10.5%	(16)	12.2%	(21)	0.23, *p* = .635
	Image	0.0%	(0)	0.0%	(0)	n/a
UV Behaviours						
Promotes tanned look	Text	41.4%	(63)	29.1%	(50)	5.44, *p* = .020*
	Image	53.4%	(118)	39.0%	(121)	10.75, *p* = .001*
Promotes self-tanners	Text	33.6%	(51)	29.7%	(51)	0.57, *p* = .450
	Image	20.8%	(46)	18.1%	(56)	0.63, *p* = .428
Promotes solar UV avoidance	Text	16.4%	(25)	16.9%	(29)	0.01, *p* = .921
	Image	11.3%	(25)	17.7%	(55)	4.17, *p* = .041*
Discourages indoor tanning	Text	14.5%	(22)	12.8%	(22)	0.20, *p* = .659
	Image	0.9%	(2)	0.3%	(1)	Fisher's, *p* = .573
Promotes indoor tanning	Text	3.3%	(5)	0.0%	(0)	Fisher's, *p* = .022*
	Image	0.9%	(2)	1.6%	(5)	Fisher's, *p* = .705
Promotes shade	Text	6.6%	(10)	12.8%	(22)	3.50, *p* = .061
	Image	7.7%	(17)	8.7%	(27)	0.18, *p* = .675
Promotes hats	Text	11.8%	(18)	20.3%	(35)	4.27, *p* = .039*
	Image	8.6%	(19)	11.6%	(36)	1.26, *p* = .312
Promotes clothes	Text	13.8%	(21)	15.7%	(27)	0.23, *p* = .634
	Image	10.0%	(22)	7.7%	(24)	0.80, *p* = .372
Promotes sunscreen	Text	71.7%	(109)	61.6%	(106)	3.68, *p* = .055
	Image	27.1%	(60)	17.7%	(55)	6.73, *p* = .009*
SPF level (30+)[a]	Text	59.1%	(55)	52.6%	(41)	0.75, *p* = .388
	Image	86.0%	(37)	71.1%	(69)	2.90, *p* = .089

Early Detection						
ABCD criteria	Text	3.9%	(6)	9.3%	(16)	3.66, $p = .056$
	Image	0.5%	(1)	2.5%	(7)	Fisher's, $p = .146$
Skin self-examination	Text	10.5%	(16)	22.1%	(38)	7.77, $p = .005$*
	Image	1.4%	(3)	7.7%	(24)	10.90, $p = .001$*
Physician-led skin examination	Text	10.5%	(16)	23.8%	(41)	9.86, $p = .002$*
	Image	0.5%	(1)	1.0%	(3)	Fisher's, $p = .645$

[a] Articles or images not mentioning or depicting a specific SPF level were excluded from these analyses
n/a = not available
ABCD = asymmetry, border irregularity, colour, and diameter
*Statistically significant

6.7 Discussion

Overall, while there was considerable focus on UV exposure as a risk factor for skin cancer and the importance of sunscreen use in Canadian women's magazine content on skin cancer and tanning, other risk factors, other prevention and protection behaviours, and screening information received little attention. When these findings are considered in light of the fact that skin cancer usually receives less media coverage than other cancers (Slater, Long, Bettinghaus, & Reineke, 2008), the concern is amplified. The lack of informative content on skin cancer and tanning in Canadian magazines may both help to explain and also reflect the general lack of knowledge about skin protection among the population.

UV exposure is *the* most important risk factor for skin cancer, so it positive that it is reported on most frequently in this media channel; however, risk is heavily modified by other variables (susceptible phenotype, personal or family history, history and severity of sunburns, and numerous or abnormal moles) which were mentioned infrequently. This may have been because magazine journalists and editors are aware that UV exposure is the most important risk factor for the disease or because it is a modifiable risk factor which can be readily changed (whereas family history, susceptible phenotype, etc., are not). Images did little to convey information about risk factors. Although UV exposure as a risk factor was frequently messaged in the magazines, this emphasis was only reflected in terms of UV protection but not by UV avoidance behaviours.

As with risk factors, there was one stand-out UV behavioural variable which was encouraged most frequently in articles: sunscreen use. It is encouraging that so many articles promoted sunscreen use; however, when this is considered in the context that

approximately half of the content also promoted the tanned look as attractive, it becomes less clear that this message is entirely positive. About 30% of articles in Canadian women's magazines also promoted self-tanners – more than those discouraging indoor tanning behaviours. This may suggest, perhaps not surprisingly given the role beauty product advertising plays in magazine operation and publication, that the UV behaviours encouraged in magazines are product-related. The lack of information about UV protection behaviours (other than sunscreen) in popular magazines may partly contribute to the lack of sun safety awareness and sun protective behaviours among Canadians (National Skin Cancer Prevention Committee, 2010).

Images generally did not promote prevention behaviours: compared to text, they were more likely to convey the tanned look as attractive, and less likely to encourage sunscreen use. That images stressed the tanned beauty ideal potentially has an even greater impact on the 'take-home' message for the readership of these women's magazines as the readability of article texts was at the post-graduate level. With such high reading grade levels readers tend to focus even more on images. The promotion of the tanned look as attractive has been reported elsewhere in Australian magazine content (Gamble et al., 2011) but we were particularly concerned that even in images accompanying Canadian articles about skin cancer and tanning this beauty ideal was present. Approximately 77% of Canadian adults report an important reason for using tanning equipment is to look better and 29% of Canadian women try to tan from the sun or tanning equipment (National Skin Cancer Prevention Committee, 2010). These attitudes and behaviours may be encouraged by Canadian media content promoting the

tanned look as normative and desirable; images are important drivers of these behaviours (McWhirter & Hoffman-Goetz, 2013a).

Given the rising incidence of melanoma and the known carcinogenic nature of UV radiation from indoor tanning devices, a number of provinces now restrict youth under 19 years of age from using tanning beds, including: British Columbia, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador (Guo et al., 2013). Health Canada recently strengthened warnings on the devices about the dangers of indoor tanning through changes to the Radiation Emitting Devices Act (Health Canada, 2014) and the Canadian Cancer Society and Canadian Dermatology Association advise against the use of these devices (Canadian Cancer Society, 2014; Canadian Dermatology Association, 2014). Despite these health policies and efforts to dissuade users, fewer than 15% of articles in the magazines included in our study discouraged indoor tanning bed use. The public health push limiting and discouraging artificial tanning device use appears not to be reflected in Canadian women's magazine content on skin cancer and tanning. The Canadian Cancer Society indicates that greater efforts are needed to encourage UV avoidance, from both the sun and tanning beds (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014). The results of this study add further support to this need.

There was very limited focus on early detection and screening for skin cancer in Canadian women's magazines. Early detection has been associated with better prognosis (Kirsner, Wilkinson, Ma, Pacheco, & Federman, 2005) and screening for skin cancer, including skin self-examination and physician check-ups, is encouraged for those at high risk of skin cancer (From et al., 2007). Early detection information was infrequently

conveyed through text, and even less so, in images. In fact, just *one* image in six Canadian women's magazines over a 13-year timeframe depicted the visual ABCD criteria – images which are necessary to promote frequent and accurate skin self-examination (McWhirter & Hoffman-Goetz, 2013b). It is unclear how Canadians might gain access to seeing such images, or even know to seek them out, if they are not depicted in the mass media. For example, at the time of writing, the Canadian Cancer Society did not provide visual examples of skin lesions on its website (Canadian Cancer Society, 2014), although it does encourage skin self-examination. This is exacerbated by the fact that there are relatively few dermatologists serving the Canadian population and family medicine programs provide limited training in dermatology (Chow & Searles, 2010).

There were significant differences in the way Canadian and U.S. women's magazines covered the issues of skin cancer and tanning. Aside from sunscreen use, which was higher in Canadian magazines, U.S. magazines were generally more informative in connection to skin cancer and tanning: they reported on a wider variety of risk factors and UV protection behaviours and more often encouraged UV avoidance and early detection and screening. The reasons for the transnational variation in popular women's magazines between the two countries are not clear from our data. We suggest differences in health care systems (Boslaugh, 2013) and the personal responsibility a private health care system in the U.S. puts on individuals for their own health (Steinbrook, 2006) may be possible factors. Variations in coverage and emphasis could also relate to the warmer and sunnier climate in many parts of the U.S. compared to Canada. Canadian magazines more often conveyed the tanned look as attractive, which

may reflect the 'tan' being rather exotic in Canada because of climate or because Canadians seek leisure time in warm, sunny climates (National Skin Cancer Prevention Committee, 2010).

6.7.1 Limitations

Our research did not investigate skin cancer and tanning coverage in Canadian men's magazines. Determining media messages around skin cancer and tanning targeted towards men is an important area for future research, especially given that men over 50 have a higher incidence of melanoma skin cancer compared to women (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014). It is also a limitation that the magazines in our study target adult women while it is adolescent girls who most often use tanning beds and to whom the tanning bed restrictions apply. There were no Canadian men's or girl's magazines published consecutively during the study timeframe, so we restricted the focus to women's magazines. Our study focused on print magazine coverage, but many Canadians turn to other print media (e.g., newspapers), online sources (e.g., websites), and social media (e.g., Twitter) for health information. Future research should investigate reporting of skin cancer and tanning in these types of mass media outlets. Our study focused only on English-language magazines and it will be important to examine French-language Canadian women's magazines coverage on skin cancer and tanning, in light of possible differences in normative beauty ideals.

Had the research been guided by other media communication theories, our results may have been interpreted differently. For example, active audience theory (Chandler & Munday, 2011) suggests that readers are actively involved with making meaning from the

information they receive from magazines. A reader who recently had a friend diagnosed with melanoma may attend more to early detection information, while a reader who has suffered a sunburn may be more influenced by content around sunscreen use. How audiences interpret media messages (passively, actively, or a combination of both) around these public health issues will be important to address in future research.

6.7.2 Conclusions

Over a decade of Canadian women's magazine reporting on skin cancer and tanning has focused on UV exposure as a risk factor and sunscreen use as a protection behaviour; however, little attention was given to other risk factors, other UV protection or avoidance behaviours, and information about early detection. Images promoted the tanned look and rarely depicted skin cancer risk factors, prevention behaviours, or early detection. With the exception of sunscreen use, U.S. magazine content, in comparison to Canadian content, tended to be more informative about skin cancer and tanning. Taken together, the results of our study indicate that some skin cancer related information is reported fairly frequently but, there is considerable room for improvement in the way Canadian women's magazines cover this public health issue. Our results strongly support the recommendation of the Canadian Cancer Society that there is a great need for "clear and consistent sun safety messages for the public" (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014). Public health engagement with Canadian mass media may facilitate the promotion of effective skin cancer and UV protection and avoidance messaging.

6.8 References

Abdelmutti, N. & Hoffman-Goetz, L. (2010). Risk messages about HPV, cervical cancer, and the HPV vaccine Gardasil in North American news magazines. *Journal of Cancer Education, 25,* 451-456.

Armstrong, B. C. & Kricker, A. (1993). How much melanoma is caused by sun exposure. *Melanoma Research, 3,* 395-401.

Boslaugh, S. E. (2013). *Health Care Systems Around the World: A Comparative Guide* (pp. 80, 492). Thousand Oaks, CA: Sage Publications Ltd.

Canadian Cancer Society. (2014). *Indoor tanning*. Retrieved from http://www.cancer.ca/en/prevention-and-screening/live-well/sun-and-uv/indoor-tanning/?region=on

Canadian Cancer Society. (2014). *Risk factors for melanoma*. Retrieved from https://www.cancer.ca/en/cancer-information/cancer-type/skin-melanoma/risks/?region=on

Canadian Cancer Society. (2014). *Signs and symptoms of melanoma*. Retrieved from https://www.cancer.ca/en/cancer-information/cancer-type/skin-melanoma/signs-and-symptoms/?region=on

Canadian Cancer Society's Advisory Committee on Cancer Statistics. (2014). *Canadian Cancer Statistics 2014*. Chapter 7: Special Topic: Skin cancers. Toronto, ON: Canadian Cancer Society. Retrieved from http://www.cancer.ca/~/media/cancer.ca/CW/cancer%20information/cancer%20101/Canadian%20cancer%20statistics/Canadian-Cancer-Statistics-2014-EN.pdf

Canadian Dermatology Association. (2014). *Indoor Tanning: Indoor tanning is out*. Retrieved from http://www.dermatology.ca/programs-resources/programs/sap/indoor-tanning/

Chandler, D. & Munday, R. (2011). *A Dictionary of Media and Communication* (pp. 3). Oxford, England: Oxford University Press.

Chow, E. Y. & Searles, G. E. (2010). The amazing vanishing Canadian dermatologist: results from the 2006 Canadian Dermatology Association member survey. *Journal of Cutaneous Medicine and Surgery, 14,* 71-79.

Dixon, H., Warne, C., Scully, M., Dobbinson, S., & Wakefield, M. (2014). Agenda-setting effects of sun-related news coverage on public attitudes and beliefs about tanning and skin cancer. *Health Communication, 29,* 173-181.

El Ghissassi, F., Baan, R., Straif, K., Grosse, Y., Secretan, B., Bouvard, V., Benbrahim-Talla, L., Guha, N., Freeman, C., & Galichet, L., on behalf of the WHO International Agency for Research on Cancer Monograph Working Group. (2009). A review of human carcinogens—Part D: radiation. *Lancet Oncology, 10,* 751-752.

From, L., Marrett, L., Rosen, C., Zwall, C., Johnston, M., Bak, K., . . . Mai, V. (2007). *Screening for Skin Cancer*. Toronto, ON: Cancer Care Ontario, Program in Evidence-based Care. Retrieved from https://www.cancercare.on.ca/common/pages/UserFile.aspx?serverId=6&path=/File%20Database/CCO%20Files/PEBC/pebc15-1s.pdf

Gamble, R. G., Fuller, E. N., Dymek, P. M., Walkosz, B. J., Jensen, J. D., Duke, J. K., & Dellavalle, R. P. (2011). Tanning and sun-protection portrayal in magazine images. *Archives of Dermatol*ogy, *147,* 983-984.

Guo, D., Hawkins, S., Quantz, S. D., & Kalisiak, M. (2013). *Indoor tanning in Canada – where we are and how we got here*. Canadian Dermatology Association annual conference proceedings. Retrieved from http://www.dermatology.ca/wp-content/uploads/2013/09/2013Abstracts_Eng-web.pdf

Health Canada. (2014). Guidelines for Tanning Salon Owners, Operators and Users. Ottawa, ON: Health Canada. Retrieved from http://www.hc-sc.gc.ca/ahc-asc/alt_formats/hecs-sesc/pdf/psp-psp/ccrpb-bpcrpcc/2014_guidelines_tanning_salon_owners_operators_users.pdf

Hoffman-Goetz, L. & MacDonald, M. (1999). Cancer coverage in mass-circulating Canadian women's magazines. *Canadian Journal of Public Health, 90,* 55-59.

International Agency for Research on Cancer. (2012). IARC monographs on the evaluation of carcinogenic risks to humans. Volume 100D. *A review of human carcinogens. Part D: Radiation*. Lyon, France: International Agency for Research on Cancer.

Kirsner, R. S., Wilkinson, J. D., Ma, F., Pacheco, H., & Federman, D. G. (2005). The association of Medicare health care delivery systems with stage at diagnosis and survival for patients with melanoma. *Archives of Dermatology*, *141*, 753-757.

Krueger, H., Williams, D., Chomiak, M., & Trenaman, L. (2010). *The Economic Burden of Skin Cancer in Canada: Current and Projected*. Toronto, ON: Canadian Partnership Against Cancer. Retrieved from http://www.partnershipagainstcancer.ca/wp-content/uploads/Economic-Burden-of-Skin-Cancer-in-Canada-Report-Final1.pdf

Magazines Canada. (2012). *U.S. Spill into Canada*. Retrieved from http://www.magazinescanada.ca/uploads/File/AdServices/Research/USSpill/USSpill2011EN_July2012.pdf

McCombs, M. E. & Shaw, D. L. (1972). The agenda-setting function of mass media. *Public Opinion Quarterly, 36*(Summer), 176-187.

McDonald's Canada. (2014). *Frequently asked questions*. Retrieved from http://www.mcdonalds.ca/ca/en/contact_us/faq.html

McWhirter, J. E., Hoffman-Goetz, L., & Clarke, J. N. (2012). Can you see what they are saying? Breast cancer images and text in Canadian women's and fashion magazines. *Journal of Cancer Education, 27*, 383-391.

McWhirter, J. E. & Hoffman-Goetz, L. (2013a). Systematic review: Impact of images on UV attitudes and behaviors. *Health Promotion International*. doi: 10.1093/heapro/dat031

McWhirter, J. E. & Hoffman-Goetz, L. (2013b). Visual images for patient skin self-examination and melanoma detection: A systematic review of published studies. *Journal of the American Academy of Dermatology*, *69*, 47-55.

National Conference on State Legislatures. (2014). *Indoor tanning restrictions for minors: a state-by-state comparison*. Retrieved from http://www.ncsl.org/research/health/indoor-tanning-restrictions.aspx

National Skin Cancer Prevention Committee. (2010). *Exposure to and Protection from the Sun in Canada: A Report Based on the 2006 Second National Sun Survey*. Toronto, ON: Canadian Partnership Against Cancer. Retrieved from http://www.partnershipagainstcancer.ca/wp-content/uploads/Exposure-to-and-Protection-from-the-Sun-in-Canada.pdf

Slater, M. D., Long, M., Bettinghaus, E. P., & Reineke, J. B. (2008). News coverage of cancer in the United States: A national sample of newspapers, television, and magazines. *Journal of Health Communication,13*, 523-537.

Steinbrook, R. (2006). Imposing personal responsibility for health. *The New England Journal of Medicine, 355*, 753-756.

The University of Nottingham and the Education Development Innovation Technologies Lab. (n.d.). SMOG calculator. Retrieved from http://www.niace.org.uk/misc/SMOG-calculator/smogcalc.php

Tim Hortons. (2014). *About Us: The Story of Tim Hortons*. Retrieved from http://www.timhortons.com/ca/en/about/the-story-of-tim-hortons.php

U.S. Cancer Statistics Work Group. (2014). *United States Cancer Statistics: 1999-2011 Incidence and Mortality Web-based Report*. Atlanta, GA: U.S. Department of

Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute. Retrieved from www.cdc.gov/uscs

CHAPTER 7: SKIN CANCER AND RECREATIONAL TANNING COVERAGE IN U.S. TEENAGE GIRLS' MAGAZINES FROM 2003 TO 2012

The work presented in this chapter is under preparation for submission:

McWhiter, J. E. & Hoffman-Goetz, L. Skin cancer and recreational tanning coverage in U.S. teenage girls' magazines from 2003 to 2012. Submission being prepared for *Journal of Adolescent Health*.

7.1 Research Questions

To what extent do U.S. teenage girls' magazines report on skin cancer and recreational tanning (i.e., how many articles were there about skin cancer and tanning)?

To what extent are skin cancer risk factors, UV-related behaviours, and early detection information covered in skin cancer and recreational tanning covered in U.S. teenage girls' magazines?

Do U.S. teenage girls' magazines differ in information about skin cancer and tanning (i.e., risk factors, UV behaviours, and early detection information) compared to U.S. women's magazines?

7.2 Hypothesis

U.S. teenage girls' magazines will contain fewer articles about skin cancer and tanning relative to U.S. women's magazines and different information about skin cancer and tanning (i.e., risk factors, UV behaviours, and early detection information) relative to U.S. women's magazines.

7.3 Chapter Overview

Background: Magazines are an important source of health information during adolescence. Adolescent girls frequently use indoor tanning beds and UV exposure in youth is especially dangerous, as it is linked with an increased risk of melanoma. *Objective*: To determine how, and how often, teenage girls' magazines report of skin cancer and recreational tanning. *Methods:* Two popular U.S. magazines targeted to teenage girls (*Seventeen*, *Teen Vogue*) were examined using a directed content analysis for information about skin cancer risk factors, UV behaviours, and early detection. *Results*: There were 42 articles accompanied by 163 images about skin cancer and recreational tanning published between 2003 and 2012. The most common risk factor reported was UV exposure (n = 19, 45.2%), with other risk factors mentioned infrequently. The magazines often promoted the use of sunscreen (n = 27, 64.3%) and self-tanning lotions (n = 26, 61.9%), but rarely emphasized early detection. Images infrequently conveyed risk factors, UV protection or avoidance behaviours, or early detection information, but did promote the tanned look (n = 85, 52.1%). Coverage in teenage girls' magazines was compared to two adult women's magazines. Women's magazines (n = 79) contained more articles about skin cancer and tanning compared to teenage girls' magazines (n = 43) (χ^2 = 10.62, df = 1, p = .001), but magazine articles targeting teen readership more often discouraged indoor tanning (45.2%) compared to articles in women's magazines (24.1%) (χ^2 = 5.71, df = 1, p = .017). Teenage girls' magazines also had more frequent messaging promoting tanned skin as attractive (71.4%), compared to women's magazines (30.4%) (χ^2 = 18.70, df = 1, p < .0001). Teenage girls' magazines contained significantly less content about early detection compared to women's magazines (e.g., skin self-examination, 14.3% vs. 31.6%, χ^2 = 4.34, df = 1, p = .037). *Conclusion*: Media coverage about skin cancer and tanning targeted to adolescent girls should

continue to emphasize indoor tanning avoidance, provide more comprehensive reporting on risk factors, and encourage early detection more frequently. Journalists and editors should be cognizant of how frequently the tanned look is encouraged as this may detract from the healthy skin messages that are presented in teen magazines targeted to this vulnerable audience.

7.4 Introduction

Adolescence is a stage of life when future patterns of health and health behaviours are shaped (Sawyer et al., 2012) and magazines are an important source of health information for this age group (Brown, 2002; Harrison, 2000). Adolescents, especially girls, are at high risk for exposure to damaging UV radiation and the skin cancer risks arising from this excess exposure. Adolescence is a critical period during which UV damage to the skin increases cancer risk (Whiteman, Whiteman, & Green, 2001) and a significant amount of lifetime UV exposure occurs before 18 years of age (Godar, Wengratis, Shreffler, & Sliney, 2001). Melanoma is the second most common cancer for young adults aged 15 to 34 in Canada (Cancer Care Ontario, 2006) and there has been a steady increase in the incidence of melanoma among young women (Purdue, Freeman, Anderson, & Tucker, 2008).

There are many public health issues of concern surrounding tanning bed use for women and girls. First, the tanning industry appears to primarily target women and youth with advertisements (Team & Markovic, 2006; Greenman & Jones, 2009; Freeman, Francis, Lundahl, Bowland, & Dellavalle, 2006). Second, tanning facilities appear to be more prevalent in neighbourhoods with more young adult demographics and high schools (Patel, Mayer, Slymen, Weeks, & Hurd, 2007). Third, indoor tanning is a common behaviour, particularly among young

females. Young women are the primary users of tanning beds (Choi et al., 2010), with adolescent girls using tanning beds at a much higher rate than adolescent boys (Cokkinides, Weinstock, O'Connell, & Thun, 2002; Demko, Borawski, Debanne, Cooper, & Stange, 2003). The results of a large meta-analysis on the prevalence of indoor tanning indicate that 65% of female university students and 21% of female adolescents have used a tanning bed in the past year (Wehner et al., 2014). In comparison, 27% of male university students and 8% of male adolescents have used a tanning bed in the past year (Wehner et al., 2014). Finally, tanning salons are often non-compliant with youth access laws (Hester et al., 2005; Pichon et al., 2009).

Taken together, this evidence suggests that magazine content about skin cancer and tanning targeted at girls has an important role to play in shaping their knowledge and behaviours related to UV exposure. Therefore, it is important to determine what information popular magazines aimed at adolescent girls are conveying about skin cancer and tanning.

Despite the significance of UV exposure during adolescence, and the popularity of indoor tanning among teenage girls, surprisingly little is know about what mass media information this population receives. There has only been one prior study on skin cancer coverage targeted towards teenage girls. Cho et al. (2010) examined skin cancer coverage in eight popular magazines, including two teen magazines. These researchers found that articles emphasized sunscreen use for prevention and had mixed messages about tanning bed use (i.e., conveyed both consequences and benefits of use). The present study aims to update and expand these results. There has been no research on teen print media reporting of skin cancer since 2006 (Cho et al., 2010), despite recent public health developments related to youth and indoor tanning. Moreover, while Cho et al. (2010) offered an initial, exploratory analysis of skin cancer coverage, certain types of information (e.g., risk factors) were not investigated, but deserve attention. Finally,

while Cho et al. (2010) included photographs in their analysis, they only examined one variable in images: whether the image discouraged, encouraged, or sent mixed messages regarding UV exposure. Images influence UV exposure behaviours (McWhirter & Hoffman-Goetz, 2013a), and understanding more about what they depict when they accompany mass media coverage of skin cancer and tanning could help further expand knowledge about the messages teenagers are receiving about these important public health issues. Hence, the purpose of the present study was to examine media coverage of skin cancer risk factors, UV behaviours, and early detection information in popular U.S. teenage girls' magazines.

Although the focus of this study is on media reporting targeting teenage girls, women's magazines are important to include as a point of comparison for a number of reasons. Although UV exposure is particularly concerning among adolescent girls, skin cancer incidence is higher in adult and older adult women than younger women (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014). Given the higher incidence of skin cancer in adulthood, the reporting on skin cancer in women's magazines may reflect the incidence patterns compared with magazines geared towards young women, where incidence is lower. Thus, it was hypothesized that women's magazines would have more coverage of skin cancer and tanning than magazines for adolescent girls.

A secondary hypothesis was that the content of skin cancer and tanning coverage would differ between the different target readerships (girls vs. women). This hypothesis comes from the following research evidence. First, Cho et al. (2010) found that magazines targeting girls reported half as frequently on the consequences of sun exposure and methods of skin cancer prevention, and almost never on skin cancer detection methods, compared to adult women's

magazines. In addition, research on other health issues besides skin cancer (e.g., sexual health) has shown differential emphasis on age reporting (Clarke, 2009).

7.5 Methods

A directed content analysis was used to examine the volume of coverage about skin cancer and indoor tanning in two teenage girls' U.S. magazines (*Seventeen* and *Teen Vogue)*. The magazines were selected based on target readership, genre of focus (beauty, fashion, or general interest), and high circulation. This information was determined from the Audit Bureau of Circulations and the magazine media kits (Conde Nast, 2013; Seventeen, 2013). The estimated 2012 circulation numbers were: 2,025,299 for *Seventeen* and 1,018,242 for *Teen Vogue*. The timeframe examined in this study was 2003 to 2012. Originally, the intention was to use the same timeframe considered in previous studies (i.e., 2000 to 2012); however, the inaugural issues of *Teen Vogue* was not published until 2003, and hence a s shorter timeframe was selected.

The nature of the coverage was also investigated, including risk factors for skin cancer, UV protection and exposure behaviours, and early detection information. These variables are listed in Table 14 and Table 15 and are operationalized in the codebook provided in Appendix B. In addition to the variables listed in Tables 14 and 15, four further variables (i.e., unsightly/graphic images, UV photographs, examples images of skin cancers other than ABCD criteria, and unique risks for skin cancer for those with dark skin) appear in the results section and these are also operationalized in Appendix B. The search strategy for the magazines and

coding details have been outlined elsewhere (McWhirter & Hoffman-Goetz, 2015; see also Chapter 5, p. 113, Chapter 6, p. 141, and Appendix A).

For the comparison of women's vs. girls' magazines, two women's magazines (*Cosmo, Glamour*) were selected to match the two girls' magazines in the study (*Seventeen, Teen Vogue*) based on circulation and mission statements outlined in each magazine's media kit. Although *Vogue* may have seemed like a natural fit to pair with *Teen Vogue*, it has a different content focus (the culture of high-end fashion) compared to *Teen Vogue* (mass-market fashion, beauty, pop culture) and thus was not considered appropriate for comparison. *Cosmo* and *Glamour* have been paired to teen girls' magazines in previous research (Cho et al., 2010).

7.6 Results

7.6.1 Overview of Coverage in Teenage Girls' Magazines

There were 43 articles (42 retrieved) on skin cancer and tanning published in the two teenage girls' magazines from 2003 to 2012. Over the same time period, there were 163 images accompanying these articles. The articles came from *Seventeen* (n = 31) and *Teen Vogue* (n = 11). Most of the articles were published in the months of May (n = 16) and June (n = 14).

Articles were between one and six pages in length (M = 1.76, SD = 1.08) and between 108 and 2259 words (M = 611.13, SD = 435.04). Article focus was on skin cancer (7.1%), indoor tanning (9.5%), outdoor tanning (2.4%), self-tanning (38.1%), sunscreen (26.2%), or had multiple foci (16.7%). Articles contained between one and 17 images (M = 4.18, SD = 2.97).

Images were less than a quarter of a page (50.9%), quarter of a page (32.5%), half a page (6.1%), three-quarters of a page (2.%), a full page (7.4%), or a two-page spread (0.6%). Relative to the space of the article text, they were less (15.3%), equal (39.9%), or more (44.8%) than the text in size. Images were either photographs (98.8%) or illustrations (1.2%) and all were in full colour (100%). Images were objects or scenes (28.2%), a person or people (69.9%), or both (1.8%).

There were few images which were unsightly (1.8%) or graphic (1.8%) and only 1.2% of images (n = 2) were UV photographs. In addition to the images showing the ABCD criteria noted in Table 14, there were 5 images (3.1%) which presented other visual examples of skin cancer (e.g., "ugly duckling").

7.6.2 Comparison Between Text and Images in Teenage Girls' Magazines

Table 14 shows the results of the comparisons between images and text in teenage girls' magazines for skin cancer risk factors, UV behaviours, and early detection information. The results are also summarized as follows.

The most common skin cancer risk factor reported on was UV exposure (45.2% of articles). Other risk factors (susceptible phenotype, numerous or abnormal moles, personal or family history of skin cancer, sunburns, or immune system/medication) were reported on much less frequently (< 17%). Images less frequently conveyed risk factors for skin cancer compared to article text. For all of the risk factors examined (except susceptible phenotype) a greater proportion of articles compared to images conveyed them (e.g., sunburns: women's 9.5% vs.

girls' 0.0%, $p = .002$). In addition, 11.9% ($n = 5$) of articles discussed the risk of skin cancer on dark skin while one image depicted this (0.6%), (Fisher's exact, $p = .002$).

For UV behaviours, sunscreen use (64.3%), self-tanners (61.9%), and discouraging indoor tanning (45.2%) were the most common healthy UV behaviours encouraged. In images, the most common UV behaviours encouraged were self-tanners (29.4%) and sunscreen use (18.4%). For both articles and images – although more so in article text – the tanned look was also very frequently promoted as attractive and desirable (text 74.1% vs. images 52.1%, $\chi^2 = 5.04$, $df = 1$, $p = .025$). For self-tanners, discouraging indoor tanning, and promoting sunscreen use, article text more often promoted these healthy behaviours compared to images ($p < .01$ in each case).

Early detection information was uncommon in article text and even less common in accompanying images. For early detection information, a greater proportion of text compared to images encouraged skin self-exams, physician-led exams, or conveyed the ABCDs of melanoma ($p < .05$ in each case).

Table 14. Comparison of variables by content type (images vs. text) in teen girls' magazines

Variable	Text		Image		χ^2 (*df* = 1) or Fisher's exact, *p* value
	%	(*n*/42)	%	(*n*/163)	
Risk Factors					
UV exposure	45.2%	(19)	4.3%	(7)	50.55, $p < .0001$*
Light skin, hair, eyes	14.3%	(6)	14.1%	(23)	0.001, $p = .977$
Moles (>50 or abnormal)	16.7%	(7)	3.1%	(5)	Fisher's, $p = .003$*
History of skin cancer	9.5%	(4)	0.0%	(0)	Fisher's, $p = .002$*
Sunburns	9.5%	(4)	0.0%	(0)	Fisher's, $p = .002$*
Immune system/medication	2.4%	(1)	0.0%	(0)	Fisher's, $p = .205$
UV Behaviours					
Promotes tanned look	71.4%	(30)	52.1%	(85)	5.04, $p = .025$*
Promotes self-tanners	61.9%	(26)	29.4%	(48)	15.25, $p < .0001$*
Promotes sun avoidance	19.0%	(8)	15.3%	(25)	0.340, $p = .560$
Discourages indoor tanning	45.2%	(19)	0.0%	(0)	81.27, $p < .0001$*
Promotes indoor tanning	2.4%	(1)	1.8%	(3)	Fisher's, $p = 1.000$
Promotes shade	9.5%	(4)	3.7%	(6)	Fisher's, $p = .124$
Promotes hats	9.5%	(4)	4.9%	(8)	Fisher's, $p = .272$
Promotes clothes	7.1%	(3)	8.6%	(14)	Fisher's, $p = 1.000$
Promotes sunscreen	64.3%	(27)	18.4%	(30)	35.020, $p < .0001$*
SPF level (30+)[a]	50.0%	(13)	81.0%	(17)	4.82, $p = .028$*
Early Detection					
Skin self-examination	14.3%	(6)	4.9%	(8)	Fisher's, $p = .043$*
Physician-led skin examination	21.4%	(9)	0.0%	(0)	Fisher's, $p <.0001$*
ABCD criteria	9.5%	(4)	1.2%	(2)	Fisher's, $p = .017$*

[a] Articles or images not mentioning or depicting a specific SPF level were excluded from these analyses
ABCD = asymmetry, border irregularity, colour, and diameter, *statistically significant

7.6.3 Comparisons Between Women's and Teenage Girls' Magazines

For the comparison to women's magazines, there were 79 articles (accompanied by 163 images) on skin cancer and tanning in two matched women's magazines (*Cosmopolitan*, *Glamour*), with n = 55 from *Cosmopolitan* and n = 24 from *Glamour*. Women's magazines published more articles about skin cancer and tanning (n = 79) than teenage girl's magazines (n = 43) ($\chi^2 = 10.62$, $df = 1$, $p = .001$). The results for the comparisons of risk factor, UV behaviour, and early detection information variables between women's and teenage girls' magazines are presented in Table 15, with key findings highlighted below.

Women's vs. teenage girls' magazines differed in coverage of two risk factors for skin cancer. A greater proportion of images in women's magazines compared to girls' magazines showed abnormal or numerous moles (9.2% vs. 3.1%, $\chi^2 = 5.33$, $df = 1$, $p = .021$) and sunburns (4.3% vs. 0.0%. Fisher's exact, $p = .007$) are risk factors, although, both were notably low. There were no other risk factor differences by age of magazine target audience across text or image.

Magazines aimed at teenage girls had a greater proportion of articles and images which promoted the tanned look and which promoted self-tanners compared to the magazines aimed at adult women ($p < .001$ in each case, see Table 15). Teenage girls' magazines more often discouraged indoor tanning in article text compared to women's magazines (45.2% vs. 24.1%, $\chi^2 = 5.71$, $df = 1$, $p = .017$). A greater proportion of images in girls' magazines promoted the use of protective clothing compared to women's magazines (8.6% vs. 2.5%, $\chi^2 = 5.88$, $df = 1$, $p = .015$). There were no other differences in UV behaviour variables between women's and teenage girls' magazines.

Articles and images in women's magazines more often encouraged skin self-examination compared to teenage girls' magazines (articles: 31.6% vs. 14.3%, $\chi^2 = 4.34$, $df = 1$, $p = .037$; images: 11.0% vs. 4.9%, $\chi^2 = 4.18$, $df = 1$, $p = .041$). There were no other differences in early detection information between the two magazine genres.

Table 15. Comparison of skin cancer risk factors, UV behaviours, and early detection information in popular U.S. magazines by genre (women's vs. teenage girls' magazines)

Variable	Content Type	Women		Girls		χ^2 (*df* = 1) or Fisher's Exact, *p* value
	Text	%	(*n*/79)	%	(*n*/42)	
	Image	%	(*n*/163)	%	(*n*/163)	
Risk Factors						
UV exposure	Text	44.3%	(36)	45.2%	(19)	0.01, $p = .922$
	Image	3.7%	(6)	4.3%	(7)	0.08, $p = .777$
Light skin, hair, eyes	Text	7.6%	(6)	14.3%	(6)	Fisher's, $p = .338$
	Image	13.5%	(22)	14.1%	(23)	0.03, $p = .872$
Moles (>50 or abnormal)	Text	13.9%	(11)	16.7%	(7)	0.16, $p = .687$
	Image	9.2%	(15)	3.1%	(5)	5.33, $p = .021$*
History of skin cancer	Text	5.1%	(4)	9.5%	(4)	Fisher's, $p = .446$
	Image	0.0%	(0)	0.0%	(0)	n/a
Sunburns	Text	12.7%	(10)	9.5%	(4)	Fisher's, $p = .769$
	Image	4.3%	(7)	0.0%	(0)	Fisher's, $p = .007$*
Immune system/medication	Text	2.5%	(2)	2.4%	(1)	Fisher's, $p = 1.000$
	Image	1.2%	(2)	0.0%	(0)	Fisher's, $p = .156$
UV Behaviours						
Promotes tanned look	Text	30.4%	(24)	71.4%	(30)	18.70, $p < .0001$*
	Image	31.3%	(51)	52.1%	(85)	14.58, $p < .0001$*
Promotes self-tanners	Text	30.4%	(24)	61.9%	(26)	11.24, $p = .001$*
	Image	12.9%	(21)	29.4%	(48)	13.40, $p < .0001$*
Promotes sun avoidance	Text	11.4%	(9)	19.0%	(8)	1.33, $p = .249$
	Image	14.7%	(24)	15.3%	(25)	0.24, $p = .877$
Discourages indoor tanning	Text	24.1%	(19)	45.2%	(19)	5.71, $p = .017$*
	Image	3.7%	(6)	0.0%	(0)	Fisher's, $p = .030$*
Promotes indoor tanning	Text	0.0%	(0)	2.4%	(1)	Fisher's, $p = .347$
	Image	1.8%	(3)	1.8%	(3)	Fisher's, $p = 1.000$
Promotes shade	Text	5.1%	(4)	9.5%	(4)	Fisher's, $p = .446$
	Image	8.0%	(3)	3.7%	(6)	2.74, $p = .098$

Promotes hats	Text	11.4%	(9)	9.5%	(4)	Fisher's, $p = 1.000$
	Image	3.7%	(6)	4.9%	(8)	0.30, $p = .585$
Promotes clothes	Text	6.3%	(5)	7.1%	(3)	Fisher's, $p = 1.000$
	Image	2.5%	(4)	8.6%	(14)	5.88, $p = .015$*
Promotes sunscreen	Text	53.2%	(42)	64.3%	(27)	1.38, $p = .239$
	Image	11.7%	(19)	18.4%	(30)	2.91, $p = .088$
SPF level (30+)[a]	Text	30.3%	(10)	50.0%	(13)	2.37, $p = .124$
	Image	64.7%	(11)	81.0%	(17)	Fisher's, $p = .293$
Early Detection						
ABCD criteria	Text	16.5%	(13)	9.5%	(4)	1.09, $p = .296$
	Image	4.3%	(7)	1.3%	(2)	Fisher's, $p = .101$
Skin self-examination	Text	31.6%	(25)	14.3%	(6)	4.34, $p = .037$*
	Image	11.0%	(18)	4.9%	(8)	4.18, $p = .041$*
Physician-led skin examination	Text	28.6%	21	30.0%	(9)	0.39, $p = .532$
	Image	0.6%	(1)	0.0%	(0)	Fisher's, $p = 1.000$

[a] Articles or images not mentioning or depicting a specific SPF level were excluded from these analyses
n/a = not available
ABCD = asymmetry, border irregularity, color, and diameter
* statistically significant

7.7 Discussion

The key findings from this analysis of skin cancer and tanning in teenage girls' magazines was that there was more coverage about skin cancer and tanning in adult women's magazines compared to magazines targeted towards teenage girls. The lack of coverage in teenage girls' magazines may be one factor which contributes to risky UV exposure behaviours among young women (Kasparian, McLoone, & Meiser, 2004; Wehner et al., 2014). Research evidence suggests that adolescents are less likely to use sun protection, to sunbathe intentionally, to use indoor tanning beds, and are more likely to spend time in the sun and experience sunburns, compared to adults (Kasparian et al., 2004). A greater volume of messaging may be necessary to have a positive impact on teenage girls recognizing the dangers of UV exposure behaviours. Not only was there more skin cancer and tanning coverage in adult women's magazines, but the nature of the coverage (i.e., information about risk factors, UV behaviours, and early detection) between women's and teenage girls' magazines also differed.

The focus on UV exposure as a risk factor for skin cancer is similar to the findings for other magazine genres where this was also the most common risk factor reported (McWhirter & Hoffman-Goetz, 2015). It is important for the media to convey UV exposure as a risk factor; however, information about other risk factors received little focus in the coverage. Teenage girls may not know about other risk factors, including non-modifiable risk factors (e.g., susceptible phenotype, family history), for skin cancer. Being made aware that they may have heightened risks or a predisposition towards skin cancer could potentially enhance the influence of behavioural messages that are conveyed in the magazines such as avoiding indoor tanning, using sunscreen, and using self-tanners. One area of concern regarding risk factors is that few articles (n = 4) in the teenage girls' magazines reported that sunburns are a risk factor for skin cancer.

Sunburns are common during adolescence. A large study on 10,000 Caucasian U.S. teenagers found that 84% have had a sunburn at least once and 36% reported having had three or more sunburns in the previous summer (Geller et al., 2002). Frequent sunburns in childhood and adolescence are associated with a significant increase in skin cancer risk; five sunburns during this vulnerable period of development increases lifetime risk for melanoma by 80% (Wu, Han, Laden, & Qureshi, 2014). Greater media attention to skin cancer risk factors, including sunburns, may help to provide the readers of these magazines with more well-rounded knowledge about skin cancer.

More teenage girls' magazines (45%) compared to women's magazines (24%) discouraged indoor tanning. This is a positive finding, given that young women are the predominate users of indoor tanning salons (Wehner et al., 2014). Moreover, key public health reports and decisions related to artificial UV exposure have emphasized the importance of avoiding indoor tanning, particularly for young women (El Ghissassi et al., 2009; International Agency for Research on Cancer, 2006). It appears that these two magazines (*Seventeen* and *Teen Vogue*) have provided reasonable coverage of the message that the use of these devices is dangerous.

Another positive finding was that there was a strong emphasis on the use of self-tanning lotions in the girls' magazines (62% of articles, 29% of images). Simultaneously, however, the tanned look was promoted in 71% of images and 52% of articles in teenage girls' magazines. Hence, although teenage girls' magazines emphasized UV exposure as a risk factor and discouraged indoor tanning, the magazines still promoted the tanned look as attractive and desirable and offered a product-related solution (i.e., self-tanning lotions). Themes of beauty are common in teen magazines, including the message that beauty can be achieved through the

purchase of products (Labre & Walsh-Childers, 2003), which may partly explain the emphasis on both of these messages.

The impact of the promotion of the tanned look, particularly through images, could be that teenage readers are indirectly being encouraged to seek a tan; they may do this through UV exposure either instead of, or in conjunction with, self-tanners. Indeed, one study found that 80% of U.S. adolescents in their sample report that a suntan looks healthy (Merten, Higgins, Rowan, & Pragle, 2014) and appearance reasons are the main reasons for using indoor tanning beds (Lazovich et al., 2004). Moreover, previous research suggests adolescents' UV behaviours are influenced by several competing factors, including both the desire to prevent skin cancer and the desire to have a tan (Kasparian et al., 2004). Adolescents who perceive UV exposure as harmful are just as likely to engage in sunbathing as those who perceive it as healthy. This may be because young people perceive the negative consequences of UV exposure as far off in the future, while the tan offers more immediate positive consequences (i.e., perceived attractiveness) (Branstrom, Brandberg, Holm, Sjoberg, & Ullen, 2001). The emphasis in the magazines of promoting suntans as attractive likely only contributes further to the desire of adolescent females to have a tan.

Sunscreen use was the most frequently emphasized skin cancer prevention behaviour information in teenage girls' magazines. Other methods to prevent skin cancer, such as avoiding the sun, seeking shade, wearing hats, and wearing protective clothing, were less commonly emphasized, a finding supported by previous research (Cho et al., 2010), despite their importance as protective behaviours (American Academy of Dermatology, 2015). Most images (81.0%) showed sunscreens with at least SPF 30 on the label, while half of article text (50.0%) indicated this. Future articles on sunscreen should explicitly indicate that SPF of at least 30 is encouraged,

as recommended by the American Academy of Dermatology (American Academy of Dermatology, 2015).

In the teenage girls' magazines, a greater proportion of text compared to images encouraged skin self-examination, a finding of concern because it has been shown that images that are helpful in encouraging early detection behaviours and accuracy (McWhirter & Hoffman-Goetz, 2013b). It is also important to note that early detection information was infrequent in the teenage girls' magazine articles. Compared to women's magazines published during the same timeframe, there was significantly fewer articles mentioning early detection and screening, a finding supported by previous research (Cho et al., 2010). One possible explanation for this lack of coverage in the teenage girls' magazines on the topic of early detection is that the readership is primarily minors; the editors of these magazines may feel it is beyond their scope, and perhaps inappropriate to discuss or encourage cancer screening behaviours for minors as it may increase fear or anxiety in their young readership (Rothman, Bartels, Wlaschin, & Salovey, 2006). Nevertheless, screening for skin cancer is important at all ages, including youth, given that melanoma is one of the most common cancers among young people, especially young women (American Cancer Society, 2014).

This research has limitations. This study focused on magazines targeted towards teenage girls. A comparison to adolescent boys' magazines was not conducted because there were virtually no North American magazines geared to adolescent boys. According to the Audit Bureau of Circulations, only one boys' magazine (*Boys' Life*, published by the Boy Scouts of America) is listed, compared to eight marketed to adolescent girls. Future research will be needed to determine the potential mass media sources of skin cancer information for boys, and to investigate the nature of that information, particularly since males are less likely to adhere to sun

protection and screening (Kasparian et al., 2009). The work presented here focused only on popular print magazines; many teens are heavy users of online and social media (Lenhart, Purcell, Smith, & Zickuhr, 2010), and these platforms will be important to evaluate for information about skin cancer and tanning. Further, while the two teen magazines in this study were matched to two women's magazines based on mission statements and genre, matching to other women's magazines may have led to different results when the coverage of skin cancer and tanning was compared. Moreover, the sample only included two teen magazines because these were the two highest-circulating magazines for this target audience and also had the longest time period of publication. However, this would limit the ability to extrapolate the findings to other teen magazines, which may report on skin cancer and recreational tanning differently. Finally, this study did not measure the actual impact of the coverage on the knowledge, attitudes, and behaviours of teenage girls.

Despite the limitations associated with this study, these findings provide an important update on how skin cancer and tanning are reported on in magazines with a female youth readership. Adolescent girls a particularly vulnerable group, with frequent use of indoor tanning facilities and resultant heightened risk for melanoma. While the coverage in the magazines often discouraged indoor tanning, this important public health message may be clouded by the simultaneous emphasis on tanned skin as attractive.

7.8 References

American Academy of Dermatology. (2015). *How do I prevent skin cancer?* Retrieved from https://www.aad.org/spot-skin-cancer/understanding-skin-cancer/how-do-i-prevent-skin-cancer

American Cancer Society. (2014). *What are the key statistics about melanoma?* Retrieved from http://www.cancer.org/cancer/skincancer-melanoma/detailedguide/melanoma-skin-cancer-key-statistics

Branstrom, R., Brandberg, Y., Holm, L., Solberg, L., & Ullen, H. (2001). Beliefs, knowledge and attitudes as predictors of sunbathing habits and use of sun protection among Swedish adolescents. *European Journal of Cancer Prevention, 10,* 337-345.

Brown, J. D. (2002). Mass media influences on sexuality. *Journal of Sex Research, 39,* 42-45.

Canadian Cancer Society's Advisory Committee on Cancer Statistics. (2014). *Canadian Cancer Statistics 2014*. Chapter 7: Special Topic: Skin cancers. Toronto, ON: Canadian Cancer Society. Retrieved from http://www.cancer.ca/~/media/cancer.ca/CW/cancer%20information/cancer%20101/Canadian%20cancer%20statistics/Canadian-Cancer-Statistics-2014-EN.pdf

Cancer Care Ontario. (2006). *Cancer in Young Adults in Canada*. Retrieved from http://www.cancercare.ns.ca/site-cc/media/cancercare/Skin_Cancer_Statistics.pdf

Clarke, J. N. (2009). Women's work, worry and fear: the portrayal of sexuality and sexual health in US magazines for teenage and middle-aged women, 2000-2007. *Culture, Health & Sexuality, 11,* 415-429.

Cho, H., Hall, J. G., Kosmoski, C., Fox, R. L., & Mastin, T. (2010). Tanning, skin cancer risk, and prevention: a content analysis of eight popular magazines that target female readers: 1997-2006. *Health Communication, 25,* 1-10.

Choi, K., Lazovich, D., Southwell, B., Forster, J., Rolnick, S. J., & Jackson, J. (2010). Prevalence and characteristics of indoor tanning use among men and women in the United States. *Archives of Dermatology, 146,* 1356-1361.

Cokkinides, V. E., Weinstock, M. A., O'Connell, M. C., & Thun, M. J. (2002). Use of indoor tanning sunlamps in US youth, ages 11-18 years, and by their parent or guardian caregivers: prevalence and correlates. *Pediatrics, 109,* 1124-1130.

Conde Nast (2013). *Teen Vogue Media Kit*. Retrieved from http://www.condenast.com/brands/teen-vogue/media-kit

Demko, C. A., Borawski, E. A., Debanne, S. M., Cooper, K. D., & Stange, K. C. (2003). Use of indoor tanning facilities by White adolescents in the United States. *Archives of Pediatric and Adolescent Medicine, 157*, 854-860.

El Ghissassi, F., Baan, R., Straif, K., Grosse, Y., Secretan, B., Bouvard, V., Benbrahim-Talla, L., Guha, N., Freeman, C., & Galichet, L., on behalf of the WHO International Agency for Research on Cancer Monograph Working Group. (2009). A review of human carcinogens—Part D: radiation. *Lancet Oncology, 10*, 751-752.

Freeman, S., Francis, S., Lundahl, K., Bowland, T., & Dellavalle, R. P. (2006). UV tanning advertisements in high school newspapers. *Archives of Dermatology, 142*, 460-462.

Geller, A. C., Colditz, G., Oliveria, S. et al., (2002). Use of sunscreen, sunburning rates, and tanning bed use among more than 10 000 US children and adolescents. *Pediatrics*, 109, 1124-1130.

Godar, D. E., Wengraitis, S. P., Shreffler, J., & Sliney, D. H. (2001). UV doses of Americans. *Photochemistry and Photobiology, 73*, 621-629.

Greenman, J. & Jones, D. A. (2009). Comparison of advertising strategies between the indoor tanning and tobacco industries. *Journal of the American Academy of Dermatology, 62*, 685e1-685e18.

Harrison, K. (2000). The body electric: Thin-ideal media and eating disorders in adolescents. *Journal of Communication, 50*, 119-143.

Hester, E. J., Heilig, L. F., D'Amrosia, R., Drake, A. L., Schilling, L. M., & Dellavalle, R. P. (2005). Compliance with youth access regulations for indoor UV tanning. *Archives of Dermatology, 141*, 959-962.

International Agency for Research on Cancer. (2006). *IARC Working Group Reports Volume 1: Exposure to Artificial UV Radiation and Skin Cancer*. Lyon, France: World Health Organization and IARC. Retrieved from http://www.iarc.fr/en/publications/pdfs-online/wrk/wrk1/ArtificialUVRad&SkinCancer.pdf

Kasparian, N. A., McLoone, J. K., & Meiser, B. (2009). Skin cancer-related prevention and screening behaviors: a review of the literature. *Journal of Behavioural Medicine, 32*, 406-428.

Labre, M. P., & Walsh-Childers, K. (2003). Friendly advice? Beauty message in web sites of teen magazines. *Mass Communication and Society, 6*, 376-396.

Lazovich, D., Forster, J., Sorensen, G., Emmons, K., Stryker, J., Demierre, M-F., Hickle, A., & Remba, N. (2004). Characteristics associated with use or intention to use indoor tanning among adolescents. *Archives of Pediatrics & Adolescent Medicine, 158,* 918-924.

Lenhart, A., Purcell, K., Smith, A., & Zickuhr, K. (2010). Social Media and Mobile Internet Use Among Teens and Young Adults. Washington, DC: Pew Internet & American Life Project. Retrieved from http://files.eric.ed.gov/fulltext/ED525056.pdf

McWhirter, J.E. & Hoffman-Goetz, L. (2013a). Systematic review of population-based studies on the impact of images on UV attitudes and behaviours. doi: 10.1093/heapro/dat031

McWhirter, J. E. & Hoffman-Goetz, L. (2013b). Visual images for patient skin self-examination and melanoma detection: A systematic review of published studies. *Journal of the American Academy of Dermatology, 69,* 47-55.

McWhirter J. E. & Hoffman-Goetz, L. (2015). Skin cancer risk factors and UV behaviors in popular U.S. magazines from 2000-2012. *Journal of Cancer Education.* doi: 10.1007/s13187-015-0808-1

Merten, J. W., Higgins, S., Rowan, A., & Ragle, A. (2014). Sun safety knowledge, attitudes, and behaviours among beachgoing adolescents. *American Journal of Health Education, 45,* 37-41.

Patel, M. R., Mayer, J. A., Slymen, D. J., Weeks, J. R., & Hurd, A. L. (2007). Correlates of tanning facility prevalence within San Diego County, California census tracts. *Journal of Community Health, 32,* 391-400.

Pichon, L. C., Mayer, J. A., Hoerster, K. D, Woodruff, S. I., Slymen, D. J., Belch, G. E., . . . Weinstock, M. A. (2009). Youth access to artificial UV radiation exposure: practices of 3647 US indoor tanning facilities. *Archives of Dermatology, 145,* 997-1002.

Purdue, M. P., Freeman, L. E., Anderson, W. K., & Tucker, M. A. (2008). Recent trends in incidence of cutaneous melanoma among US Caucasian young adults. *Journal of Investigative Dermatology, 128,* 2905-2908.

Rothman, A. J., Bartels, R. D., Wlaschin, J., & Salovey, P. (2006). The strategic use of gain- and loss-framed messages to promote healthy behavior: How theory can inform practice. *Journal of Communication, 56*(s1), s202-s220.

Sawyer, S. M., Afifi, R. A., Bearinger, L. H., Blakemore, S-J., Dick, B., Ezeh, A. C., & Patton, G. C. (2012). Adolescence: a foundation for future health. *The Lancet, 379,* 1630-1640.

Seventeen Magazine (2013). *Seventeen Magazine Media Kit*. Retrieved from http://www.seventeenmediakit.com/r5/home.asp

Stern, R. S., Weistein, M. G., & Baker, S. G. (1986). Risk reduction for non-melanoma skin cancer with childhood sunscreen use. *Archives of Dermatology, 122*, 537-545.

Team, V. & Markovic, M. (2006). Internet advertising of artificial tanning in Australia. *European Journal of Cancer Prevention, 15*, 371–376.

Whiteman, D. C., Whiteman, C. A., & Green, A. C. (2001). Childhood sun exposure as a risk factor for melanoma: a systematic review of epidemiologic studies. *Cancer Causes & Control, 12*, 69-82.

Wehner, M. R., Chren, M. M., Nameth, D., Choudhry, A., Gaskins, M., Nead, K. T., Boscardin W. J., Linos, E. (2014). International prevalence of indoor tanning: A systematic review and meta-analysis. *JAMA Dermatology, 150*, 390-400.

Wu, S., Han, J., Laden, F., Qureshi, A. A. (2014). Long-term ultraviolet flux, other potential risk factors, and skin cancer risk: a cohort study. *Cancer Epidemiology, Biomarkers & Prevention, 23*, 1080-1089.

CHAPTER 8: APPLICATION OF THE HEALTH BELIEF MODEL TO U.S. MAGAZINE TEXT AND IMAGE COVERAGE OF SKIN CANCER AND RECREATIONAL TANNING (2000-2012)

The work presented in this chapter is currently under review as:

McWhirter, J. E. & Hoffman-Goetz, L. Application of the health belief model to U.S. magazine text and image coverage of skin cancer and recreational tanning (2000-2012). Under review at *Journal of Health Communication*.

8.1 Research Questions

To what extent are constructs from the Health Belief Model conveyed in popular U.S. magazine coverage of skin cancer and recreational tanning?

Do article text and accompanying visual images about skin cancer and recreational tanning in popular U.S. magazines differ regarding the extent to which they convey constructs from the Health Belief Model?

Do women's and men's popular U.S. magazines differ regarding the extent to which they convey constructs from the Health Belief Model in skin cancer and recreational tanning coverage?

8.2 Hypotheses

Article text and images in popular U.S. magazine coverage of skin cancer and recreational tanning will differ in the Health Belief Model constructs conveyed.

Women's and men's popular U.S. magazine coverage of skin cancer and recreational tanning will differ in the Health Belief Model constructs conveyed.

8.3 Chapter Overview

Background: The Health Belief Model (HBM) has been widely used to inform health education, social marketing, and health communication campaigns. *Objective*: Although the HBM can explain and predict an individual's willingness to engage in positive health behaviours, its application to, and penetration of the underlying constructs into, mass media content has not been well-characterized. *Method*: We examined 574 articles and 905 images about skin cancer and tanning risks, behaviours, and screening from 20 U.S. women's and men's magazines (2000-2012) for the presence of HBM constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action. *Results*: Susceptibility (48.1%) and severity (60.3%) information was common in text. Perceived benefits (36.4%) and barriers (41.5%) to prevention of skin cancer were equally mentioned in articles. Self-efficacy (48.4%) focused on sunscreen use. There was little emphasis on HBM constructs related to early detection. Few explicit cues to action about skin cancer appeared in text (12.0%) or images (0.1%). HBM constructs were present to a significantly greater extent in text vs. images (e.g., severity, 60.3% vs. 11.3%, $\chi^2 = 399.51$, $df = 1$, $p < .0001$; benefits prevention, 36.4% vs. 8.0%, $\chi^2 = 184.80$, $df = 1$, $p < .0001$). *Conclusion*: These findings suggest that readers are not visually messaged in ways that would effectively promote skin cancer prevention and early detection behaviours, based on the constructs of the HBM.

8.4 Introduction

As skin cancer rates increase, it is important for health communication researchers and practitioners to consider health beliefs which may motivate or inhibit individuals' prevention and early detection behaviours. One important source of health information, which shapes beliefs and behaviours around skin cancer, is the popular media. In this study, we investigate the extent to which concepts from the Health Belief Model (HBM) are present in popular magazine content about skin cancer and recreational tanning.

8.4.1 The Health Belief Model

The HBM is a social-psychological model that attempts to explain and predict health behaviour by focusing on people's attitudes and beliefs (Rosenstock, 1974). The theory assumes that people will perform a health behaviour if they perceive they are susceptible to the disease or condition, if they expect that taking action will help them to avoid the negative health event or condition, and if they believe they can successfully perform the action. It is one of the most robustly validated and commonly used theories in health education and promotion (Champion & Skinner, 2008; National Cancer Institute, 2003) and has been widely used to develop successful health communication interventions (Sohl & Moyer, 2007). The HBM consists of six core constructs: *perceived susceptibility* (beliefs about the risks of getting the condition), *perceived severity* (beliefs about the seriousness of the condition or its consequences), *perceived benefits* (beliefs about effectiveness of taking action to reduce risk or severity), *perceived barriers* (beliefs about the costs of taking action), *cues to action* (factors that activate readiness to change or mobilizing information), and *self-efficacy* (confidence in one's ability to take action in performing the recommended action or demonstrating desired behaviour) (Champion & Skinner,

2008). The HBM is often applied to preventative health behaviours (Conner & Norman, 1996) and screening behaviour (Champion & Skinner, 2008), with strong empirical support for the model (Janz & Becker, 1984).

8.4.2 Context of Skin Cancer and Tanning

Skin cancer is the most common cancer worldwide and its incidence, including that of melanoma, is growing (American Cancer Society, 2014; World Health Organization, 2014). Risk for the disease can be reduced considerably through appropriate UV avoidance and protection behaviours (American Academy of Dermatology [AAD], 2014a). UV exposure is the most important risk factor for skin cancer (International Agency for Research on Cancer, 2012). So alarming is the increasing incidence of skin cancer that the U.S. Surgeon General recently highlighted prevention of the disease as a key public health priority (U.S. Department of Health and Human Services, 2014). In addition to prevention, screening is essential: early detection of skin cancer is associated with a high likelihood of survival (Ries et al, 2004) and is a recommended behaviour through either self-examination and by a health-care provider (AAD, 2014b).

The HBM has been studied in connection with skin cancer and tanning intervention-based research. Several constructs of the HBM are linked to individuals' UV protection behaviours, which in turn may help prevent skin cancer. Perceived susceptibility to skin cancer and photoaging are associated with sun-protective intention and behaviour (Mahler, Fitzpatrick, Parker, & Lapin, 1997; Mahler, Kulik, Gibbons, Gerrard, & Harrell, 2003), perceived benefits of sun protection are connected to sun-protection intention and behaviour (Mahler et al., 1997; Mahler et al., 2003), perceived barriers of sun protection are negatively correlated to sun

protection (Carmel, Shani, & Rosenberg, 1994), and self-efficacy for UV protection predicts UV protection intention (Jackson & Aiken, 2000; Mahler et al., 1997). Despite their importance to skin cancer and tanning related knowledge and behaviours, it remains unclear the extent to which HBM constructs appear in mass print messages about skin cancer.

Both men and women are at risk for skin cancer, but the level of risk and risk behaviours differ. Young women have a higher incidence of melanoma compared to young men, but with increasing age men have higher incidence and mortality rates from the disease (National Cancer Institute, 2014). Women more frequently engage in indoor tanning (Wehner et al., 2014), but men are more likely to accumulate greater solar UV exposure over the course of their lives (Ramirez, Federman & Kirsner, 2005). There are also gender differences regarding early detection of skin cancer: men are less likely than women to conduct skin self-examination (SSE) for early signs of the disease (Kasparian, McLoone, Meiser, 2009). It is, therefore, important to determine if, and how, HBM-related skin cancer information in the popular media differentially targets women and men, especially since this is an area not previously investigated.

8.4.3 Media Content and Visual Images

Images are particularly powerful health communication tools. Visual health communication is defined as "an area of theory, research, and practice that involves the use of visual imagery (e.g., photographs, illustrations, maps, graphs, diagrams) to convey information about health and disease in order to improve health-related knowledge, attitudes, and behaviours of individuals and populations" (McWhirter & Hoffman-Goetz, 2014). Visual images affect patients' attention, recall, and comprehension of health information and behaviours (Houts,

Doak, Doak, & Loscalzo, 2006), including those related to skin cancer and tanning (McWhirter & Hoffman-Goetz, 2013a).

Images are pervasive in mass media content and influence reader's interpretations of media stories (Messaris & Abraham, 2001; Gibson & Zillman, 2000; Zillman, Gibson, & Sargent, 1999). Images are powerful because information associated with them is easier to remember (Pictorial Superiority Effect) (Paivio & Csapo, 1973) and because they are very effective toward influencing behaviour (Visual Persuasion) (Messaris, 1997).

The HBM has been used to examine the impact of images on skin cancer related attitudes and behaviour. Images support various aspects of the HBM, including increasing perceived susceptibility, severity, benefits, and self-efficacy and reducing perceived barriers regarding UV exposure and protection (Mahler et al., 2003; Mahler, Kulik, Gerrard, & Gibbons, 2006; Mahler et al., 2007; Jackson & Aiken, 2006). Thus, images are an important medium to examine with respect to HBM constructs and messages they convey about skin cancer and tanning in the mass media.

8.4.4 Skin Cancer and Tanning in Mass Media

The mass media is a common and influential source of skin cancer information (Dixon, Warne, Scully, & Dobbinson, 2014; Hay, Coups, Ford & DiBonaventura, 2009; Walter, Humphrys, Tso, Johnson, & Cohn, 2010). Consistent with Agenda Setting Theory (McCombs & Shaw, 1972), media coverage of skin cancer and tanning has been shown to increase knowledge about the dangers of UV exposure (Jalleh, Donovan, Lin, & Slevin, 2008) and has influenced people's attitudes and beliefs about skin cancer and tanning (Dixon, Dobbinson, Wakefield, Jamsen & McLeod, 2008; Dixon et al., 2014).

There have been numerous media content analyses on cancer information and a modest number on skin cancer and tanning specifically. However, few content analyses on skin cancer have been informed by behavioural theories, though there are important exceptions (see Cho, Hall, Kosmoski, Fox & Mastin, 2010). Moreover, most content analyses focus on text content, largely ignoring images, and the print sources analyzed are either not gender-specific (e.g., newspaper or news magazines) (Slater, Long, Bettinghaus, & Reineke, 2008) or, when gender-specific, have focused on women's magazines only (Cho et al., 2010).

Given the significance of the HBM in health communication practice, and the related research gaps in applying it to mass media content, we aimed to describe the extent to which HBM concepts were present in popular women's and men's magazine content about skin cancer and tanning, with a focus on two behaviours: skin cancer prevention and early detection (screening). In addition to describing the content in this regard, we sought to answer two questions: 1) Did the volume of each of the HBM constructs differ significantly by content type (text vs. images)? 2) Did the volume of each of the HBM constructs differ significantly by gender of target audience (women's vs. men's magazines)?

8.5 Methods

8.5.1 Data

Twenty magazines were selected for analysis: 10 popular U.S. women's magazines and 10 popular U.S. men's magazines. The magazines were selected due to their large circulation size and their primary target readership (men or women), which was obtained from the Audit Bureau of Circulations and magazine media kits. Women's magazines included general interest,

beauty/fashion, and health/fitness. Men's magazines included general interest, sport/science, and health/fitness. The magazines, their circulation numbers, and the number of relevant articles retrieved from each, are detailed in Table 16.

All magazines were available for the full study timeframe (2000-2012) except *Women's Health*, which was available only from 2006 to 2012. To adjust for this in the analyses, we excluded content from *Men's Health* for the same timeframe. Data from these magazines were included in the analysis, but only for 2006-2012.

Magazines were searched for articles about skin cancer and tanning using electronic databases (*Reader's Guide to Periodical Literature, LexisNexis, Factivia, ProQuest Research Library*) and, when not indexed online, using the table of contents. Example search terms included: skin cancer, melanoma, basal cell carcinoma, squamous cell carcinoma, tan*, indoor tan*, outdoor tan*, suntan*, sunburn, sunscreen, and sunblock. (The asterisk represents the inclusion of potential variant endings: e.g., tan* would include tanning and tanned.) Articles were included if they focused on skin cancer and tanning (i.e., the title, by-line, introductory paragraph, and majority article of space [≥ 75%] were devoted to the issues).

Articles about skin cancer and tanning, and accompanying images, were collected for analyses from electronic databases and library archives. Data retrieval was very high (98.8%).

Table 16. Magazine details and number of skin cancer and tanning articles and images published in each (2000-2012)

Magazine	**Magazine Genre**	**Circulation (2012)**	**Number of Articles**	**Number of Images**
Women's Magazines				
Good Housekeeping	general interest	4,346,747	48	61
Family Circle	general interest	4,100,977	11	45
Ladies Home Journal	general interest	3,205,302	23	65
Cosmopolitan	beauty/fashion	3,017,834	67	139
Glamour	beauty/fashion	2,374,291	25	41
Vogue	beauty/fashion	1,222,373	16	32
Elle U.S.	beauty/fashion	1,121,529	49	66
*Women's Health**	health/fitness	1,617,737	50	32
Shape	health/fitness	1,635,933	112	187
Self	health/fitness	1,528,583	49	114
Men's Magazines				
GQ	general interest	963,507	3	3
Esquire	general interest	721,399	10	18
Details	general interest	461,937	2	7
Sports Illustrated	sport/science	3,204,945	1	1
Golf Digest	sport/science	1,678,538	17	18
Popular Science	sport/science	1,350,685	7	7
Field and Stream	sport/science	1,252,833	1	2
*Men's Health**	health/fitness	1,918,387	41	24
Men's Fitness	health/fitness	585,265	26	19
Muscle and Fitness	health/fitness	325,000	17	24
Totals			574	905

*only for the years 2006-2012

8.5.2 HBM Constructs and Coding

Using a directed content analysis (Hsieh & Shannon, 2005), articles and images were coded for the presence (1) or absence (0) of the following HBM constructs, tailored to the issues of skin cancer and tanning: perceived susceptibility to skin cancer or UV exposure; perceived severity of skin cancer or UV exposure; perceived benefits of prevention (UV protection and avoidance); perceived benefits of early detection; perceived barriers to prevention; perceived barriers to early detection; cues to action (explicit and implicit); self-efficacy prevention; self-efficacy early detection. Table 17 operationalizes each of the HBM constructs. A construct was considered to be present in an article or image if any of the aspects of the construct outlined in Table 2 were mentioned in the text of an article or visually depicted in an image. For articles and images where the construct was present, the main emphasis of the construct was coded as one of the subcategories listed in Table 17. The codebook, including the definitions and subcategories, was developed based on risks, behaviours, and outcomes associated with skin cancer and tanning and drawing upon previous research on skin cancer in the media (Cho et al., 2010; Moriarty & Stryker, 2008). To test the HBM constructs (categories and subcategories) in our dataset, we reviewed a sample of articles (n = 57) and images (n = 90), with further subcategories added as necessary. Categories and subcategories were discussed amongst the researchers, and the final codebook was used for the full dataset. The unit of analysis was one article and one image.

Table 17. HBM codebook for articles and images

HBM Construct	Description of Construct	Subcategory Classifications
Perceived Susceptibility	Information that would increase perceived risk of getting skin cancer (e.g., people with fair skin are more likely to get skin cancer).	modifiable risk, non-modifiable risk, or numerical risk information
Perceived Severity	Information that would increase perceived seriousness of skin cancer or UV exposure as conveyed by specific consequences (e.g., UV exposure leads to premature skin aging, skin cancer can be fatal).	photoaging (wrinkles, brown spots), discoloration (overly tanned, tan lines), sunburn, negative effects of skin cancer treatment, physical pain, emotional pain, skin cancer, death, disfigurement, social (impact on work, family life, social relations), or financial effects (medical costs, lost income)
Perceived Benefits (prevention)	Content that may influence beliefs about the effectiveness or benefits of skin cancer prevention behaviours (i.e., UV protection or avoidance) to reduce threat (risk or severity) (e.g., wearing sunscreen prevents skin cancer).	avoidance of photoaging, avoidance of discoloration, avoidance of sunburn, avoidance of skin cancer, or avoidance of death
Perceived Benefits (early detection)	Content that may influence beliefs about the effectiveness or benefits of early detection (i.e., SSE or physician-led skin exam) to reduce threat (risk or severity) (e.g., early detection reduces the chances of dying from skin cancer)	avoidance of morbidity, avoidance of mortality, avoidance of disfigurement, or avoidance of fear or not knowing
Perceived Barriers (prevention)	Potential negative aspects of UV protection/avoidance which may impede or deter uptake of the recommended behaviour. Content that may influence a person's beliefs about the costs or barriers of UV protection/avoidance. (e.g., applying sunscreen takes extra time and it's hard to remember to re-apply)	appearance reasons, health reasons, social reasons, psychotropic reasons (the pleasure of being exposed to the sun or artificial UV light), inconvenience, forgetfulness, monetary cost, misinformation/confusion (incorrect information or false beliefs about a particular prevention behaviour), or lack of effectiveness (a particular prevention behaviour is not effective)
Perceived Barriers (early detection)	Content that may influence beliefs about the costs or barriers related to the early detection of skin cancer (SSE or physician-led skin examination). The potential negative aspects of early detection,	social reasons, inconvenience, fear of finding something, misinformation/confusion, lack of knowledge (not knowing how to look for early signs of skin cancer or not know how to book an appointment for a skin

	which may impede or deter uptake of the recommended behaviour (e.g., not knowing the early signs of skin cancer).	examination by a physician), no doctor/dermatologist, forgetfulness, monetary cost, or lack of effectiveness (belief that SSE is not effective)
Cues to Action* (explicit)	Informational content or mobilizing information that may activate readiness to change (e.g., website to visit, phone number to call).	Type: e-resource (website or app), print, person, place, telephone number, or organization Source: commercial, governmental, non-governmental, medical facility, individual MD, or aesthetic industry
Cues to Action* (implicit)	Informational content or mobilizing information that may activate readiness to change but that is shared in a less direct way. Implicit cues are more difficult to follow-up on than explicit cues (e.g., name of dermatologist, but no contact information).	Type: person, place, or organization Source: commercial, governmental, non-governmental, medical facility, individual MD, or aesthetic industry
Self-efficacy (prevention)	Content that may increase confidence in one's ability to take action or engage in UV protection/avoidance behaviours to help prevent skin cancer. Specific and actionable information that serves as training/guidance (instructional) in performing UV protection/avoidance (e.g., how to properly apply sunscreen).	UV avoidance (solar), UV avoidance (indoor tanning), UV avoidance (solar and indoor tanning), UV protection (sunscreen), UV alternatives (self-tanners or bronzers), UV protection (clothes/hats/sunglasses), or other (prevention methods not fitting in these categories)
Self-efficacy (early detection)	Content that may increase confidence in one's ability to take action or engage in behaviours to detect skin cancer early. Specific and actionable information that serves as training/guidance (instructional) in performing the recommended action (SSE) or is a demonstration of the desired behaviour (i.e., peer modeling).	dermatological/medical assistance, SSE how-to (when, where, how to look), SSE warning signs (what to look for), or SSE how-to and warning signs combined

*Within the HBM, mass media and informational prompts are considered cues to action (Hochbaum, 1958; Champion & Skinner 2008). However, since this study is an analysis of media content, we more narrowly defined cues to action to be specific prompts or mobilizing resources that could lead readers to more information or medical care.

8.5.3 Analysis

One researcher coded all articles and images. To minimize potential bias, an independent coder reviewed a 10% sample of articles and images using the HBM categories and subcategories from the codebook, and inter-coder reliability was determined. Kappa scores for HBM constructs (e.g., perceived susceptibility) ranged from 0.82 to 0.97 with percent agreement ranging from 93.0% to 98.8%. Kappa scores for detailed HBM subcategory coding (e.g., type of susceptibility information conveyed) ranged from 0.82 to 0.92 with percent agreement ranging from 89.5% to 96.5%. Discrepancies in coding were resolved through iterative discussion.

We summarized the frequency with which each of the HBM constructs was present in article text and images. To conduct comparisons on differences by content type (images vs. text) and gender of target audience (women vs. men) Chi-square and Fisher's exact tests were used. Results with $p < .05$ were considered statistically significant. SPSS v21 was used for statistical analyses and NVivo 10 was used to capture quotes and image descriptions.

8.6 Results

In total, 574 articles and 905 images about skin cancer and tanning were published in the 20 magazines included in the study between 2000 and 2012. Almost four-fifths of the articles (78.4%; $n = 450$) came from women's magazines with the remainder (21.6%; $n = 124$) from men's magazines; 86.4% ($n = 782$) of images came from women's magazines and 13.6% (n = 123) from men's magazines. Articles were 0.25 to 10 pages ($M = 1.13$, $SD = 1.44$) and 19 to 4706 words ($M = 487.57$, $SD = 667.37$) in length. Each article was accompanied by 0 to 18

images (M = 1.59, SD = 1.81), which ranged in size from being smaller (44.0%), equal to (29.1%), or greater (26.9%) than, the size of article text.

8.6.1 Content Type (text vs. images)

The percentage of articles and images conveying HBM constructs, and the nature of those constructs, are outlined in Table 18. Table 19 provides example quotes from article text and descriptions of images to illustrate each HBM construct.

There were significant differences between images and text for most HBM constructs (Table 3). With one exception (susceptibility), the data demonstrated the same pattern: article text had more information about HBM constructs (severity, benefits of prevention and detection, barriers to prevention and detection, cues to action, and self-efficacy related to prevention and detection) compared to images ($p < .0001$). For example, perceived severity was more frequently reported in article text compared to depiction in images (60.3% vs. 11.3%, $\chi^2 = 399.51$, $df = 1$, $p < .0001$).

The most common HBM constructs in text were susceptibility (48.1%), severity (60.3%), implied cues to action (52.8%) and self-efficacy prevention (48.4%). The most common HBM constructs appearing in images were susceptibility (43.1%), barriers to prevention (31.7%), and self-efficacy with respect to prevention (28.6%). The other HBM constructs occurred in ≤ 11% images. In addition to noting the differences between how frequently text and images presented information relating to the HBM constructs, the details of how each of HBM constructs were conveyed was also studied. These details are presented in Table 18 and are highlighted as follows.

There was no significant difference in the presence of susceptibility information between articles (48.1%) and images (43.1%). Most articles with susceptibility information focused on modifiable (32.1%) whereas images focused on non-modifiable (24.9%) risk factors.

The majority of articles contained severity information, a significantly greater proportion than was present in images (60.3% vs. 11.3%, $\chi^2 = 399.51$, $df = 1$, $p < .0001$). In article text, severity focused on skin cancer (33.7%), sunburn (10.6%), and photoaging (9.1%) due to UV exposure. While uncommon in images, severity information was most often presented as skin cancer (5.2%) resulting from UV exposure.

Information about the HBM construct of benefits of prevention was more common in text than images (36.4% vs. 8.0%, $\chi^2 = 184.80$, $df = 1$, $p < .0001$). In article text, benefits of prevention focused on avoiding skin cancer (18.1%), photoaging (8.7%) and sunburn (8.2%). In the few images where benefits of prevention were present, the focus was primarily on avoiding photoaging (4.6%). Barriers to prevention of skin cancer information occurred in 41.5% of articles. The most frequent barriers to prevention in text were appearance (10.5%), misinformation/confusion (8.7%), and lack of effectiveness (5.9%). Barriers to prevention were also common in images (31.7%), though less so compared to text, and focused on appearance (22.1%).

Benefits of early detection information was present in 16.7% of articles, with the focus on avoidance of morbidity (9.8%) and mortality (6.4%). The most frequent barriers to early detection described in the articles were misinformation/confusion (2.3%), lack of effectiveness (2.1%), and lack of knowledge (1.6%). There were virtually no images that identified benefits (0.2%) or barriers (0.1%) to early detection of skin cancer.

Few articles (12.0%) contained explicit cues to action, but when present, they were usually e-resources (11.1%), such as websites or apps. In contrast, more than half of articles (52.8%) offered implicit cues to action; these cues were usually the names of physicians or dermatologists (38.9%), but without contact information. There was only one explicit cue to action in an image (and no implicit cues), a significantly smaller proportion than in text ($p < .0001$).

Nearly half of articles (48.4%) contained self-efficacy information related to skin cancer prevention. The focus of this information in articles was on instructions for sunscreen use (32.4%) and for UV alternatives (9.4%). Significantly fewer images contained self-efficacy prevention information (28.6%) compared to text ($\chi^2 = 59.62$, $df = 1$, $p < .0001$). The focus of self-efficacy prevention information in images was on UV avoidance (9.6%) where people without suntans were pictured indoors and UV alternatives (8.6%) where self-tanning lotions were shown.

Few articles (19.2%), and even fewer images (7.0%), contained information relating to the HBM construct of self-efficacy for the early detection of skin cancer. A significantly greater proportion of articles compared to images contained this information ($\chi^2 = 50.83$, $df = 1$, $p < .0001$). When present, the focus for text (9.1%) and images (4.8%) was on the warning signs of skin cancer (e.g., ABCD criteria) during SSE.

Table 18. HBM construct frequencies, comparisons, and details in text and images

HBM Construct	**Present in Text (%, *n*/574)**	**Present in Images (%, *n*/905)**	**Significance (χ^2, *df* = 1, *p* value)**
Perceived Susceptibility	48.1% (276)	43.1% (390)	3.53, $p = .060$
Numerical risk information	(10.1%, 58)	(0.3%, 3)	
Non-modifiable risk factors	(5.9%, 34)	(24.9%, 225)	
Modifiable risk factors	(32.1%, 184)	(17.9%, 162)	
Perceived Severity	60.3% (346)	11.3% (102)	399.51, $p <. 0001$*
Photoaging	(9.1%, 52)	(0.4%, 4)	
Discoloration	(0.9%, 5)	(2.0%, 18)	
Sunburn	(10.6%, 61)	(1.7%, 15)	
Negative effects of treatment	(0.9%, 5)	(0.7%, 6)	
Physical pain	(0.3%, 2)	(0)	
Emotional pain	(0.5%, 3)	(0)	
Skin cancer	(33.7%, 194)	(5.2%, 47)	
Death	(1.9%, 11)	(0)	
Disfigurement	(1.9%, 11)	(1.3%, 12)	
Social	(0.2%, 1)	(0)	
Financial	(0.2%, 1)	(0)	
Perceived Benefits Prevention	36.4% (209)	8.0% (72)	184.80, $p < .0001$*
Avoidance of photoaging	(8.7%, 50)	(4.6%, 42)	
Avoidance of discoloration	(0.7%, 4)	(1.8%, 16)	
Avoidance of sunburn	(8.2%, 47)	(1.0%, 9)	
Avoidance of skin cancer	(18.1%, 104)	(0.4%, 4)	
Avoidance of death	(0.5%, 3)	(0.1%, 1)	
Other	(0.2%, 1)	(0)	
Perceived Benefits Early Detection	16.7% (96)	0.2% (2)	154.62, $p < .0001$*
Avoidance of morbidity	(9.8%, 56)	(0)	
Avoidance of mortality	(6.4%, 37)	(0.2%, 2)	
Avoidance of disfigurement	(0.3%, 2)	(0)	
Avoidance of fear of not knowing	(0.2%, 1)	(0)	
Perceived Barriers Prevention	41.5% (238)	31.7% (287)	14.59, $p < .0001$
Appearance reasons	(10.5%, 60)	(22.1%, 200)	
Health reasons	(2.8%, 16)	(0.2%, 2)	
Social reasons/norms	(3.0%, 17)	(4.2%, 38)	
Psychotropic reasons	(3.5%, 20)	(4.4%, 40)	
Inconvenience	(4.0%, 23)	(0.1%, 1)	
Forgetfulness	(3.1%, 18)	0.1%, 1)	
Monetary cost	(0)	(0)	
Misinformation/confusion	(8.7%, 50)	(0.2%, 2)	
Lack of effectiveness	(5.9%, 34)	(0.4%, 4)	

Perceived Barriers Early Detection		8.4% (48)	0.1% (1)	74.66, $p < .0001$*
Social reasons		(0.5%, 3)	(0)	
Inconvenience		(0.5%, 3)	(0)	
Fear of finding something		(0)	(0)	
Misinformation/confusion		(2.3%, 13)	(0)	
Lack of knowledge		(1.6%, 9)	(0)	
No doctor/dermatologist		(1.0%, 6)	(0)	
Forgetfulness		(0.2%, 1)	(0)	
Monetary cost		(0.2%, 1)	(0)	
Lack of effectiveness		(2.1%, 12)	(0.1%, 1)	
Cues to Action Explicit		12.0% (69)	0.1% (1)	110.50, p < .0001*
Type	E-resource (website/App)	(11.1%, 64)	(0.1% 1)	
	Print	(0.2%, 1)	(0)	
	Person	(0.3%, 2)	(0)	
	Place	(0.2%, 1)	(0)	
	Telephone	(0.2%, 1)	(0)	
	Organization	(0)	(0)	
Source	Commercial	(2.4%, 14)	(0.1%, 1)	
	Governmental health	(0.5%, 3)	(0)	
	Non-governmental health	(2.8%, 16)	(0)	
	Medical facility	(3.3%, 19)	(0)	
	Individual MD	(0.2%, 1)	(0)	
	Aesthetic industry	(0.3%, 2)	(0)	
	Other	(2.4%, 14)	(0)	
Cues to Action Implicit		52.8% (303)	0.0% (0)	600.81, $p < .0001$*
Type	Person	(44.9%, 258)	(0)	
	Place	(1.2%, 7)	(0)	
	Organization	(6.6%, 38)	(0)	
Source	Commercial	(0.2%, 1)	(0)	
	Governmental health	(1.2%, 7)	(0)	
	Non-governmental health	(4.5%, 26)	(0)	
	Medical facility	(2.1%, 12)	(0)	
	Individual MD	(38.9%, 223)	(0)	
	Aesthetic industry	(5.9%, 34)	(0)	
	Other	(0)	(0)	
Self-Efficacy Prevention		48.4% (278)	28.6% (259)	59.62, $p < .0001$*
UV avoidance (solar)		(2.8%, 16)	(9.6%, 87)	
UV avoidance (artificial)		(0.5%, 3)	(0)	
UV avoidance (solar/artificial)		(0.9%, 5)	(0)	
UV protection (sunscreen)		(32.4%, 186)	(5.1%, 46)	
UV alternatives		(9.4%, 54)	(5.3%, 48)	
(tanners/bronzers)		(2.1%, 12)	(8.6%, 78)	
UV protection (clothes/hats)		(0.3%, 2)	(0)	
Other		(0)	(0)	

Self-Efficacy Early Detection	19.2% (110)	7.0% (63)	50.83, $p < .0001$*
Medical assistance	(4.4%, 25)	(0.9%, 8)	
SSE how-to	(4.2%, 24)	(1.3%, 12)	
SSE warning signs	(9.1%, 52)	(4.8%, 43)	
SSE how-to and warning signs	(1.6%, 9)	(0)	

*statistically significant

Other: a classification of "other" was used when the focus of the article or image did not fit one of the pre-determined categories. For example, a benefit of prevention (avoiding indoor tanning) was saving money; self-efficacy prevention information, in one article, focused on getting the HPV vaccine.

Table 19. Examples of HBM constructs present in article text and images

HBM Construct	Text Quote	Image Description
Perceived Susceptibility	"But Glenna did indulge in one unhealthy practice: tanning. […] Yet tanning is connected to skin cancer. Studies have shown that exposure to UV rays can trigger changes to the DNA in skin cells that may lead to cancerous growths." (A Death by Suntan at Age 26, *Cosmopolitan*, October 2009) [modifiable risk factor] "According to the American Academy of Dermatology, melanoma kills one American every 68 minutes." (Beach Patrol, *Elle US*, June 2005) [numerical risk information]	Image of young, Caucasian woman (who has had skin cancer) featured with skin cancer headline. (Skin Cancer at Age 20, *Cosmopolitan*, May 2007; first image) [non-modifiable risk factor] Image of graph depicting melanoma incidence in men ages 20-44. (Conquering Cancer, *Men's Health*, July 2009) [numerical risk information]
Perceived Severity	"A month later, she died of melanoma at home. She was 26." (A Death by Suntan at Age 26, *Cosmopolitan*, October 2009) [death] "Things in my life changed severely. I had to stop working. The chemotherapy treatments rattled my body and many times left me too weak to speak." (When a Young Woman Has Cancer, *Shape*, August 2002) [negative effects of treatment]	Image of a woman's legs, including a 6-inch scar on her right leg from where a mole and lymph nodes were removed after being diagnosed with melanoma. (Diagnosis Skin Cancer, *Self*, June 2012) [disfigurement] UV photograph of man's face showing sun damage to the skin. (If You Had Skin Cancer, Would You Know It? *Men's Health*, June 2006) [photoaging]
Perceived Benefits (prevention)	"The flaming ball may be 93 million miles away, but it will still kill 7400 Americans this year […]. So the best way to avoid trouble is to stay out of the sun completely. And the second best is to wear sunblock." (Skin Protection, *Esquire*, July 2002) [avoid death] After one too many sunburns, I have fine lines on my decolletage. […] Ward off any future damage by always wearing an SPF 15. (Wrinkly Chest Rx, *Cosmopolitan*, August 2003) [avoid photoaging]	Cluster of images of pale celebrities and models with wrinkle-free skin accompanying article about importance of protecting skin from the sun and the pale look as attractive. (Tan Ban, *Vogue*, May 2012) [avoid discoloration] Model wearing bathing suit poolside, is sitting in the shade wearing a wide-brimmed hat. Her skin shows no signs of photoaging. (Healthy Skin, June 2008, *Self*) [avoid photoaging]

Perceived Benefits (early detection)	"And when it is caught and treated early, virtually all cases are curable." (Safeguard Your Skin, *Family Circle*, May 2007) [avoid morbidity] "'These cancers are seldom life threatening, but they can be incredibly disfiguring.' […] Protect yourself by watching for small open sores; reddish, irritated patches that itch or sting; shiny bumps; or crust pink growths […]" (Safeguard Your Skin, *Family Circle*, May 2007) [avoid disfigurement]	Picture of woman with her physician after Mohs surgery for skin cancer after having a cancerous lesion detected. In the photo the patient has a large bandage on, but is alive and smiling, suggesting detection is linked with successful treatment and healing. (What it's Like to Have Skin Cancer, June 2012, *Ladies Home Journal*) [avoid mortality] Photograph of man who survived skin cancer, but whose delay to get screened resulted in aggressive treatment and suffering. (If You Had Skin Cancer, Would You Know It?, June 2006, *Men's Health*) [avoid mortality]
Perceived Barriers (prevention)	"You can grease yourself up all day, but it doesn't necessarily mean you're preventing all the potentially harmful effects of sun exposure." (Ask Dr. Oz, *Esquire*, June 2006) [lack of effectiveness] "More surprisingly, 30 percent of those who recovered from melanoma still believed that tans were 'healthy.'" (A Shocking Truth About Skin Cancer, *Shape*, June 2007) [misinformation/confusion]	Attractive woman wearing white bikini on a towel, completely exposed to the sun. She is smiling, looking relaxed, and has a dark suntan. (Safe in the Sun, May 2002, *Self*) [appearance reasons] Woman wearing woven straw hat that lets in a lot of sun. The hat does not effectively block UV rays from reaching her skin. (The Reason You Feel Good in the Sun, *Shape*, July 2006) [lack of effectiveness]
Perceived Barriers (early detection)	"Still, she put off visiting a dermatologist. 'The problem with skin cancer,' she says, 'is that you don't feel sick. I thought I was fine.'" (Skin Cancer at Age 20, *Cosmopolitan*, May 2007) [misinformation/confusion] "Get naked and stand before a full-length mirror […] If you need to, get someone to help out. Don't weird out; this is your life we're talking about." (Melanoma on the	Woman sitting poolside with a large tattoo on her lower back. The accompanying article indicates tattoos can hide skin changes and moles, making it harder to detect skin cancer. (The Doctor Is In, *Self*, December 2010) [lack of efficacy]

	(Sun)rise, July 2000, *Men's Fitness*) [social reasons]	
Cues to Action (explicit)	"Go to skincarephysicians.com to find a dermatologist in your area, and get screened annually." (Fifty Nine Percent, *Women's Health*, September 2010) [e-resource; medical facility] […] dermatologists in over 20 states will conduct free full-body exams from May through September in a customized traveling RV as part of the fourth annual Road to Healthy Skin Tour […]. Log on to skincancer.org/tour for a complete list of dates and cities. (Free Skin Cancer Screenings, June 2011, *Good Housekeeping*) [e-resource; non-governmental health]	Image of Quick Response Code to scan with smartphone, which takes readers to a video about SSE on the magazine's website. (My 20 Years of Skin Cancer, *Ladies Home Journal*, August 2010) [e-resource; commercial]
Cues to Action (implicit)	With the help of MH advisor Adnan Nasir, M.D., the director of dermatology at Wake Research Associates in Raleigh, North Carolina, we picked three sunscreens that'll cover you in any situation--if you combine them with common sense." (Which Sunscreen is the Best? *Men's Health*, June 2012) [person; individual MD] "Dr. John Tkach, a Montana dermatologist who treats many anglers and high-altitude hunters, suggests using a product rated at least SPF 30, with 45 or 50 preferable." (Save Your Hide, July 2003, *Field and Stream*) [person; individual MD]	n/a
Self-efficacy (prevention)	"The most important piece of information on a sunscreen label is the indication of 'broad spectrum' coverage-protection against both UVB rays (which burn) and UVA rays (which penetrate deeper into the skin to cause DNA damage and photo-aging)." (Sunscreen Master Class, *Vogue*, May 2007) [UV protection] "Avoid unnecessary sun exposure, especially between 10 a.m. and 4 p.m., the peak hours for harmful ultraviolet radiation." (Sun Day School, *Men's Fitness*, June 2002) [UV avoidance]	Image of sunscreen poured into two tablespoon measuring spoons to indicate how much sunscreen should be applied to the body. (Use enough! *Glamour*, May 2008) [UV protection (sunscreen)] Image of a woman (face and neck) smiling, wearing a wide-brimmed sun hat. (Safe in the Sun, *Self*, May 2002) [UV protection (clothes/hats)]

Self-efficacy (early detection)	"When exploring, follow the ABCDE method: Check for asymmetry, borders, color variation, diameter (a mole shouldn't exceed six millimeters), and evolution (change over time)." (Strip Search, *Women's Health*, September 2008) [warning signs]	Images of normal moles, atypical moles, and malignant moles in order to visually train reader how to recognize skin cancer during SSE. (The Two-Minute Cancer Test, *Glamour*, May 2009) [warning signs]
	"[…] you should see a dermatologist once a year. In the meantime, you should inventory the moles, freckles, and blemishes on your body – make mental notes and take pictures. The check monthly changes." (Burned to a Crisp, July 2008, *Men's Health*) [how-to]	Woman looking in mirror to examine her skin for early signs of cancer. (The Other Monthly Self-Exam, *Shape*, May 2005) [how-to]

8.6.2 Target Audience (women's vs. men's magazines)

Comparisons on the presence of HBM constructs by target gender of the magazine readership are outlined in Table 20.

There were no statistically significant differences in the proportion of articles in women's compared to men's magazines which conveyed HBM constructs, with the exception of self-efficacy in skin cancer prevention. Articles in women's magazines contained information related to self-efficacy for prevention of skin cancer more often than men's magazines (51.3% vs. 37.9%, $\chi^2 = 7.02$, $df = 1$, $p = .008$).

There were no statistically significant differences between the proportion of images in women's compared to men's magazines which contained HBM constructs, with the exception of severity. A greater proportion of articles in men's compared to women's magazines contained information about the severity of skin cancer (17.9% vs. 10.2%, $\chi^2 = 6.23$, $df = 1$, $p = .013$).

Table 20. HBM constructs compared between women's and men's magazines

HBM construct	Content type	Women's magazines	Men's magazines	χ^2 (*df* = 1) or Fisher's Exact, *p* value
	Text Image	% (*n*/450) % (*n*/782)	% (*n*/124) % (*n*/123)	
Perceived Susceptibility	Text Image	47.3% (213) 44.1% (345)	50.8% (63) 36.6% (45)	0.47, *p* = .493 2.46, *p* = .117
Perceived Severity	Text Image	58.9% (265) 10.2% (80)	65.3% (81) 17.9% (22)	1.68, *p* = .195 6.23, *p* = .013*
Perceived Benefits (prevention)	Text Image	36.4% (164) 8.4% (66)	36.3% (45) 4.9% (6)	0.001, *p* = .975 1.84, *p* = .175
Perceived Benefits (early detection)	Text Image	17.1% (77) 0.1% (1)	15.3% (19) 0.8% (1)	0.22, *p* = .637 Fisher's exact, *p* = .253
Perceived Barriers (prevention)	Text Image	40.9% (184) 32.7% (256)	43.5% (54) 25.2% (31)	0.28, *p* = .595 2.79, *p* = .095
Perceived Barriers (early detection)	Text Image	8.2% (37) 0.1% (1)	8.9% (11) 0.0% (0)	0.05, *p* = .817 Fisher's exact, *p* = 1.00
Cues to Action (explicit)	Text Image	12.4% (56) 0.1% (1)	10.5% (13) 0.0% (0)	0.35, *p* = .552 Fisher's exact, *p* = 1.00
Cues to Action (implicit)	Text Image	53.8% (242) 0.0% (0)	49.2% (61) 0.0% (0)	0.82, *p* =.365 n/a
Self-efficacy (prevention)	Text Image	51.3% (231) 29.3% (229)	37.9% (47) 24.4% (30)	7.02, *p* = .008* 1.25, *p* = .264
Self-efficacy (early detection)	Text Image	18.5% (83) 6.5% (51)	21.8% (27) 9.8% (12)	0.68, *p* = .410 1.72, *p* = .190

*statistically significant

8.7 Discussion

We examined whether popular magazine articles and images on skin cancer prevention and early detection presented information in line with constructs of the HBM. The skin cancer and tanning content present in articles from popular U.S. women's and men's magazines during the 13-year study timeframe focused on the severity of consequences of UV exposure, susceptibility to skin cancer, and how-to information for sunscreen use (self-efficacy prevention). There were clear and pronounced differences in the way images and text conveyed HBM constructs with article text containing more helpful, positive information incorporating HBM constructs than images. Other than susceptibility and self-efficacy prevention, there was little HBM-related information in images to guide readers' health behaviours for prevention of skin cancer. In contrast, there were almost no differences in the presence of HBM variables in women's vs. men's magazines.

8.7.1 Susceptibility

Almost half of the magazine articles provided information about susceptibility, with a focus on modifiable risk factors (e.g., UV exposure). This is encouraging since UV exposure is the single most important risk factor for skin cancer (IARC, 2012). Nevertheless, readers may be more likely to reduce their modifiable risks if they know they also have elevated risks due to non-modifiable factors, such as susceptible phenotype. Images most commonly focused on non-modifiable risk factors (e.g., fair skin); taken together the information in text and images may complement one another in conveying susceptibility messages. The emphasis on this non-modifiable risk factor in images (susceptible phenotype) may be why perceived susceptibility was the only HBM construct which did not differ significantly between text and images. Relative

to modifiable and non-modifiable risk, numerical risk information was not frequently emphasized in text or images, and yet is important information for understanding disease risk (Hoffman-Goetz, Donelle, & Ahmed, 2014). Targeting the public with more numeric risk information may help to change the widespread belief that susceptibility to skin cancer is low (Garside, Pearson, & Moxham, 2010). The visual representation of numeric risk information may be particularly helpful, as it is more easily understood and persuasive compared to text (Lipkus & Hollands, 1999).

8.7.2 Severity

Nearly 60% of articles contained severity information, focusing on skin cancer as a potential consequence of UV exposure. Although articles made the connection between the risk behaviour and the potential disease outcome, specific details about the consequences of skin cancer, including negative effects of treatment, disfigurement, work/social/financial costs, or death, were rarely emphasized in the text. The absence of important severity details may contribute to readers' beliefs that skin cancer is not a serious disease and may undermine the impact of the HBM severity construct in motivating behavioural action. Indeed, results of a systematic review indicate the public generally views skin cancer severity to be low (Garside et al., 2010).

There was a troubling absence of severity information in images. This is illustrated by photoaging as a consequence of UV exposure. We found only four images depicting photoaging as a type of severity information, but over 50 articles described it. Prior research has demonstrated that when disease consequences of a behaviour are depicted visually, the perception of disease severity tends to be greater than when the consequences are conveyed

through text alone (Chang, 2013). Moreover, when displayed visually, the threat of photoaging can be a key motivator toward UV protection and avoidance (Jackson & Aiken, 2006; Mahler et al., 2006; McWhirter & Hoffman-Goetz, 2013a). Additional emphasis of severity information in the visuals accompanying articles on skin cancer may help to motivate positive health behaviours.

8.7.3 Benefits, Barriers, and Self-Efficacy for Prevention

Benefits of, and barriers to, the prevention of skin cancer through UV protection and avoidance were covered in magazine article content in somewhat equal percentages (36.4% and 41.5%, respectively). A greater emphasis on the benefits of skin cancer prevention in proportion to the emphasis on barriers is desirable in future media coverage of the disease. This is important because, compared to other HBM components, benefits and barriers are particularly strong predictors of health behaviours (Carpenter, 2010) and barriers to prevention are significant predictors of UV-related behaviours (Cody & Lee, 1990).

Benefits of prevention in articles focused on avoiding skin cancer, but also on avoiding photoaging and sunburn (paralleling severity information results). Barriers to prevention were varied, with appearance reasons (e.g., suntanned skin is attractive) and misinformation/confusion about prevention (e.g., SPF 8 is enough; a tan is protective against sunburn) as the most common foci. Benefits of prevention were rarely present in images; images frequently depicted barriers to prevention (primarily the attractiveness of a tan), suggesting magazine images offered little helpful information. Given the power of media images to influence behaviours, including UV protection and avoidance behaviours (Mahler, Beckerley, & Vogel, 2010; McWhirter &

Hoffman-Goetz, 2013a), our findings suggest future health communication campaigns should counter these visual aspects of popular media content around skin cancer.

Nearly half (48.4%) of magazine articles presented skin cancer self-efficacy prevention information, with a focus on sunscreen use. The substantial coverage of self-efficacy prevention is encouraging, especially because the public's misinformation/confusion was frequently mentioned as a barrier to prevention. The inclusion of how-to information to increase readers' confidence in their ability to protect themselves from the sun may help mitigate the effects of perceived barriers to prevention related to misinformation/confusion. Nevertheless, additional self-efficacy information would be useful to the readership of these magazines, including regarding wearing protective clothing, an important prevention strategy (AAD, 2014a). Images had significantly less self-efficacy information compared to text. This does a disservice to readers because the inclusion of self-efficacy information is especially salient for images: the visual depiction of prevention has been associated with increased self-efficacy to engage in preventative behaviours (Chang, 2013).

8.7.4 Benefits, Barriers, and Self-Efficacy for Early Detection

Early detection and screening for skin cancer is essential for reducing morbidity and mortality from the disease (Ries et al, 2004) and the HBM framework is often applied in designing cancer screening campaigns (Champion & Skinner, 2008). Our HBM-focused findings on information about early detection for skin cancer in popular magazines are worrying. There was little messaging on either the benefits of (e.g., avoid mortality) or the barriers to (e.g., not knowing what to look for) early detection in the magazine articles and images. Without an emphasis on the benefits of early detection, readers may not be motivated to take up this

important screening behaviour. The lack of focus on the benefits of early detection is also concerning because people tend to view screening behaviours as risky (because there is potential for a negative outcome) and prevention behaviours as safe (because they relate to the maintenance of health) (Rothman, Bartels, Wlaschin, & Salovey, 2006). An emphasis on the benefits of early detection for skin cancer may be useful toward promoting more positive attitudes toward screening.

There was even less information on self-efficacy skills for early detection of skin cancer (e.g., how to do a skin self-examination [SSE]) compared to self-efficacy skills for prevention of skin cancer (e.g., how to properly apply sunscreen). The HBM construct of self-efficacy has been shown to be a significant predictor of future skin self-examination in adults (Auster et al., 2013). More step-by-step information in the magazine articles about how to do a SSE would be useful for increasing readers' self-confidence so that they could engage in early detection behaviours (and reduce the severity of and consequences of the disease). Not surprisingly, there was even less information on self-efficacy skills for detection of skin cancer in the images. Previous research has demonstrated the usefulness of images in conveying information about SSE (McWhirter & Hoffman-Goetz, 2013b). Moreover, individuals who have the knowledge and confidence to conduct SSE do so more frequently (Friedman, Bruce, Webb, & Weinberg, 1993). They usually present at an earlier stage of disease and have lower mortality (Berwick, Begg, Fine, Roush, & Barnhill, 1996). Our findings suggest that both in text and images, readers are not getting sufficient information and how-to skills to motivate important early detection behaviours.

8.7.5 Cues to Action

Cues to action provide individuals with concrete and specific informational tools to enable positive behaviours. There was little emphasis on explicit cues to action around skin cancer prevention or early detection in magazine articles. There were significantly more implied cues (e.g., name of a dermatologist but without contact information) than explicit cues (e.g., a specific website to visit). While implied cues to action could potentially enable skin protection and skin cancer detection behaviours, these may not be as effective given the lack of specificity about next steps. The lack of explicit mobilizing information has also been found in other mediated cancer information contexts (Moriarty & Stryker, 2008; Friedman & Hoffman-Goetz, 2003). Our data do not provide an explanation for the lack of explicit cues to action, but points to a clear, and easily remedied, area for improvement regarding media coverage of skin cancer.

8.7.6 Gender of Target Audience

There were virtually no differences in the frequency of the specific HBM constructs in text or images when the gender of the magazine target audience was considered. The only difference noted was that women's magazine articles more often mentioned self-efficacy prevention whereas images in men's magazines more often depicted severity relative to magazine coverage in the other target gender. These differences may reflect gender-based differences in health information or media content more broadly. For example, media aimed at men is more commonly graphic and violent (Carter & Weaver, 2003), which may explain the greater emphasis on visual severity of skin cancer in men's magazines. Moreover, less coverage of self-efficacy prevention information in men's magazines was concerning because men

typically do not engage in UV-protection behaviours to the same extent as women (Kasparian et al., 2009).

8.7.7 Limitations

The HBM has been used in and validated for health information, including media print information (Janz & Becker, 1984), but it is not typically applied to images. Hence, our application of HBM constructs to images, while novel, will require validation to ensure constructs carry-over to images successfully. Moreover, there is subjectivity analyzing visual information, though we minimized this by developing a detailed codebook and conducting inter-rater reliability assessments.

We did not consider magazines targeting other types of readers or other age groups, nor did we evaluate other types of media, including online media. Although magazines also publish editorial content on their websites, these were not available for the entire 13 year timeframe.

We used the HBM to inform the coding of magazine articles and images and limitations of this theory to predict behaviour (Jones, Smith, & Llewellyn, 2013) are also limitations of this content analysis. Other behavioural and communication theories may provide different insights about how skin cancer information is conveyed in the mass media.

Finally, we did not assess the impact of information on magazine readers' intentions and actions on skin cancer prevention and early detection. Nevertheless, content analysis is an important initial step to show that media can influence skin cancer and tanning behaviours.

8.7.8 Conclusions

This is the first study to apply the HBM to a content analysis of mediated print information (text and images) on skin cancer and tanning. Given the established significance of this theory in health communication and education, the connection between the HBM constructs and their ability to predict health behaviour, and the key role of the mass media in informing the public about skin cancer, our findings may offer insights about the risky skin cancer behaviours and corresponding lack of knowledge by the public on the seriousness of the disease. Indeed, risky UV exposure behaviours are common (Wehner et al., 2014; Buller et al., 2011), protective behaviours are suboptimal (Buller et al., 2011; Kasparian et al., 2009), and screening behaviours are rare (Mayer, Swetter, Fu, & Geller, 2014; Aitken et al., 2004).

In text, there was reasonable coverage of the HBM constructs of susceptibility and severity related to skin cancer, as well as benefits and self-efficacy information around prevention. Readers may benefit from a greater emphasis on benefits, relative to barriers, of prevention. In addition, more explicit cues to action may be useful to readers, as would more information on benefits and self-efficacy information around early detection.

The penetration and conveyance of the constructs of the HBM were clearly different in text and images. Visually, readers were not frequently messaged with information that, according to the HBM, might motivate healthy skin cancer-related behaviours. When considered in the context of the cancer communication landscape, where images in print cancer information are often not reflective of either evidence or theory (King, 2014), the need for more "visually strategic" messages is strong.

Greater emphasis on HBM constructs, especially in images, in mass communication about skin cancer and tanning may help to shape more positive health behaviours, including both prevention and screening, around these important public health issues.

8.8 References

Aiken, J. F., Janda, M., Lowe, J. B., Elwood, M., Ring, I. T., Youl, P. H., & Firman, D. W. (2004). Prevalence of whole-body skin self-examination in a population at high risk for skin cancer (Australia). *Cancer Causes and Control, 15*, 453-463.

American Academy of Dermatology (2014a): *How do I prevent skin cancer?* Retrieved from http://www.aad.org/spot-skin-cancer/understanding-skin-cancer/how-do-i-prevent-skin-cancer

American Academy of Dermatology (2014b): *How do I check my skin?* Retrieved from https://www.aad.org/spot-skin-cancer/understanding-skin-cancer/how-do-i-check-my-skin

American Cancer Society (2014). *Cancer Facts & Figures 2014.* Retrieved from http://www.cancer.org/acs/groups/content/@research/documents/webcontent/acspc-042151.pdf

Auster, J., Hurst, C., Neale, R. E., Youl, P., Whiteman, D. C., Baade, P., & Janda, M. (2013). Determinants of uptake of whole-body skin self-examination in older men. *Behavioral Medicine, 39*, 36-43.

Berwick, M., Begg, C. M., Fine, J. A., Roush, G. C., & Barnhill, R. L. (1996). Screening for cutaneous melanoma by skin self-examination. *Journal of the National Cancer Institute, 88*, 17-23.

Bullera, D. B., Cokkinides, V., Hall, H. I., Hartman, A. M., Saraiya, M., Miller, E., Paddock, L., & Glanz, K. (2011). Prevalence of sunburn, sun protection, and indoor tanning behaviors among Americans: Review from national surveys and case studies of 3 states. *Journal of the American Academy of Dermatology, 65*, S114.e1-S114-e11.

Carmel, S., Shani, E., & Rosenberg, L. (1994). The role of age and an expanded health belief model on predicting skin cancer protective behavior. *Health Education Research, 9*, 433-447.

Carpenter, C. J. (2010). A meta-analysis of the effectiveness of Health Belief Model variables in predicting behavior. *Health Communication, 25*, 661-669.

Carter, C. & Weaver, C. K. (2003). *Violence and the Media*. Buckingham: Open University Press.

Champion, V. L. & Skinner, C. S. (2008). The Health Belief Model. In K. Glanz, B. K. Rimmer, & K. Viswanath (Eds.), *Health Behavior and Health Education* (4th ed.) (pp. 45-65). San Francisco, CA: Jossey-Bass.

Chang, C. (2013). Seeing is believing: the direct and contingent influence of pictures in health promotion advertising. *Health Communication*, *28*, 822-834.

Cho, H., Hall, J. G., Kosmoski, C., Fox, R. L., & Mastin, T. (2010). Tanning, skin cancer risk, and prevention: a content analysis of eight popular magazines that target female readers: 1997-2006. *Health Communication*, *25*, 1-10.

Cody, R. & Lee, C. (1990). Behaviours, beliefs, and intentions in skin cancer prevention. *Journal of Behavioural Medicine*, *13*, 373-389.

Conner, M. & Norman, P. (1996). *Predicting Health Behavior: Research and Practice with Social Cognition Models.* Maidenhead, BRK, England: Open University Press.

Dixon, H., Warne, C., Scully, M., Dobbinson, S., & Wakefield, M. (2014). Agenda-setting effects of sun-related news coverage on public attitudes and beliefs about tanning and skin cancer. *Health Communication, 29,* 173-181.

Dixon, H., Dobbinson, S., Wakefield, M., Jamsen, K., & McLeod, K. (2008). Portrayal of tanning, clothing fashion and shade use in Australian women's magazines, 1987-2005. *Health Education Research, 23*, 791-802.

Friedman, L. C., Bruce, S., Webb, J. A., & Weinberg, A. D. (1993). Skin self-examination in a population at increased risk for skin cancer. *American Journal of Preventative Medicine, 9,* 359-364.

Friedman, D. B., & Hoffman-Goetz, L. (2003). Cancer coverage in North American publications targeting seniors. *Journal of Cancer Education, 18,* 43-47.

Garside, R., Pearson, M., & Moxham, T. (2010). What influences the uptake of information to prevent skin cancer? A systematic review and synthesis of qualitative research. *Health Education Research, 25,* 162-182.

Gibson, R. & Zillmann, D. (2000). Reading between the photographs: The influence of incidental pictorial information on issue perception. *Journalism and Mass Communication Quarterly, 77,* 355-366.

Hay, J., Coups, E. J., Ford, J., DiBonaventura, M. (2009). Exposure to mass media health information, skin cancer beliefs, and sun protection behaviors in a United States probability sample. *Journal of the American Academy of Dermatology, 61,* 783-792.

Hochbaum, G. M. (1958). *Public Participation in Medical Screening Programs: A Sociopsychological Study*. PHS publication no. 572. Washington, D.C.: Government Printing Office.

Hoffman-Goetz, L., Donelle, L., Ahmed, R. (2014). *Health Literacy in Canada: A Primer for Students*. Toronto: Canadian Scholars Press.

Houts, P. S., Doak, C. C., Doak, L. G., & Loscalzo, M. J. (2006). The role of pictures in improving health communication: A review of research on attention, comprehension, recall, and adherence. *Patient Education and Counseling, 61*, 173-190.

Hsieh, H. F. & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*, 1277-1288.

International Agency for Research on Cancer (2012). IARC monographs on the evaluation of carcinogenic risks to humans. Volume 100D. A review of human carcinogens. Part D: Radiation. Lyon: International Agency for Research on Cancer.

Jackson, K. M. & Aiken, L. S. (2000). A psychosocial model of sun protection and sunbathing in young women: The impact of health beliefs, attitudes, norms, and self-efficacy for sun protection. *Health Psychology*, *19*, 469-478.

Jackson, K. M. & Aiken, L. S. (2006). Evaluation of a multi-component appearance-based sun-protective intervention for young women: uncovering the mechanisms of program efficacy. *Health Psychology*, *25*, 34-46.

Jalleh, G., Donovan, R. J., Lin, C., & Slevin, T. (2008). Changing perceptions of solaria and cancer risk: the role of the media. *The Medical Journal of Australia*, *188*, 735.

Janz, N. K. & Becker, M. H. (1984) The Health Belief Model: A decade later. *Health Education Quarterly, 11*, 1-47.

Jones, C. J., Smith, H., & Llewellyn, C. (2013). Evaluating the effectiveness of health belief model interventions in improving adherence: a systematic review. *Health Psychology Review*, *8*, 253-269.

Kasparian, N. A., McLoone, J. K., & Meiser, B. (2009). Skin cancer-related prevention and screening behaviors: A review of the literature. *Journal of Behavioral Medicine, 32,* 406–428.

King, A. J. (2014). A content analysis of visual cancer information: prevalence and use of photographs and illustrations in printed health materials. *Health Communication* doi: 10.1080/10410236.2013.878778.

Lipkus, I. M. & Hollands, J. G. (1999). The visual communication of risk. *Journal of the National Cancer Institute Monographs, 25*, 149-163.

Mahler, H. I. M., Fitzpatrick, B., Parker, P., & Lapin, A. (1997). The relative effects of a health-based versus an appearance-based intervention designed to increase sunscreen use. *American Journal of Health Promotion, 11*, 426-429.

Mahler, H. I. M., Kulik, J. A., Gibbons, F. X., Gerrard, M., & Harrell, J. (2003) Effects of appearance-based interventions on sun protection intentions and self-reported behaviors. *Health Psychology, 22*, 199-209.

Mahler, H. I. M., Beckerley, S. E., & Vogel, M. T. (2010). Effects of media images on attitudes toward tanning. *Basic and Applied Social Psychology, 32*, 118-127.

Mahler, H. I. M., Kulik, J. A., Gerrard, M., Gibbons, F. X. (2006). Effects of two appearance-based interventions on the sun protection behaviors of southern California beach patrons. *Basic and Applied Social Psychology, 28*, 263-267.

Mahler, H. I. M., Kulik, J. A., Gerrard, M., & Gibbons, F. X. (2007). Long-term effects of appearance-based interventions on sun protection behaviors. *Health Psychology, 26*, 350-360.

Mayer, J. E., Swetter, S. M., Fu, T., & Geller, A. C. (2014). Screening, early detection, education, and trends for melanoma: Current status (2007-2013) and future directions. Part II. Screening, education, and future directions. *Journal of the American Academy of Dermatology* DOI: 10.1016/j.jaad.2014.05.045

McCombs, M. E., & Shaw, D. L. (1972). The agenda-setting function of mass media. *Public Opinion Quarterly, 36*(Summer), 176-187.

McWhirter, J. E. & Hoffman-Goetz, L. (2013a). Systematic review of population-based studies on the impact of images on UV attitudes and behaviours. *Health Promotion International*. DOI: 10.1093/heapro/dat031

McWhirter, J. E. & Hoffman-Goetz, L. (2013b). Visual images for patient skin self-examination and melanoma detection: A systematic review of published studies. *Journal of the American Academy of Dermatology, 69*, 47-55.

McWhirter, J. E. & Hoffman-Goetz, L. (2014). A systematic review of visual image theory, assessment, and use in skin cancer and tanning research. *Journal of Health Communication, 19*, 738-757.

Messaris, P. & Abraham, L. (2001). The role of images in framing news stories. In S. Reese, O. Gandy, & A. Grant (Eds.), *Framing Public Life* (pp. 215-226). Mahwah, NJ: Erlbaum.

Messaris, P. (1997). *Visual Persuasion: The Role of Images in Advertising*. California: SAGE Publications.

Moriarty, C. M. & Stryker, J. E. (2008). Prevention and screening efficacy messages in newspaper accounts of cancer. *Health Education Research, 23*, 487-498.

National Cancer Institute (2003). *Theory at a glance: A guide for health promotion practice*. Washington, DC: U.S. Department of Health and Human Services.

National Cancer Institute (2014). *SEER Stat Fact Sheets: Melanoma of the Skin*. Retrieved from http://seer.cancer.gov/statfacts/html/melan.html.

Paivio, A., & Csapo, K. (1973). Picture superiority in free recall: imagery or dual-coding? *Cognitive Psychology*, *5*, 176-206.

Ramirez, C. C., Federman, D. G., & Kirsner, R. S. (2005). Skin cancer as an occupational disease: the effect of ultraviolet and other forms of radiation. *International Journal of Dermatology*, *44*. 95-100.

Ries, L. A. G., Melbert, D., Krapcho, M., Mariotto, A., Miller, B. A., Feuer, E. J., Clegg, L., Horner, M. J., Howlader, N., Eisner, M. P., Reichman, M., Edwards, B.K. (eds) (2004). *SEER Cancer Statistics Review, 1975-2004*. Bethesda: National Cancer Institute. Retrieved from http://seer.cancer.gov/csr/1975_2004/

Rosenstock, I. (1974). Historical Origins of the Health Belief Model. *Health Education Monographs, 2,* 328.

Rothman, A. J., Bartels, R. D., Wlaschin, J., & Salovey, P. (2006). The strategic use of gain- and loss-framed messages to promote healthy behavior: How theory can inform practice. *Journal of Communication, 56,* s202-s220.

Slater, M. D., Long, M. Bettinghaus, E. P., & Reineke, J. B. (2008). News coverage of cancer in the United States: A national sample of newspapers, television, and magazines. *Journal of Health Communication, 13*, 523-537.

Sohl, S. J. & Moyer, A. (2007). Tailored interventions to promote mammography screening: A meta-analytic review. *Preventative Medicine*, *45*, 252–261.

U.S. Department of Health and Human Services (2014). *The Surgeon General's Call to Action to Prevent Skin Cancer*. Washington: U.S. Department of Health and Human Services, Office of the Surgeon General. Retrieved from http://www.surgeongeneral.gov/library/calls/prevent-skin-cancer/call-to-action-prevent-skin-cancer.pdf

Walter, F. M., Humphrys, E., Tso, S., Johnson, M., & Cohn, S. (2010). Patient understanding of moles and skin cancer, and factors influencing presentation in primary care: a qualitative study. *BMC Family Practice*, *11*, 62.

Wehner, M. R., Chren, M. M., Nameth, D., Choudhry, A., Gaskins, M., Nead, K. T., Boscardin, W. J., & Linos, E. (2014). International prevalence of indoor tanning: A systematic review and meta-analysis. *JAMA Dermatology*, *150,* 390-400.

World Health Organization (2014). *Skin cancers.* Retrieved from http://www.who.int/uv/faq/skincancer/en/index1.html

Zillmann, D., Gibson, R., & Sargent, S. L. (1999). Effects of photographs in news-magazine reports on issue perception. *Media Psychology, 1*, 207-228.

CHAPTER 9: DISCUSSION AND CONCLUSIONS

9.1 Overview of Findings

The main objective of this doctoral research was to investigate content (i.e., article text and images) about skin cancer and recreational tanning in mass print media. To this end, a series of directed content analyses were conducted on a dataset of articles and images about skin cancer and recreational tanning published between 2000 and 2012 in 31 popular North American women's, men's, girls', and news magazines. Central to this research was Agenda Setting Theory (AST) and the Health Belief Model (HBM). The inclusion of images, meanwhile, was important based on the theory of Visual Persuasion and the Pictorial Superiority Effect, as well as research in visual health communication where images have been shown to influence health knowledge, attitudes, and behaviours.

This body of work outlined the coverage of skin cancer risk factors, UV-related avoidance, protection, and exposure behaviours, screening and early detection for skin cancer, tanned beauty ideals, and the presence of constructs from the Health Belief Model (HBM) in magazines. Descriptive statistics, including Chi square and Fisher's Exact tests, were conducted in order to describe the volume and nature of the coverage as well as to make pertinent comparisons relative to the 2006 IARC report (before vs. after) and the 2009 classification of tanning beds as carcinogenic (before vs. after). Comparisons according to content type (images vs. text) and target audience (U.S. vs. Canada, women vs. men, girls vs. women) were also conducted.

Coverage focused narrowly on one risk factor (UV exposure) and one behaviour (sunscreen use), while simultaneously promoting the tanned look as attractive and containing

little information about early detection. A key international public health report and decision was associated with little change in magazine coverage of skin cancer and tanning. Women's magazines contained significantly more articles about skin cancer and tanning compared to men's magazines, and the nature of that content differed. Canadian and U.S. magazines published similar volumes of articles, but there were differences in the nature of the information contained within them. Women's magazines published more skin cancer and tanning content compared to girls' magazines, but there were also differences in the content published. Regarding content type, visual images infrequently offered helpful information, other than sunscreen use, and even promoted unhealthy UV behaviours, such as tanning. Finally, regarding the HBM, only certain constructs of the HBM were present to a significant extent in magazine coverage of skin cancer and tanning (perceived severity, perceived susceptibility), there was generally a greater focus on the constructs in text compared to images and on prevention rather than detection, and there was a similar quantity of coverage on both benefits of, and barriers to, skin cancer prevention.

Overall, the key findings showed: 1) there are clear gaps in magazine reporting on skin cancer and recreational tanning, 2) volume of coverage of skin cancer in magazines was not significantly associated with a key public health report and decision, and 3) the magazine coverage contained some information to influence positive health behaviours, but also competing information which could encourage unhealthy behaviours. Table 21 provides an overview of the six studies, including the key findings and implications of each. This work has widened and deepened the knowledge about how the mass print media presents information about skin cancer and tanning to the public.

Table 21. Overview of thesis research studies

	STUDY 1 Chapter 3 **Pre vs. post 2006 IARC report**	**STUDY 2** Chapter 4 **Pre vs. post 2009 carcinogen classification**	**STUDY 3** Chapter 5 **Risk factors, UV behaviours, and early detection**	**STUDY 4** Chapter 6 **Canadian magazine coverage**	**STUDY 5** Chapter 7 **Teen magazine coverage**	**STUDY 6** Chapter 8 **Health Belief Model constructs**
Journal	*BMC Public Health* (published)	*Journal of Cancer Education* (published)	*Journal of the American Academy of Dermatology, Journal of Cancer Education* (published)	*Canadian Journal of Public Health* (accepted)	*Journal of Adolescent Health* (manuscript in preparation)	*Journal of Health Communication* (under review)
Magazine Genre	Women's, men's, girls', and news	Women's, men's, girls', and news	Women's and men's	Canadian and U.S.	Girls' and women's	Women's and men's
General Focus & Variables of Interest	Overall frequency; risk factors, UV behaviours, early detection	Overall frequency; risk factors, UV behaviours, early detection	Overall frequency; risk factors, UV behaviours, early detection	Overall frequency; risk factors, UV behaviours, early detection	Overall frequency; risk factors, UV behaviours, early detection	Health Belief Model (HBM) constructs: susceptibility, severity, benefit, barriers, self-efficacy, cues to action
Comparisons	Temporal comparison	Temporal comparison	Content type (images vs. text), gender of target audience (women's vs. men's magazines)	Content type (images vs. text), jurisdiction of publication (Canadian vs. U.S.)	Content type (images vs. text); age of target audience (girls' vs. women's magazines)	Content type (images vs. text); gender of target audience (women's vs. men's magazines)
Key Findings	Volume of coverage increased modestly after 2006 IARC report; key report messages not taken up; little focus on discouraging indoor tanning. Promotion of sunscreen use increased & promotion of tanned look decreased after 2006.	No change in volume of coverage after 2009 carcinogen classification; key related messages did not change. Promotion of high SPF sunscreen & tanned look increased after 2009.	UV exposure (risk factor) and sunscreen use (behaviour) most common; little focus on UV avoidance and early detection. Text more informative than images; images promoted tanned look. Women's magazines had more skin cancer coverage than men's magazines.	Canadian magazines emphasized UV exposure as risk factor and sunscreen use for prevention. No difference in volume of coverage (Canadian vs. U.S.); greater emphasis on spectrum of risk factors and on early detection in U.S. magazines; tanned look promoted more in Canadian magazines. Average reading grade level was 16.	Girls' magazines: focused on UV exposure as risk factor, use of sunscreen & self-tanners for prevention, rarely mentioned early detection. Compared to women's magazines, girls' had fewer articles, but a greater content discouraging indoor tanning and promoting tanned look.	Susceptibility and severity information present in more than half of articles. Benefits and barriers to prevention mentioned equally. Benefits and barriers related to early detection uncommonly reported. Few explicit cues to action. HBM constructs present more in text than images.

Implications for health communication, public health, and/or cancer prevention	Little change over time in volume of coverage and lack of uptake of key public health messages suggests minimal impact of skin cancer/UV exposure report & decision on media coverage. More effective dissemination of public health messages about skin cancer and tanning, including that indoor tanning is carcinogenic, is needed. Increased coverage on sunscreen use over time is positive and may contribute to uptake of this skin cancer behaviour by the public.	Emphasis on protection (through sunscreen) rather than other protection methods and UV avoidance may give public false sense of protection from skin cancer. Focus only on one risk factor may lead to lack of public knowledge about true skin cancer risk. Need for comprehensive skin cancer information, including about screening. Media images of attractive tans counterproductive to healthy skin messages & encourage UV exposure. Men are targeted with very little information: may contribute to poor knowledge and risky behaviours.	Canadian women not targeted with sufficient information about skin cancer risk factors, UV avoidance, and especially early detection. Without such knowledge, Canadians may be uninformed about skin cancer and this could contribute to unhealthy skin behaviours. Health information about skin cancer should be written in plain and understandable language.	Greater frequency of media coverage targeted towards teenage girls may help counter dangerous UV exposure behaviours. Future information should convey there are multiple risk factors, including sunburns. Emphasis on tanned ideal in text and images may negate healthy skin messages (e.g., avoid indoor tanning, wear sunscreen); these should be countered in health communication campaigns.	Readers may benefit from greater emphasis on benefits relative to barriers of prevention in media reporting on skin cancer. Magazine readers not visually messaged in ways that would effectively promote prevention and early detection. Journalists and editors should provide appropriate resources (e.g., websites) for further information and action when reporting on skin cancer.
Next Research Steps	Investigate how this report and decision impacted other types of media (e.g., newspapers). Study impact of more recent, North American reports (i.e., Surgeon General's report on skin cancer prevention) and public health decisions (e.g., banning minors from tanning beds) on media coverage. Compare and contrast fluctuations in volume of media coverage with key related outcomes and behaviours (e.g., melanoma incidence, tanning bed usage rates, and sunscreen purchasing behaviour) in an effort to explore associations.	Conduct content analyses focused on celebrity, unique risks of skin cancer for those with dark skin, and relevant advertisements. Conduct thematic analysis to more deeply investigate coverage. Investigate impact of media coverage on public's knowledge, attitudes, and behaviours.	Investigate skin cancer coverage in other Canadian media sources (e.g., newspapers). Design and research resources for encouraging early detection. Develop a national communication plan around skin cancer and UV exposure.	Research where teens get information about skin health. Investigate skin cancer and tanning coverage in online resources and social media. Study role of parents, schools, and paediatricians in communicating with teens about safe UV behaviours.	Consider avenues for conveying images that better utilize HBM constructs to motivate safer UV behaviours (e.g., graphic image-based warning labels on tanning beds to convey perceived severity may discourage their use).

9.2 Coverage Relative to 2006 IARC Report and 2009 Carcinogen Classification

The hypothesis that magazine coverage of skin cancer and tanning would increase after the 2006 IARC report was modestly supported, while the hypothesis that coverage would increase after the 2009 carcinogen classification was not confirmed. The volume of skin cancer and tanning coverage increased slightly after the 2006 IARC report, while volume of coverage did not change relative to the 2009 classification by the WHO's IARC of UV radiation from indoor tanning devices as carcinogenic. Generally, information about skin cancer risk factors and early detection did not change relative to either of these public health items, but there were some changes in reporting on UV behaviours. There was a decrease in the promotion of the tanned look as attractive after compared to before 2006, but an increase in its promotion after 2009. Also after 2009, there was a decrease in the promotion of sunless alternatives to a tan (i.e., self-tanners). There was increased emphasis on UV protection through sunscreen use after the IARC report and after the carcinogen classification. Messages to discourage indoor tanning were infrequent and did not change significantly over the study timeframe.

Both temporal comparisons (after the 2006 IARC report and after the 2009 carcinogen classification) indicate an increased focus on sunscreen use, including high SPF sunscreen, in magazine content, while messages to avoid the sun or use sunless alternatives for a tan decreased. The increased focus on sunscreen use is positive given the role it plays in skin cancer prevention; however, as described in Chapter 3, this was likely unrelated to the IARC report or carcinogen classification because neither report mentioned sunscreen use. Instead, it may related to a growing commercial market for sunscreen, public health campaigns promoting sunscreen use as a skin cancer prevention strategy, or a general increase in the awareness by the public that sunscreen use is important. As evidence to support this, the increased focus on sunscreen use in

magazine content over the study timeframe (2000 to 2012) parallels growing use of sunscreen among the public during the same approximate timeframe (2000 to 2010) (Centers for Disease Control and Prevention, 2012).

Quite surprisingly, neither temporal comparison revealed changes in volume of reporting around discouraging indoor tanning, even though this was a central message of both the 2006 IARC report and the 2009 carcinogen classification. The actual messages can be found in Appendix C; the corresponding press releases, which further emphasize these messages, are found in Appendix D and E. Both the 2006 IARC report and the 2009 carcinogen classification emphasized the link between UV radiation from indoor tanning and melanoma skin cancer (WHO & IARC, 2006; El Ghissassi et al., 2009). The lack of penetration of the IARC report key findings into North American popular magazine coverage was further indicated by the finding that only 3% of articles published after 2006 mentioned the report and only 7% reported the key statistic (i.e., 75% increase in risk of melanoma when use of indoor tanning devices begins before age 30).

Based on AST (McCombs & Shaw, 1972; Kosicki, 1993), it was expected that the public health report and decision would set the media agenda around skin cancer and tanning. From an empirical standpoint, coverage was expected to increase because prior research found a large increase in magazine coverage about lung cancer and smoking after the release of the Surgeon General's report (Pierce & Gilpin, 2001). There are a number of possible reasons for the lack of impact of the report and decision on the volume of coverage and the lack of uptake of related messages (see discussion sections in Chapter 3 and 4). Some of the reasons discussed included: journalists may believe indoor tanning is already established as dangerous and thus not newsworthy; reports from IARC and the WHO do not influence the North America media

agenda the same way reports from national public health organizations do; and that the press releases contained a lot of scientific language and were even somewhat confusing (McWhirter & Hoffman-Goetz, 2014; McWhirter & Hoffman-Goetz, 2015). There are further reasons to consider.

The messages from the IARC report and carcinogen classification may not have infiltrated article content because magazines (which are published monthly) are not as sensitive to such information compared to news media, such as newspapers (which are published daily). Mass print news media (i.e., newspapers) is thought to set the cancer-reporting agenda of other general interest mass print media publications, such as women's magazines (Henderson & Kitzinger, 1999). It may be that media coverage in newspapers was influenced to a greater extent than magazines by the 2006 IARC report and the 2009 carcinogen classification. In support of this assumption is the recent evidence that newspaper coverage of indoor tanning in California was influenced by indoor tanning legislation to ban minors. Mayer, Swetter, Guild, and Geller (2014) found that more California newspaper articles mentioned the risks of indoor tanning after Senate Bill 746 banning minors from using indoor tanning devices was passed (June 1, 2011) compared to before. They did not, however, appraise magazine coverage over the same time period. This may also suggest that policy decisions, and not the actual scientific evidence leading up to policy, influences the media agenda and reporting on skin cancer and recreational tanning.

The limited impact of the 2006 IARC report on magazine coverage of skin cancer and tanning is in contrast to the dramatic impact of the analogous report from the Surgeon General on magazine reporting on lung cancer and smoking (Pierce & Gilpin, 2001). These two landmark reports were sponsored and spearheaded by different jurisdictional sources (international vs. national), which may contribute to the difference in the uptake of messages. The differential

uptake in the media may also relate to how scientific health information is shared with the media (and public) now compared with 60 years ago. The landscape of scientific and mass communication has changed dramatically since 1950s when the Surgeon General's report was released compared to the mid 2000s when the IARC report was released. Some of the messages on the dangers of indoor tanning may have been promoted through other information channels during the lead-up period to the IARC report and the 2009 WHO/IARC classification of tanning beds as Class I carcinogen. Lending support to this possibility is Figure 2 in Chapter 3: there is a trend towards a building volume of coverage leading up to 2006/2007 when the IARC report was published and then again leading up to 2009/2010 when the carcinogen classification took place. The U.S. Surgeon General's report on smoking, in contrast, was released at a time when there were fewer communication channels, such as the Internet, social media, and apps. Magazine and newspaper coverage around the Surgeon General's report on smoking was likely the key print modality for dissemination at that time.

While both the 2006 IARC report and the 2009 carcinogen classification led to small increases in magazine coverage (see Figure 2, Chapter 3), only the increase in volume of coverage after the 2006 IARC report was marginally significant. The reason for this divergence in volume of magazine coverage between these two reports is not clear from the data presented in this thesis. One possibility is, however, that the content of the IARC report (i.e., link between indoor tanning and melanoma) was viewed by journalists and editors as new and novel, and thus worthy of media coverage. The subsequent carcinogen classification may not have been viewed as novel and newsworthy, particularly if the issues (or related ones) had already been covered around the time of the IARC report three years prior.

Finally, while the 2006 IARC report and 2009 carcinogen classification may not have had a large impact in terms of significant increases in magazine coverage, these public health documents may have at least kept the issues of skin cancer and tanning on the media agenda. Media coverage of a topic tends to drop off in the absence of further news events (Downs, 1972). It is possible that without this public health report and decision, the coverage on skin cancer and tanning would have decreased considerably or not been sustained. As can been seen in Figure 2 (Chapter 3), there were small increases in the volume of articles immediately after the report and classification, followed by a subsequent drop-off.

Regardless of the underlying reasons for the lack of penetration of the report and carcinogen classification on magazine coverage of skin cancer and tanning, the findings are disturbing given the role the media has in shaping the public and policy agenda. Supported by Agenda Setting Theory (McCombs & Shaw, 1972), research from Australia has demonstrated the important influence of media coverage on indoor tanning. Negative media coverage around indoor tanning was associated with a reduction in tanning bed business listings (Makin & Dobbinson, 2009), helped to provide the impetus for legislation against indoor tanning (Sinclair & Makin, 2008), and aided the public in recognizing the skin cancer risk associated with indoor tanning (Jalleh et al., 2008). In order to push the public health agenda related to skin cancer and UV exposure onto the North American mass media agenda, a greater emphasis on the newsworthiness of skin cancer and tanning related research findings, events, or decisions might be necessary. This could be accomplished through the production of appropriately worded press releases and by public health advocates developing professional relationships with journalists, which may facilitate an understanding of the significance (and thus newsworthiness) of the dangers of UV exposure.

9.3 Risk, Susceptibility, and Severity Information

UV exposure was the most common risk factor reported on in the magazine articles; other risk factors (i.e., susceptible phenotype, personal or family history of skin cancer, sunburns, numerous or abnormal moles, or a weakened immune system) received little coverage. UV exposure is the most important risk factor for skin cancer (IARC, 2000; Armstrong & Kricker, 2001) and it is encouraging that this risk factor was identified frequently in the magazine reports. Nevertheless, the other risk factors for skin cancer are also important (Canadian Cancer Society, 2015a; Canadian Cancer Society, 2015b) and the public should be informed about them as well. Getting and keeping skin cancer risk information on the media agenda is important because there is evidence to suggest that below a certain threshold in the amount of reporting on cancer risks, public knowledge about these risks is not influenced (Stryker, Moriarty, & Jensen, 2008). For example, Stryker and colleagues (2008) found that self-reported attention to health news was associated with knowledge about cancer risks for smoking and diet, which received significant media attention, but not risks associated sun exposure, which received relatively little media attention by comparison.

The focus on UV exposure as a risk factor was also supported by findings about the HBM construct of perceived susceptibility to skin cancer: the most common type of susceptibility information covered was on modifiable risk factors (e.g., UV exposure), while non-modifiable risk factors (e.g., susceptible phenotype) and numerical risk information were emphasized in the coverage to a much lesser extent. Perceived susceptibility to skin cancer and photoaging are associated with sun-protective intention and behaviour (Mahler, Fitzpatrick, Parker, & Lapin, 1997; Mahler, Kulik, Gibbons, Gerrard, & Harrell, 2003). A greater emphasis on this in future media reporting may encourage more skin cancer prevention behaviours among the public.

There was little content in the magazines to convince readers that skin cancer can have severe (and even fatal) effects on their health. Information around the HBM construct of perceived severity focused on consequences of UV exposure (skin cancer, photoaging, sunburn) rather than on the consequences of skin cancer itself (treatment, pain, disfigurement, death). Previous research has shown that people generally consider the severity of skin cancer to be low (Garside et al., 2010). It is possible that the lack of balanced media reporting in this regard contributes to this public misconception.

Overall, the results of this doctoral research show that magazine readers are being messaged that UV exposure is an important and modifiable risk factor for skin cancer. However, they receive much less information about other risk factors, including non-modifiable risk factors, and few statistics about the disease. There was little information that might help to convince readers that skin cancer, especially melanoma, is a severe disease. If readers are not familiar with the factors that may put them at high risk for skin cancer, and if readers do not believe skin cancer is a serious threat to health, they may be less likely to engage in skin cancer prevention and early detection behaviours.

9.4 Skin Cancer Prevention Information

9.4.1. UV Protection, Exposure, and Avoidance

The overwhelming emphasis in magazine coverage of skin cancer and tanning regarding skin cancer prevention was on the use of sunscreens. Further, the coverage for the presence of HBM constructs indicated the self-efficacy information related to prevention was focused almost exclusively on sunscreen use. While this is encouraging, it is important to remember that risky

UV exposure behaviours are common (Wehner et al., 2014; Buller et al., 2011) and protective behaviours are suboptimal (Buller et al., 2011; Kasparian et al., 2009).

Sunscreen use is recommended to help prevent skin cancer and it is effective in this regard; however, other prevention behaviours, such as wearing a hat and protective clothing, seeking shade, and avoiding the sun, are also important to reduce risk (Canadian Cancer Society, 2015c, 2015d; American Academy of Dermatology 2015b). In fact, these other behaviours are recommended as the *primary* means to prevent skin cancer, while sunscreen is considered a *secondary* form of protection (Vainio & Bianchini, 2001). The content of the magazines included in this research may give readers the false impression that sunscreen alone is sufficient to prevent the disease.

The emphasis in the magazine data on sunscreen use for skin cancer prevention, but not other protection methods, and the absence of information on specific types of severity information (e.g., significant negative consequences of unprotected UV exposure) has also been found in sun-care product advertisements in U.S. parenting magazines (King & Walsh-Childers, 2014). This suggests that both editorial *and* advertising content in magazines have similarities in what is promoted regarding skin cancer prevention and the type of information that tends to be absent. Together, this may contribute to a lack of knowledge for the public about the range of important prevention behaviours one can engage in to help prevent skin cancer and the dangers of unprotected UV exposure.

There was some evidence that misinformation or confusion and lack of effectiveness are perceived barriers to skin cancer prevention. This warrants further, more detailed investigation. Some of the content in the magazine articles suggested this confusion may be related to a lack of clarity about how effective sunscreen is and the general, although inaccurate, belief that tans and

sun exposure can be healthy (e.g., because UV exposure stimulates Vitamin D production). The public should be targeted with information to convey and clarify the effectiveness of prevention strategies, such as sunscreen use, seeking shade and wearing protective clothing and a hat. While frequent promotion of sunscreen use in the magazine is positive, pairing this with information about how to use it and the effectiveness may help to translate the prevention message of sunscreen use into actual behaviours by the public.

The general message in magazine coverage was one of UV protection (through sunscreen use) rather than of UV avoidance (sun and indoor tanning avoidance). The focus on sunscreen, rather than avoiding tanning beds or the sun, has been shown by other researchers (Cokkinnides et al., 2011). Articles discouraging indoor tanning bed use were infrequent. This lack of focus on avoidance of indoor tanning has been found in other mass media research on skin cancer (Stryker et al., 2005; Cho et al., 2010). It appears that while UV exposure was reported frequently as a risk factor, it was not explicitly linked to indoor tanning being discouraged. One possible reason for the emphasis on UV protection through sunscreen use rather than UV avoidance is that there is nothing for the magazines to sell (no products to pitch) when it comes to avoiding the sun or tanning beds. Magazines obtain significant revenue from advertising money (Ontario Media Development Corporation, 2015) and may slant editorial content so as to prime readers to product advertisements, including those for sunscreen.

Ideally, journalists, cancer educators, and public health communication specialists should work together to promote a comprehensive list of skin cancer prevention behaviours to the public, and also provide information about the efficacy of each and details about how to apply them to maximize their effectiveness. While it is important to discourage UV exposure and encourage UV protection, this information may sometimes be at odds with other health

promotion messages, such as engaging in physical activity, which can involve increased solar UV radiation exposure. These competing messages may be especially true for the magazines included in this study, as six were focused on lifestyle and health (e.g., *Women's Health*, *Men's Fitness*). It would be interesting to explore whether magazines with a primary fitness or health focus demonstrate conflicting messages about solar UV radiation harms (skin cancer) and health lifestyle (physical activity).

9.4.2 Tanned Skin as a Beauty Ideal

Skin cancer risk, susceptibility, severity and prevention information was juxtaposed against a backdrop of tans being promoted as attractive and desirable in text and images. The tanned look was emphasized more in images compared to text, more in women's magazines compared to men's magazines, and more in teenage girls' magazines compared to women's magazines. This is a barrier to UV protection and avoidance behaviours. These findings fit with the results from the HBM analysis (Study 6) which indicated that perceived barriers to UV protection or avoidance behaviours (e.g., having a tan) were common. One of the most prominent types of information for perceived barriers to prevention in articles and images was for appearance reasons (i.e., it is challenging to engage in skin cancer prevention behaviours to avoid or protect oneself from UV exposure when one desires to have the appearance of a suntan). The emphasis on the tanned look in popular magazines may help to explain recent findings that increased magazine exposure is associated with negative attitudes towards UV protection and less behavioural control when it comes to unprotected sun exposure (Lovejoy et al., 2015)

An emphasis on the tanned look has been demonstrated in general magazine content on health and non-health issues (Dixon et al., 2008). It is especially worrying, however, that even magazine content specifically about skin cancer also demonstrates this trend. These types of images may undermine the more positive health messages contained in the text they accompany. There are a number of implications of the promotion of tanned skin as attractive in magazine content. First, this type of imagery has been found to encourage UV exposure (McWhirter & Hoffman-Goetz, 2013; Dixon et al., 2014). The fact that the tanned ideal was promoted more often in images than text suggests that this type of imagery may be taking away from important public health messages about avoiding UV exposure in the text; indeed, people attend to images accompanying media stories and are often swayed by them (Gibson & Gillman, 2000; Messaris & Abraham, 2001). Second, by associating images of tanned skin with articles about health (skin cancer), readers may be encouraged to continue to conflate health and beauty, and a suntan with good health.

There are differences of opinion, and even of scientific evidence, regarding whether human beauty is subjective, objective, or both. Some researchers have argued that beauty ideals are culturally constructed (Wolf, 1997) while others consider that there are more objective aspects to human beauty and that some beauty ideals have a biological and evolutionary basis (Etcoff, 1999). Given that beauty ideals on pale and tanned skin have fluctuated historically in dramatic ways (Chang et al., 2014; Segrave, 2005, Martin et al., 2009), tanned skin is likely a culturally constructed beauty ideal. Further support for this notion that tanned skin is a culturally constructed ideal, comes from evidence that non-North American cultural groups, particularly those of Asian heritage, consider pale skin to be a sign of great beauty (Xie & Zhang, 2013).

This has important implications for public health communication around skin cancer and tanning.

If tanned skin as a beauty ideal is culturally constructed, this implies it is possible to alter people's attitudes of tanned skin as attractive. By being more strategic with the types of images selected for media stories about skin cancer, and through the use of images of a wide variety of natural, untanned skin tones in health communication campaigns, public health practitioners may be able to change the public perception that one needs a suntan in order to be attractive or "healthy-looking". In support of this is evidence that images of attractive models with suntans encouraged people to want to have a tan themselves and engage in UV exposure, while images of attractive models with pale skin encouraged people to want to protect themselves from UV exposure (Dixon et al., 2011).

9.5 Skin Cancer Screening and Early Detection Information

Early detection and screening are necessary to reduce skin cancer morbidity and mortality (Ries et al., 2004). The research described in this doctoral thesis focused on three key types of information related to screening and early detection: skin self-examination (SSE), skin examination led by a physician, and the ACBDE characteristics to look for during skin self-examination. In relation to the HBM, perceived benefits, perceived barriers, and self-efficacy as they relate to early detection were examined.

Overall, screening and early detection for skin cancer received little attention in popular North American magazines, especially when compared to prevention. This finding parallels what previous research on media coverage of skin cancer in connection to early detection has found.

Cho et al. (2010) reported that in women's magazines the emphasis was on prevention rather than detection for skin cancer. Moreover, prior content analyses of newspaper coverage indicated a lack of focus on skin self-examination and warning signs of skin cancer (Moriarty & Stryker, 2008; Stryker et al., 2005). For example, Stryker et al. (2005) found that while 25% of newspaper articles mentioned detection, fewer than 7% of articles mentioned clinical skin examination and less than 6% mentioned self-detection for skin cancer. The lack of focus on early detection in the mass media may be a contributing factor to how infrequent screening behaviours are among the public (Mayer, Swetter, Fu, & Geller, 2014; Aitken et al., 2004; Kasparian et al., 2009). For example, Oliveria et al. (1999) found that 24% of U.S. Caucasian adults in their sample reported engaging in SSE on an annual basis.

The lack of visuals related to example images of moles in this research is notable as these are effective towards encouraging more frequent and accurate skin self-examination (SSE) (Girardi et al., 2006; McWhirter & Hoffman-Goetz, 2013). Moreover, text descriptions alone of melanoma warning signs are not effective (Aldridge, Zanotto, Ballerini, Fisher, & Rees, 2011); the inclusion of images is important for effective health communication because they enable people to visually learn the characteristics of malignant skin lesions (McWhirter & Hoffman-Goetz, 2013). The lack of peer-modelling in images of people conducting their own skin examination or having a skin examination conducted by a physician is also a concern, since peer-modelling is important for motivating healthy behaviours (Schunk, 1987; Lowe, Horne, Tapper, Bowdery, & Egerton, 2004) and results in increased self-efficacy, which is important for behaviour modification (Bandura, 1997; Bandura, 1998).

Magazine reporting on early detection did not show any steady linear change (increase or decrease) between 2001 and 2012. There were also no differences in the proportion of early

detection coverage according to the gender (women's vs. men's magazines) of the target audience readership. Importantly, though, while the proportions did not differ, absolute numbers did. Because men's magazines had significantly fewer articles and images on skin cancer and tanning, the absolute numbers of articles and images focused specifically on early detection in men's magazines were very low. Despite North American men's increased risk and morality from melanoma (Canadian Cancer Society's Advisory Committee on Cancer Statistics, 2014; American Cancer Society, 2015), men receive less information about early detection compared to women. This may help to explain why men are somewhat less likely than women to conduct SSE for early signs of skin cancer (Kasparian, McLoone, & Meiser, 2009). Jurisdictional differences in magazines reporting on early detection were found, with U.S. magazines containing a greater proportion of information on skin self-examination and physician-led skin examination. As suggested in Chapter 7, Canadian magazine readership may be less targeted with screening information because there are relatively few dermatologists in the country (Chow & Searles, 2010). Differences in the healthcare systems (and associated costs) between these two countries may also be contributory.

The HBM is an effective framework for developing cancer screening initiatives (Champion & Skinner, 2008), but there was little coverage in the magazines around perceived benefits of early detection and even less coverage of self-efficacy related to early detection. This is potentially problematic because people who feel confident in their ability to effectively perform SSE are more likely to conduct SSE (Auster et al., 2013; Friedman, Bruce, Webb, & Weinberg, 1993). Likewise, the paucity of information about the benefits of early detection in magazines is an issue because greater perceived benefits of early detection for skin cancer are associated with performing annual SSE (Girgis, Campbell, Redman, & Sanson-Fisher, 1991).

The reasons for the lack of coverage around early detection and screening for skin cancer, especially relative to prevention, in these magazines are not known. There are several intriguing possibilities. First, magazines are commercial products, with revenue dependent on subscriptions from readers and from advertising (Ontario Media Development Corporation, 2015). Prevention allows products to be sold – namely, sunscreen, but also self-tanners; there are no clear products to sell in connection to early detection. Because media editorial content can be informed by advertising (Warner, Goldenhar, & McLaughlin, 1992; An & Bergen, 2007) it is possible that this results in less editorial content that lacks a clear connection to the sale of commercial goods. A further possibility is that magazine writers and editors may be attuned to the public's fears around cancer diagnoses. While people tend to view screening behaviours as risky or frightening (because there is potential for a negative outcome), they view prevention behaviours as safe (because they relate to the maintenance of health) (Rothman, Bartels, Wlaschin, & Salovey, 2006). Early detection information may encourage readers to consider their susceptibility to disease, a potential diagnosis of skin cancer, and even cause them to reflect on their own mortality. Perhaps some magazine editor feel screening is not an appropriate topic for their upbeat, optimistic approach to lifestyle content. Another reason for the lack of reporting on early detection, and for other gaps in media reporting on skin cancer and tanning found in this study, may relate to the journalists themselves, who frame health issues differently depending on their own gender, age, and race/ethnicity (McCauley, Blake, Meissner, & Viswanath, 2013).

9.6 Visual Health Communication

Central to this doctoral research has been investigating the information which visual images that accompanying articles about skin cancer and tanning may convey to readers of

popular magazines. The hypothesis that magazine coverage would be different between article text and images was supported. The details of the results from the image data did not paint an especially encouraging picture regarding how readers are visually messaged about skin cancer prevention and early detection.

For nearly all variables, article text contained more information about risk factors, behaviours, and early detection compared to images. An important exception was that a greater proportion of images promoted the tanned look compared to text. There was a lack of information about disease severity in images, a lack of risk factors in images, and little visual content to aid readers with early detection of skin cancer. Only one previous study has examined images accompanying skin cancer magazine content. Similar to the findings of this present research, Cho and colleagues (2010) found conflicting and inconsistent messages around UV exposure in images, with images sometimes encouraging UV exposure.

UV photographs are influential for UV exposure and protection behaviours (McWhirter & Hoffman-Goetz, 2013), but were rarely featured in the magazines in this study. In fact, in 20 U.S. women's and men's magazines over the 13-year timeframe of this study, there were just four UV photographs. Figure 6 offers an example of UV photography, including how it communicates to the viewer about skin damage and how sunscreen works to block damaging UV radiation from reaching the skin. Including such images in future media reporting on skin cancer and tanning may help to motivate healthy skin behaviours among the public.

The nature of the visuals included in magazine skin cancer and tanning content may be especially problematic for those with low literacy. Visual images that accompany health information are particularly important for those with low literacy, as they aid in comprehension of written information (Hoffman-Goetz, Donelle, & Ahmed, 2014; Houts, Doak, Doak, &

Loscalzo, 2006; Michielutte, Bahson, Digman, & Schroeder, 1992). Nearly half of the Canadian population lacks sufficient literacy to cope in modern society (literacy level of 2 or below) (Hoffman-Goetz et al., 2014). Given that the average reading grade level of magazine article text about skin cancer and tanning in Canadian magazines was approximately 16 (Study 4), this places extra emphasis on the importance of health information conveyed in the visual images. Since the images in this data set lacked important information about skin cancer risks, prevention, and early detection – and even promoted suntans – readers with low literacy may not be receiving appropriate take-away messages to encourage healthy skin cancer-related behaviours.

Overall, while many articles emphasized UV exposure as a risk factor for skin cancer, many images emphasized the tanned look as attractive, thereby promoting UV exposure. This discordance of messages may be confusing to magazine readers and likely undermines the healthy messages that were present (e.g., UV exposure is dangerous, wear sunscreen, avoid indoor tanning). This message discordance also points to the role of editors and journalists to make more informed choices about image selection when publishing editorial content about skin cancer and tanning. Problematic image selection for health topics in the mass media is not limited to just skin cancer and tanning. For example, when news stories about the health risks of being overweight are accompanied by images of people who are morbidly obese, a common practice, this leads the readers to believe the health risks discussed in the article apply to people who are obese and not overweight (Juszczyk, Gillison, & Dean, 2014).

The lack of careful attention to images stretches even beyond health and media reporting; it is also illustrated by the challenges encountered around data collection for this thesis research. While most of the magazine articles (text) were indexed in online library databases, these

archives rarely included the accompanying images. This lack of online data access created a significant barrier to the collection of visual data as the magazines had to be obtained in hardcopy in order to obtain the images. This may partly explain why most other health-focused content analyses of magazines and newspapers do not include images in the analysis. Given the role images play in shaping interpretation of media stories (Messaris & Abraham, 2001; Gibson & Zillman, 2000; Zillman, Gibson & Sargent, 1999) and health behaviours (Houts et al., 2006), the lack of archiving of visual content presents a barrier to media content analysis research focused on visual images. Improved archiving of the visual content appearing in mass media may help to facilitate a greater focus on this type of data in future media analyses, including those related to health.

The power of visual images is well established and, as such, their inclusion as subjects for analysis and critique, and as persuasive tools, will be important for effective health communication in connection to skin cancer and tanning. Future media content may have a greater, more positive impact on attitudes and behaviours of the public by including exemplar UV photographs, images of the consequences of skin cancer, and more images of example skin cancers to motivate and aid with early detection. To this end, implications for policy and practice and directions for future research related to visual health communication in the context of skin cancer and tanning deserve particular attention.

Figure 6. UV Photograph (Photograph by Thomas Leveritt. Used with permission.)

9.7 Implications of Findings for Health Communication Practice and Public Health Policy

When the findings of this thesis research are taken together, there are a number of areas where media reporting can be improved and gaps can be addressed. There are also important implications of the research findings for public health policy and practice.

9.7.1 Gaps in Media Reporting

In general, the results suggest that media reporting on skin cancer and tanning needs to be improved through greater reporting and emphasis on: comprehensive skin cancer risk information; UV avoidance rather than only UV protection; UV protection methods beyond just sunscreen use, such as clothing, hats, and shade; the importance of early detection for skin cancer; and the benefits, relative to the barriers, of skin cancer prevention behaviours. Without a focus on this type of information, including increasing content aimed at teenage girls and men, the public may not view skin cancer prevention and detection as salient. And if the information is not viewed as relevant to readers of mass print media, there may be less motivation to adopt healthy behaviours. Cancer educators and health communication specialists need to be aware of the gaps in reporting on skin cancer and the emphasis on the tanned look as attractive, so that they might adjust their programs and initiatives accordingly. Further, if they are asked to serve as a spokesperson in the media, they should take the opportunity to emphasize the important information that is often missing from media reporting.

The mass media is an extremely important health communication channel, not only because of its reach and influence, but also because it is a cost-effective way to share health messages with large audiences (Randolph & Viswanath, 2004). One important recommendation

to come out of this work is to develop best practice guidelines on the reporting on skin cancer and tanning, which include the use of images, and to make these available publicly for free. If journalists and editors have ready access to high-quality advice about how best to report on skin cancer, they may be more likely to use it in their reporting.

9.7.2 Policy and Practice Implications

One important finding of this doctoral research was that readers of the popular North American magazines included in the sample are not frequently messaged to avoid indoor tanning, although this did increase somewhat over the study timeframe. In addition, the message that tanned skin is attractive was prominent in images. Together, these may be contributing factors to high rates of use of indoor tanning devices. Policies that restrict access to indoor tanning devices for youth remain important and outright bans on use for all ages, such as those legislated Australia, may be worthwhile considerations in North America.

Given the importance and prominence of visual images for health and cancer communication, including skin cancer specifically, and the general lack of effective use of visual images in magazine reporting, a number of practice and policy considerations to address this are warranted. Visual images often did not contain helpful information related to skin cancer, and instead often contained information that was harmful to health (i.e., images that promoted the tanned look as attractive). While it is difficult, if not impossible, to control what the mass media publishes when it comes to content, there are strategies to encourage journalists and editors to be more health aware when it comes to image selection. When press releases (social marketing materials) go out to the media about skin cancer and tanning, they should be accompanied by images – the types of images should be those which research has demonstrated to be effective

towards encouraging healthy skin cancer behaviours. For example, a common type of image in magazine coverage related to indoor tanning is of an attractive young woman lying on the beach or in a tanning bed, often with little or no clothing (Castillo, 2013; De, 2014). If press releases, such as those accompanying the 2006 IARC report, the 2009 carcinogen classification, or other research on skin cancer were accompanied by images that have been shown to motivate healthy skin beahviours, potentially damaging stock images may be less likely to be used by journalists and editors. Example images might include UV photographs or images of attractive people with natural skin tones (untanned skin) engaged in healthy skin protective behaviours (e.g., seeking shade and wearing protective clothing and a hat). The media landscape is becoming more and more visual. It will be important for those in public health practice to facilitate effective use of this change by providing guidance to those who work in media on the use of the most appropriate images to include with health-related editorial content in order to maximize its ability to inform and effect change.

There are limits, however, to the extent that health educators can control images the press publishes. It is necessary to consider other means by which effective images can be shared with the public beyond the mass media. In the magazines included in this thesis, there was a lack of severity information about skin cancer (e.g., graphic images) or UV exposure consequences (e.g., photoaging) conveyed in the images. Graphic images of skin cancer or scars from treatment, as well as images depicting photoaging, are successful in deterring UV exposure in behavioural research (McWhirter & Hoffman-Goetz, 2013). These types of images could be used to create image-based health warning labels for indoor tanning devices. As of 2014, Health Canada and the U.S. Food and Drug Administration require warning labels on indoor tanning beds (Health Canada 2014a; U.S. Food and Drug Administration, 2014). These warning labels, however, are

text-based (Health Canada, 2014b; U.S. Food and Administration, 2014). Research from tobacco control efforts indicates that larger, image-based health warning labels on tobacco products are more effective than smaller, text-based warning labels for deterring use (Hammond, 2011) and image-based warning labels enhance fear reactions about health-related consequences and decrease smoking motivations among young adults (Cameron, Pepper, & Brewer, 2015). The adoption of graphic warning labels on cigarette packages in Canada has significantly reduced smoking rates (Huang, Chaloupka, & Fong, 2014). There is currently no research on image-based health warning labels for indoor tanning devices, although the evidence of the effectiveness of images to deter UV exposure and evidence on the effectiveness of image-based warning labels for deterring use of tobacco products, suggest this is a promising area to explore. Moreover, the political climate (i.e., tanning bed bans for minors in some provinces and states, mandatory warning labels implemented by federal governments), the growing incidence of skin cancer, and the continued popularity of these devices suggest this is an area suitable for knowledge translation research, with strong potential for health policy development.

9.8 Limitations

There are a number of limitations to this research. These are outlined below.

9.8.1 Limitations of Magazine Sample

First, only a select subset of popular North American magazines were included. Although these were high-circulating magazines, and coverage was of a large timeframe (13 years), other magazines or time periods may have reported on skin cancer and tanning differently. Moreover,

the focus on magazines may have excluded important information from other forms of mass print media communication, such as newspapers. However, given the large subscription volumes for the magazines included, they have considerable reach in informing the public about health risks.

Second, articles were searched for and retrieved using a strategy that only identified articles indexed in the table of contents or library archive search engines. If articles or mentions of skin cancer or tanning appeared elsewhere in the magazine without being formally indexed, these would have been missed. Hence, the volume of articles identified may have been under-reported.

A further limitation was that six years of *Women's Health Magazine* (2000-2006) was not available for analysis. As a result, this magazine was excluded from the time comparisons related to the 2006 IARC report and the 2009 carcinogen classification (Studies 1 and 2) and the corresponding years of *Men's Health Magazine* also had to be excluded for the target audience comparisons (women's vs. men's magazines) (Studies 3 and 6). These two health-focused magazines contained a substantial number of articles about skin cancer and tanning relative to other magazine genres, so their partial exclusion may have led to under-sampling of coverage. While including the full timeframe for these magazines would have strengthened the scope of the findings, articles and images from four other health magazines (i.e., *Men's Fitness*, *Muscle & Fitness*, *Shape*, *Self*) were included without any restrictions. Given that there were a significant number of articles and images sourced from health-focused magazines in the data set, the results likely reflect content from this magazine genre adequately.

Another limitation was that there are virtually no magazines in North America designed for male youth. Therefore, skin cancer and tanning coverage targeting male adolescents was not investigated and a comparison of adolescent female and male magazines regarding coverage of

skin cancer and tanning was not possible. This raises the further question of what male youth read; in order to investigate the quantity and nature of skin cancer and tanning coverage targeted towards adolescent males, the media sources they consume and are exposed to need to be determined. This is important to investigate because UV exposure and sunburn during adolescence are significant risk factors for melanoma (Whiteman, Whiteman, & Green, 2001; Godar, Wengratis, Shreffler, & Sliney, 2001; Wu, Han, Laden, & Qureshi, 2014) and males less often engage in UV protection behaviours (Kasparian et al., 2009; Cokkinides et al., 2006).

The analysis of news magazines (*Time*, *Newsweek*, *Maclean's*) was excluded from all but two of the studies (they were retained for Studies 1 and 2, the temporal comparisons). Thus, for the most part, the interpretation of findings on skin cancer and tanning is limited to popular gender-oriented magazines. There were two reasons for exclusion of news magazines from Studies 3 to 6. First, the publication frequency differed considerably from general interest magazines (i.e., weekly as opposed to monthly). This would have potentially inflated the volume of coverage when compared to other magazines, such as women's magazines. Second, these were the only appropriate news magazines available for the study timeframe and there was an insufficient number of unique titles to allow comparisons between the U.S. and Canada. Nevertheless, some descriptive results are given in Appendix B and further analyses of news magazines may be undertaken in future studies.

A further potential limitation relates to the fact the data came from print magazines. Many magazines have both hardcopy and online versions. It is possible that online magazine coverage of skin cancer and tanning information differs from hard copy magazine coverage of the same issues. However, focusing on print media coverage was necessary for several reasons. First, it enabled a historical analysis of a large timeframe of coverage and temporal comparisons.

Because the online content of magazines can be edited or removed altogether, it was not considered a stable source of data for the studies. Moreover, the start of the timeframe of interest was 2000: at this time, magazines were not regularly posting content online, rendering the historical analysis and temporal comparison of media coverage impossible. Finally, there is some evidence that the general public tends not to seek out skin cancer information on the Internet (Hay, Coups, Ford & DiBonaventura, 2009), relying instead on coverage in magazines, newspapers and on television (Hay et al., 2009). This may be because the public receives skin cancer information passively; those who are actively seek health information often use the Internet primarily (Dutta-Bergman, 2004). Because the general public has low perceived risk of skin cancer and generally considers it to be not a serious disease, passive consumption of media coverage may be a more important source of information about skin cancer and tanning.

Finally, only English-language magazines were included in the sample. Magazines published in other languages (notably French-language in Quebec) may have contained somewhat different information about skin cancer and recreational tanning.

9.8.2 Limitations of Content of Sample

This research focused on editorial content only, and not advertisements (e.g., self-tanning lotion, sunscreens, tanning beds, etc.). Restricting the work to editorial content ensured it could be examined for the types of information most relevant to this research (risk factors, screening, UV behaviours, and constructs of the Health Belief Model). There was, however, an increase in the promotion of sunscreen use over time, which may reflect a growing market for this product. Studies focused on advertising of skin cancer related products (i.e., sunscreens) in U.S. parenting magazines and women's health and fitness magazines found that relatively few advertisements

focused on products to protect the skin from UV radiation (Basch, 2014; Basch 2013). Future research could be designed to examine articles and advertisements in parallel to determine how they inform each other; it is not uncommon for health-related editorial content to be influenced by advertisements (Warner, Goldenhar, & McLaughlin, 1992) and pressures from advertisers can influence mass print media editorial content (An & Bergen, 2007).

There were, and continue to be, difficulties in assessing visual images. Visuals can be more subjective than text to apprise and, unlike text, there are few tools to guide use or analysis in health communication contexts. This was true for coding some variables in these studies, such as whether an image promoted tanning or not. Further, the perception of images can be influenced by a number of factors, including characteristics of the viewer (Rose, 2013). These may include gender, age, race/ethnicity, socioeconomic status, and personal experiences during the life course. Subjectivity and potential for bias was reduced by creating a detailed codebook and assessing inter-coder reliability. While there are challenges of assessing visuals compared to text, this should not outweigh the importance of including them in health communication and media analysis research and practice.

9.8.3 Limitations to Methodological Approaches

The results of the comparisons focused on the differences in proportion (percentage) between the variables of interest (e.g., women vs. men's magazines, before vs. after the 2006 IARC report). Chi-square analyses have been used routinely in other comparative content analysis research (Scully et al., 2014; Mayer, Swetter, Guild, & Geller, 2014; Heuer, McClure, & Puhl, 2011) and are a recommended non-parametric statistical test for content analyses (Riffe et al., 2013). While comparing the proportion of coverage is important, so too are the absolute

numbers of articles and images. For example, there were cases where the numbers differed (light skin as a risk factor was reported on in 58 articles in women's magazines vs. 17 articles in men's magazines) although the proportions did not differ (12.9% vs. 13.7%). This was due to the fact that there were many more articles in women's compared to men's magazines about skin cancer and tanning. The focus on percentage was necessary to allow comparison of the two target audiences. Nevertheless, the findings on comparisons of proportions between men's and women's magazine coverage should be interpreted together with the findings on total numbers of articles and images.

A significant proviso of this work is that is primarily a quantitative content analysis rather than a qualitative (thematic) one. The findings therefore offer little insight into the deeper meaning of the text and construction of messages in the images around skin cancer and tanning in magazines. A rich, detailed qualitative analysis of manifest and latent themes would have enhanced the results and uncovered new and different findings than the directed, quantitative content analyses. Thematic analysis is an important type of analysis for articles and images in health research (Bourgeault, Dingwall, & de Vries, 2010) and will be an important type of analysis to conduct on this dataset in future work. Nevertheless, directed quantitative content analysis research is a widely-accepted and standard approach to media analysis and an effective first step in identifying issues with coverage on particular health topics (Riffe, Lacy, & Fico, 2013).

9.8.4 Theoretical Limitations

There are several considerations related to the theoretical approaches utilized. Studies 1 through 5 were guided by Agenda Setting Theory (AST). Other behavioural and communication

theories may have given different insights and findings regarding how skin cancer information is conveyed in magazines. For example, active audience theory (Chandler & Munday, 2011) suggests that readers are actively involved with making meaning from the information they receive from magazines. A reader who recently had a friend diagnosed with melanoma may attend more to early detection information, while a reader who has suffered a sunburn may be more influenced by content around sunscreen use. AST, on the other hand, assumes a more passive audience. How audiences interpret media messages (passively, actively, or a combination of both) around these public health issues will be an interesting area to explore in future research. The Health Belief Model (HBM) has been used in and validated for health information, including media print information (Janz & Becker, 1984), but it has not been validated for use on visual images. The application of HBM constructs to images (i.e., Study 6) will require validation to ensure constructs carry-over to images successfully. Further, while the HBM informed coding of article text and images in Study 6, there are some limitations of this theory to predict behaviour (Jones, Smith, & Llewellyn, 2013), which are also limitations of this content analysis research. Nevertheless, the HBM was selected because it is commonly applied to preventative health behaviours (Conner & Norman, 1996), to screening behaviours (Champion & Skinner, 2008), and because several HBM constructs are linked to skin cancer-related behaviours (Mahler et al., 2003; Mahler et al., 1997; Jackson & Aiken, 2000).

9.8.5 Limitations of Potential Impact

Although it was found that coverage after the 2006 IARC report changed modestly, causation could not be determined owing to the nature of the data. This is a limitation of all content analysis research (Riffe et al., 2013). Nevertheless, it remains an important finding that

there were few changes over time relative to the key public health report and carcinogenic classification around the dangers of indoor tanning.

While this research has highlighted clear gaps and problems in media reporting on these issues, the work does not establish that this is the reason public knowledge and behaviours in connection to skin cancer are poor. Moreover, because the study was archival text- and image-based, the impact of media coverage on the public's knowledge, attitudes, or behaviours was not addressed. However, theories (AST and HBM) and previous research suggest that the media can influence people regarding skin cancer and tanning intentions and behaviours.

9.9 Directions for Future Research

There are a number of areas for further study to widen and deepen what is known about media reporting on skin cancer and tanning. These include: studying skin cancer and tanning media coverage using a more qualitative approach, examining the focus on celebrity and the risks of skin cancer for dark skin, assessing advertisements, studying coverage in newspapers and in online and social media, and investigating the behavioural impact of skin cancer and tanning coverage on the public. In addition, developing tools to facilitate analysis of visuals in health communication contexts are also important moving forward.

9.9.1 Qualitative Approaches

Although this doctoral research draws on qualitative and quantitative methodologies, the emphasis was on quantitative reporting of risk factors, behaviours, and early detection information. While the findings using the HBM (Study 6) were arguably the most "qualitative",

it was still predominately quantitative in the reporting of the results. Further research in the form of open-coded thematic analysis, would help to uncover new types of information and findings which were overlooked by the directed content analysis methodology. It is anticipated that a thematic, qualitative approach will be undertaken in future analyses of this data set.

9.9.2 Celebrity Focus

Few articles mentioned celebrities (9%). When celebrities were mentioned, the focus was on reporting these individuals as being tanned or pale, rather than on a skin cancer diagnosis. There were a very small number of articles mentioning somewhat higher-profile individuals who had skin cancer, but these individuals would likely only be known to certain sub-groups of the population (e.g., a body builder in one of the weight-training men's magazines may be well-known amongst fellow body-builders). Given that coverage of celebrities with particular types of cancer can drive cancer screening and treatment behaviours (Chapman et al., 2005; Cram et al., 2003; Metcalfe et al., 2010; Kamenova et al, 2013; Sunnybrook Health Sciences Centre, 2013; Evans et al, 2013), and such coverage is common for cancers other than melanoma, this lack of celebrity focus was unexpected. This is also a worthy area of future research on media coverage of skin cancer. It is suspected that the public disclosure of skin cancer cases by widely-known, mainstream celebrities – such as Hugh Jackman in 2013 and 2014 – may lead to greater reporting in the mass media. Jackman's disclosure of being diagnosed with skin cancer occurred after the study timeframe and thus would not have influenced the findings of this research. Harnessing the power of celebrity may be an important area for heath communicators to pursue in connection with skin cancer as it may help to shape beauty ideals, prevention behaviours, and early detection and screening for the disease.

9.9.3 Risks of Skin Cancer for Dark Skin

Although people with light coloured skin are at greater risk of melanoma, people with dark skin are more likely to die from the disease, partly reflecting later detection (Cress & Holly, 1997; Clairwood, Ricketts, Grant-Kels, & Gonslaves, 2014). There was little focus in the magazines on the risks associated for melanoma among those with dark skin; the most common ethnicity in images was Caucasian and few articles mentioned dark skin and melanoma. A more in-depth analysis of this is warranted, given the public misunderstanding that people with dark skin are not susceptible to skin cancer. Future research should also explore reporting on skin cancer in magazines with readership that is predominately aimed at visible minorities (e.g., *Ebony* for African Americans). Also important to study further is the extent of media coverage on Bob Marley's death from melanoma and whether this influenced either skin cancer coverage in general, or actual screening behaviours. Further, attention to images is also pertinent to study because previous research has shown that depicting skin cancer in people with darker skin types helps to shape the perception of the risk that skin cancer affects all people, regardless of skin colouring (Robinson et al., 2011; Guevara et al., 2015; Kundu et al., 2010) and ethnic minorities are discouraged from reading skin cancer information when images do not feature people of their own ethnicity (Robinson et al., 2011).

9.9.4 Other Media Content

Research is needed in connection with advertising of products related to skin cancer and tanning, including sunscreens and self-tanners. It will be crucial to learn more about how the tanning industry markets its services to consumers. The tanning industry primarily targets women and teens (Team & Markovic, 2006; Greenman & Jones, 2009) and there are many

similarities between advertising strategies utilized by the indoor tanning and tobacco industries, such as using celebrities, downplaying health risks, and associating the product with being fashionable (Greenman & Jones, 2009). Both assessing advertising for skin cancer related consumer goods and developing strategies and policies to control how the tanning industry can market its carcinogenic service will be important to investigate.

Another area for future study will be to examine how newspapers (print and online) report on the topics of skin cancer and tanning. This is especially true for the Canadian context because Canadian newspapers have never been studied for this type of coverage. There is evidence that newspapers set the cancer-reporting agenda of other general interest mass print media publications, such as magazines (Henderson & Kitzinger, 1999). It may be possible that newspapers report on skin cancer and tanning differently than popular magazines and would be more sensitive to related public health reports and decisions. Local newspaper reporting on skin protection and the risks of indoor tanning increased in association with the California indoor tanning bed ban for minors (Mayer et al., 2014). It would also be interesting to measure whether the 2014 U.S. Surgeon General's report on skin cancer prevention and the Canadian Cancer Society's skin cancer-focused statistical report from 2014 were associated with any changes in North American newspaper coverage of skin cancer and UV exposure.

9.9.5 Online and Social Media

Future research on how skin cancer and tanning is reported in online media (e.g., web version of traditional magazines and news) and on social media (e.g., Twitter) will also be important. There is currently only one study about skin cancer or tanning on social media. Wehner et al. (2014) investigated the frequency of mentions of indoor tanning on Twitter during

a two-week time period in March and April of 2013: 154,496 tweets mentioned indoor tanning during this time, but only a very small percentage of these mentioned any the associated health risks (e.g., less than 3% mentioned skin cancer). Similar findings about the Movember Canada campaign and the lack of health information on prostate and testicular cancers on Twitter have recently been reported (Bravo & Hoffman-Goetz, 2015). Hence, a more comprehensive and detailed analysis of skin cancer issues on social media may help to shed light on useful findings for how this type of communication channel facilitates or inhibits cancer prevention messaging.

It would be particularly interesting to examine the impact of celebrity cases of skin cancer on social media content. As noted previously, Hollywood actor and celebrity Hugh Jackman was first diagnosed with non-melanoma skin cancer in 2013 and twice more since then; he announced his diagnosis on Twitter (Jackman, 2013a) and simultaneously shared a photograph of himself with his nose bandaged post-treatment on Instagram (Jackman, 2013b). The tweet was re-tweeted 2,495 times and the Instragram image was "liked" over 29,000 times (Jackman, 2013a, 2013b). From there, mainstream media, including magazines, began reporting on his diagnosis (Donahue, 2014). Online and social media are largely untapped communication channels regarding the investigation of skin cancer content, including how it feeds into or drives mainstream media coverage, and will be a very valuable area to study in the future.

Not only will the topic of skin cancer be important to examine on social media, but so too will be themes of beauty and appearance as they relate to UV exposure (e.g., the tanned beauty ideal, photoaging). It is plausible that image-sharing social media sites, such as Instragram, hold a similar role in the social construction of beauty ideals as magazines do. For example, a search of images "tagged" with hashtag "#tan" on Instargram resulted in 8,480,428 image posts. By comparison, a search for Instagram images tagged with "#pale" resulted in roughly half as many

image posts: 4,306,979. Such large volumes of visual content related to tans may promote the tanned look as attractive and, in turn, encourage unhealthy UV exposure behaviours. However, while there were fewer images tagged with "#pale" compared to "#tan", the volume of such images is still significant. This could point to the possibility that participatory, active media sites, such as Instragram, might be allow for niche or alternative aesthetics to expand in popularity and visual consumption.

In addition to examining still images in online media, it will also be important to consider video communication about skin cancer and UV exposure. One very interesting example of this is a three-minute film called "How the Sun Sees You", which went "viral" in 2014 and has had over 14,800,000 views on YouTube (Leveritt, 2014), The film's creator, Thomas Leveritt, used UV photography techniques to enable viewers to see UV-related damage to the skin which is not normally visible to the naked eye; this photography technique also allowed sunscreen to appear opaque in the film, enabling viewers to see how sunscreen blocks UV radiation from reaching the skin. The magazine content evaluated in this doctoral research contained very few UV photographs, and yet these are effective tools to motivate safer UV exposure behaviours (Mahler et al., 2003, Mahler et al., 2005; Walsh & Stock, 2012; McWhirter & Hoffman-Goetz, 2013). Given the extensive reach of this YouTube video, it is possible that the video could have a positive influence on motivating UV avoidance and protection behaviours. There is no research on how topics of tanning and UV exposure are covered on online video-sharing websites, such as YouTube and Vimeo, although information about other cancer-related topics have been studied (Broines, Nan, Madden & Waks, 2011).

9.9.6 Behavioural Impact

Future work should investigate the impact of media coverage about skin cancer and tanning on the public's related knowledge, attitudes, and behaviours. While this research has highlighted clear gaps and problems in media reporting on these public health issues, the current studies do not measure the impact of content on individual or population-level behaviours. While establishing causality between media coverage and skin protection behaviours would not be possible, certain methodologies, such as those utilized by Dixon and colleagues (2014), will help to establish correlation. The results of such correlations may help to guide future reporting and health communication efforts related to skin cancer and tanning.

9.9.7 Visual Health Communication Tools

Finally, the findings from this doctoral research, as well as research leading up to it, suggest there is a need to develop, test, and validate visual health communication tools which can be used to assess visual images either alone or accompanying text information, as well as guide their use in health communication practice. These tools may be as focused as a validated visual image guide for assessing suntanned skin in images or as broad as a general-use tool to provide guidance on how to select imagery for any health communication context.

9.10 Summary and Conclusions

Magazines are important channels for dissemination of health information, including about skin cancer and tanning. Magazines also broadcast standards of beauty, including regarding tanned skin. This doctoral research is the largest quantitative content analysis on

magazine coverage of skin cancer and tanning to date and one of the only ones to include visual images as a source of information, in addition to article text. This work is also the first investigation into the volume and nature of skin cancer and tanning reporting in Canadian mass media and media targeting men.

There were clear and visible tensions in the magazine coverage between communicating health information (e.g., risk) and social norms/beauty ideals (e.g., tanned skin). Positive aspects of reporting included frequent coverage of UV exposure as a risk factor and significant content encouraging the use of sunscreen as a preventative behaviour. Significant gaps in reporting included an absence of other important risk factors for skin cancer, little attention on other prevention strategies, particularly solar or artificial UV avoidance, and a lack of coverage on early detection. There was also considerable room for improvement in how skin cancer is described, namely with respect to the Health Belief Model. Importantly, more (and in-depth) coverage of skin cancer and tanning is especially needed in media targeting both men and young adults.

Given what is known about the role of the mass media in influencing people's health knowledge, attitudes, and behaviours (Dixon, Warne, Scully, Dobbinson, & Wakfield, 2014) and key findings about gaps and issues in media reporting on skin cancer and tanning presented in the studies which comprise this doctoral thesis, it is possible that magazine skin cancer and tanning content may be a contributing factor to inaccurate public understanding of skin cancer risks, prevention, and early detection (Buster, You, Fouad, & Elmets, 2010; Wehner et al., 2014; Buller et al., 2014). Magazine content about skin cancer and tanning also may not contain sufficient information to influence healthy skin behaviours among the public or to enable action. Cancer educators, health communication specialists, public health practitioners, and journalists

need to work together to improve media messages around skin cancer and tanning and counter potentially harmful messages through public health initiatives, campaigns, and policies. With increased and improved media reporting on skin cancer and recreational tanning, including through effective visual health communication, it may be possible to indirectly but significantly influence public knowledge, attitudes, and behaviours around these important public health issues. Ultimately, the hope of such enhanced media attention and increased public knowledge is to promote important public health policies to protect people from the dangers of indoor tanning and reduce the burden of skin cancer.

9.11 References

Aldridge, R. B., Zanotto, M., Ballerini, L., Fisher, R. B., Rees, J. L. (2011). Novice identification of melanoma: not quite as straightforward as the ABCDs. *Acta Dermato-Venereologica, 91*, 125-30.

American Cancer Society (2015). *Melanoma Skin Cancer: What are the key statistics about melanoma skin cancer?* Retrieved from http://www.cancer.org/cancer/skincancer-melanoma/detailedguide/melanoma-skin-cancer-key-statistics

An, S. & Bergen, L. (2007). Advertiser pressure on daily newspapers: A survey of advertising sales executives. *Journal of Advertising, 36*, 111-121.

Auster, J., Hurst, C., Neale, R. E., Youl, P., Whiteman, D. C., Baade, P., & Janda, M. (2013). Determinants of uptake of whole-body skin self-examination in older men. *Behavioral Medicine, 39*, 36-43.

Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. New York, NY: W. H. Freeman.

Bandura, A. (1998). Health promotion from the perspective of Social Cognitive Theory. *Psychology and Health, 13*, 623-649.

Basch, C. H., Ethan, D., Hillyer, G. C., & Berdnik, A. (2014). Skin cancer prevention coverage in popular US women's health and fitness magazines: an analysis of advertisements and articles. *Global Journal of Health Sciences, 6*, 42-48.

Basch, C. H., Hillyer, G. C., Ethan, D., Berdnik, A., & Basch, C. E. (2014). Tanning shade gradations of models in mainstream fitness and muscle enthusiast magazines: Implications for skin cancer prevention in men. *American Journal of Men's Health*, doi: 10.1177/1557988314543511

Basch, C. H., Hillyer, G. C., & Basch, C. E. (2013). Descriptive analysis of articles and advertisements pertaining to skin cancer prevention in 2 popular US parenting magazines, 2000-2010. *Preventing Chronic Disease*, 10, E48.

Bourgeault, I., Dingwall, R., & de Vries, R. (2010). *The SAGE Handbook of Qualitative Methods in Health Research*. Thousand Oaks, California: SAGE Publications Inc.

Bravo, C. A. & Hoffman-Goetz, L. (2015). Tweeting about prostate and testicular cancers: Do Twitter conversations and the 2013 Movember Canada campaign objectives align? *Journal of Cancer Education*. doi: 10.1007/s13187-015-0796-1

Broines, R., Nan, X., Madden, K., & Waks, L. (2011). When vaccines go viral: An analysis of HPV vaccine coverage on YouTube. *Health Communication, 27*, 478-485.

Buller, D. B., Cokkinides, V., Hall, H. I., Hartman, A. M., Saraiya, M., Miller, E., Paddock, L., & Glanz, K. (2011). Prevalence of sunburn, sun protection, and indoor tanning behaviors among Americans: Review from national surveys and case studies of 3 states. *Journal of the American Academy of Dermatology, 65,* S114.e1-S114-e11.

Buster, K. J., You, Z., Fouad, M., & Elmets, C. (2012). Skin cancer risk perceptions: a comparison across ethnicity, age, education, gender, and income. *Journal of the American Academy of Dermatology, 66,* 771-779.

Cameron, L. D., Pepper, J. K., & Brewer, N. T. (2015). Responses of young adults to graphic warning labels for cigarette packages. *Tobacco Control, 24,* e14-e22.

Canadian Cancer Society's Advisory Committee on Cancer Statistics. (2014). Canadian Cancer Statistics 2014. Chapter 7: Special Topic: Skin cancers. Toronto, ON: Canadian Cancer Society, 2014. Retrieved from http://www.cancer.ca/~/media/cancer.ca/CW/cancer%20information/cancer%20101/Canadian%20cancer%20statistics/Canadian-Cancer-Statistics-2014-EN.pdf

Castillo, M. (August 20 2013). Study: 29 percent of high school girls indoor tan despite risks. *CBS News*. Retrieved from http://www.cbsnews.com/news/study-29-percent-of-high-school-girls-indoor-tan-despite-risks/

Centers for Disease Control and Prevention. (2012). Sunburn and sun protective behaviors among adults aged 18-29 years—United States, 2000-2010. *Morbidity and Mortality Weekly Report, 61,* 317--322.

Chandler, D. & Munday, R. (2011). *A Dictionary of Media and Communication* (pp. 3). Oxford, England: Oxford University Press.

Chang, C., Murzaku, E. C., Penn, L., Abassi, N. R., Davis, P. D., Berwick, M., & Polsky, D. (2014). More skin, more sun, more tan, more melanoma. *American Journal of Public Health, 104,* e92-e99.

Chapman, S., McLeod, K., Wakefield, M., & Holding, S. (2005). Impact of news of celebrity illness on breast cancer screening: Kylie Minogue's breast cancer diagnosis. *Medical Journal of Australia, 183,* 247-250.

Cho, H. & Choi, J. (2011). Television, gender norms, and tanning attitudes and intentions in young men and women. *Communication Studies, 62,* 508-530.

Chow, E. Y. & Searles, G. E. (2010). The amazing vanishing Canadian dermatologist: results from the 2006 Canadian Dermatology Association member survey. *Journal of Cutaneous Medicine and Surgery, 14,* 71-79.

Clairwood, M., Ricketts, J., Grant-Kels, J., & Gonslaves, L. (2014). Melanoma in skin of color in Connecticut: an analysis of melanoma incidence and stage at diagnosis in non-Hispanic

blacks, non-Hispanic whites, and Hispanics. *International Journal of Dermatology*, *53*, 425-433.

Cokkinides, V, Kirkland, D., Andrews, K., Sullivan, K., & Lichtenfeld, J.L. (2011). A profile of skin cancer prevention media coverage 2009. *Journal of the American Academy of Dermatology*, *67*, 570-575.

Cokkinides, V., Weinstick, M., Glanz, K., Albano, J., Ward, E., & Thun, M. (2006). Trends in sunburns, sun protection practices, and attitudes toward sun exposure protection and tanning among US adolescents, 1998 to 2004. *Pediatrics, 118*, 853-864.

Cram, P., Fendrick, A. M., Inadomi, J., Cowen, M. E., Carpenter, D., & Vijan, S. (2003). The impact of celebrity promotional campaign on the use of colon cancer screening: The Katie Couric Effect. *Archives of Internal Medicine*, *163*, 1601-1605.

Cress, R. D. & Holly, E. A. (1997). Incidence of cutaneous melanoma among non-Hispanic whites, Hispanics, Asians, and blacks: an analysis of California cancer registry data, 1988-93. *Cancer Causes & Control*, *8*, 246-252.

De, P. (September 9, 2014). 10 Everyday Ways to Lower Your Risk of Cancer. *Huffington Post*. Retrieved from http://www.huffingtonpost.ca/prithwish-de-phd/lower-cancer-risk_b_5790336.html?utm_hp_ref=tw

Dixon, H. G., Warne, C. D., Scully, M. L., Wakefield, M. A., & Dobbinson, S. J. (2011). Does the portrayal of tanning in Australian women's magazines relate to real women's tanning beliefs and behavior? *Health Education & Behavior*, *38*, 132-142.

Dixon, H., Warne, C., Scully, M., Dobbinson, S., & Wakefield, M. (2014). Agenda-setting effects of sun-related news coverage of public attitudes and beliefs about tanning and skin cancer. *Health Communication*, *29*, 173-181.

Donahue, K. (May 12, 2014.) Wolverine's All-Too-Human Weakness. *Men's Health Magazine*. Retrieved from http://www.menshealth.com/health/wolverine-s-all-too-human-weakness

Downs, A. (1972). Up and down with ecology: the issue attention cycle. *The Public Interest*, *28*, 38-40.

Dutta-Bergman, M. J. (2004). Primary sources of health information: Comparisons in the domain of health attitudes, health cognitions, and health behaviors. *Health Communication*, *16*, 273-288.

El Ghissassi, F., Baan, R., Straif, K., Grosse, Y., Secretan, B., Bouvard, V. *et al*. (2009). A review of human carcinogens—Part D: radiation. *Lancet Oncology*, *10*, 751-752.

Evans, D. G. R., Barwell, J., Eccles, D. M., Collins, A., Izatt, L., Jacobs, C., … Murray, A. (2013). The Angelina Jolie effect: how high celebrity profile can have a major impact on

provision of cancer related services. *Breast Cancer Research*, *16*, 442, doi 10.1186/s13058-014-0442-6

Garside, R., Pearson, M., & Moxham, T. (2010). What influences the uptake of information to prevent skin cancer? A systematic review and synthesis of qualitative research. *Health Education Research*, *25*, 162-182.

Girgis, A., Campbell, E., Redman, S., & Sanson-Fisher, R. (1991). Screening for melanoma: A community survey of prevalence and predictors. *Medical Journal of Australia, 154*, 338-343.

Godar, D. E., Wengraitis, S. P., Shreffler, J., & Sliney, D. H. (2001). UV doses of Americans. *Photochemistry and Photobiology, 73*, 621-629.

Guevara, Y., Gaber, R., Clayman, M. L., Gordon, E. J., Friedwald, J., & Robinson, J. K. (2015). Sun protection education for diverse audiences: Need for skin cancer pictures. *Journal of Cancer Education*, *30*, 187-189.

Hammond, D. (2011). Health warning messages on tobacco products: a review. *Tobacco Control*, *20*, 327-337.

Hay, J., Coups, E. J., Ford, J., & DiBonaventura, M. (2009). Exposure to mass media health information, skin cancer beliefs, and sun protection behaviors in a United States probability sample. *Journal of the American Academy of Dermatology, 61*, 783-792.

Health Canada (February 26, 2014a). Government of Canada announces stronger labelling requirements for tanning beds – Warning labels remind users about skin cancer risk [press release]. Retrieved from http://www.hc-sc.gc.ca/ahc-asc/media/nr-cp/_2014/2014-025-eng.php

Health Canada (2014b). *Guidelines for Tanning Salon Owner, Operators and Users: A Guideline published in collaboration with the Federal Provincial Territorial Radiation Protection Committee*. Cat. No. H129-41/2014E-DPF. Ottawa, ON. Retrieved from http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/tan-bronzage/index-eng.php#appe

Henderson, L. & Kitzinger, J. (1999). The human drama of genetics: 'hard' and 'soft' media representations of inherited breast cancer. *Sociology of Health & Illness, 21*, 560-578.

Heuer, C. A., McClure, K. J., Puhl, R. M. (2011). Obesity stigma in online news: A visual content analysis. *Journal of Health Communication: International Perspectives*, *16*, 976-987.

Hoffman-Goetz, L., Donelle, L., & Ahmed, R. (2014). *Health Literacy in Canada: A Primer for Students*. Toronto, ON: Canadian Scholars Press Inc.

Houts, P. S., Doak, C. C., Doak, L. G., & Loscalzo, M. J. (2006). The role of pictures in improving health communication: A review of research on attention, comprehension, recall, and adherence. *Patient Education and Counseling, 61*, 173-190.

Huang, J., Chaloupka, F. J., & Fong, G. T. (2014). Cigarette graphic warning labels and smoking prevalence in Canada: a critical examination and reformulation of the FDA regulatory impact analysis. *Tobacco Control*, *23*, i7-i12.

Hunt Y, Augustson E, Rutten L, Moser R, Yaroch A (2012). History and Culture of Tanning in the United States. In *Shedding Light on Indoor Tanning*. Edited by Heckman CJ, Manne SL. New York, NY: Springer Science+Business Media. Retrieved from http://www.springer.com/biomed/cancer/book/978-94-007-2047-3

Jackman, H. [therealhughjackman] (November 21, 2013a). Deb said to get the mark on my nose checked. Boy, was she right! I had a basil cell carcinoma. Please…https://instagram.com/p/g_GQqMChOX/ [Tweet]. Retrieved from https://twitter.com/realhughjackman/status/403584376975683584

Jackman, H. [therealhughjackman] (November 21, 2013b). Deb said to get the mark on my nose checked. Boy, was she right! I had a basil cell carcinoma. Please don't be foolish like me. Get yourself checked. And USE sunscreen!!! [Instagram post]. Retrieved from: https://instagram.com/p/g_GQqMChOX/

Jackson, K. M. & Aiken, L. S. (2000). A psychosocial model of sun protection and sunbathing in young women: The impact of health beliefs, attitudes, norms, and self-efficacy for sun protection. *Health Psychology*, *19*, 469-478.

Janz, N. K. & Becker, M. H. (1984) The Health Belief Model: A decade later. *Health Education Quarterly, 11*, 1-47.

Jones, C. J., Smith, H., & Llewellyn, C. (2013). Evaluating the effectiveness of health belief model interventions in improving adherence: a systematic review. *Health Psychology Review, 8*, 253-269.

Juszczyk, D., Gillison, F. B., & Dean, S. (2014). Can media images of obese people undermine health messages? An experimental study on visual representation and risk perception. *The European Journal of Public Health, 24*, 930-935.

Kamenova, K., Reshef, A., & Caulfield, T. (2013). Angelina Jolie's faulty gene: newspaper coverage of a celebrity's preventive bilateral mastectomy in Canada, the United States, and the United Kingdom. *Genetics in Medicine, 16*, 522-528.

Kang, H. & Walsh-Childers, K. (2014). Sun-care product advertising in parenting magazines: What information does it provide about sun protection? *Health Communication*, *29*, 1-12.

Kasparian, N. A., McLoone, J. K., & Meiser, B. (2009). Skin cancer-related prevention and screening behaviors: a review of the literature. *Journal of Behavioural Medicine, 32,* 406-428.

Kosicki, G. M. (1993). Problems and opportunities in agenda-setting research. *Journal of Communication, 43,* 100-127.

Kundu, R. V., Kamaria, M., Oritz, S., West, D. P., Rademaker, A. W., & Robinson, J. K. (2010). Effectiveness of knowledge-based intervention for melanoma among those with ethnic skin. *Journal of the American Academy of Dermatology, 62,* 777-784.

Lee, E.T., O'Riordan, D., Swetter, S.M., Demierre, M.F., Brooks, K., & Geller, A.C. (2006). Sun care advertising in popular U.S. magazines. *American Journal of Health Promotion, 20,* 349-352.

Leveritt, T. (2014). *How the Sun Sees You*. Video available at: https://www.youtube.com/watch?v=o9BqrSAHbTc&feature=youtu.be

Lovejoy, J., Riffe, D., & Lovejoy, T. I. (2014). An examination of direct and indirect effects of exposure and attention to health media on intentions to avoid unprotected sun exposure. *Health Communication, 30,* 261-270.

Lowe, C. F., Horne, P. J., Tapper, K., Bowdery, M., & Egerton, C. (2004). Effects of a peer modelling and rewards-based intervention to increase fruit and vegetable consumption in children. *European Journal of Clinical Nutrition, 58,* 510-522.

Mahler, H. I. M., Fitzpatrick, B., Parker, P., & Lapin, A. (1997). The relative effects of a health-based versus an appearance-based intervention designed to increase sunscreen use. *American Journal of Health Promotion, 11,* 426-429.

Mahler, H. I. M., Kulik, J. A., Gibbons, F. X., Gerrard, M., & Harrell, J. (2003) Effects of appearance-based interventions on sun protection intentions and self-reported behaviors. *Health Psychology, 22,* 199-209.

Mahler, H. I. M., Kulik, J. A., Harrell, J., Correa, A., Gibbons, F. X., & Gerrard, M. (2005). Effects of UV photographs, photoaging information, and use of sunless tanning lotion on sun protection behaviors. *Archives of Dermatology, 141,* 373-380.

Mayer, J. E., Swetter, S. M., Fu, T., & Geller, A. C. (2014). Screening, early detection, education, and trends for melanoma: Current status (2007-2013) and future directions. Part II. Screening, education, and future directions. *Journal of the American Academy of Dermatology* DOI: 10.1016/j.jaad.2014.05.045

Mayer, J. E., Swetter, S. M., Guild, S., & Geller, A. C. (2014). The impact of indoor tanning legislation: Newspaper coverage of the risks of indoor tanning before and after the California indoor tanning ban for minors. *Journal of Cancer Education, 30,* 124-129.

McCauly, M. P., Blake, J. D., Meissner, H. I., & Viswanath, K. (2013). The social group influences of US health journalists and their impact on the newsmaking process. *Health Education Research, 28,* 339-351.

McCombs, M. E. & Shaw, D. L. (1972). The agenda-setting function of mass media. *Public Opinion Quarterly, 36*(Summer), 176-187.

McWhirter, J. E. & Hoffman-Goetz, L. (2013). Visual images for patient skin self-examination and melanoma detection: A systematic review of published studies. *Journal of the American Academy of Dermatology, 69,* 47-55.

Meppelink, C. S. & Bol, N. (2015). Exploring the role of health literacy on attention to and recall of text-illustrated health information: An eye-tracking study. *Computers in Human Behavior, 48,* 87-93.

Metcalfe, D., Price, C., & Powell, J. (2010). Media coverage and public reaction to a celebrity cancer diagnosis. *Journal of Public Health, 33,* 80-85.

Michielutte, R., Bahson, J., Digman, M. B., & Schroeder, E. (1992). The use of illustrations and narrative text style to improve readability of a health education brochure. *Journal of Cancer Education, 7,* 251–260.

Oliveria, S. A., Christos, P. J., Halpern, A. C., Fine, J. A., Barnhill, R. L., & Berwick, M. (1999). Evaluation of factors associated with skin self-examination. *Cancer Epidemiology, Biomarkers and Prevention, 8,* 971–978.

Ontario Media Development Corporation (2015). *Industry Profile: Magazine Publishing*. Retrieved from http://www.omdc.on.ca/Assets/Industry+Profile/Magazine/Industry+Profile+Magazine_en.pdf

Pierce, J.P. & Gilpin, E.A. (2001). News media coverage of smoking and health is associated with changes in population rates of smoking cessation but not initiation. *Tobacco Control, 10,* 145-153.

Randolph, W. & Viswanath, K. (2004). Lessons learned from public health mass media campaigns: Marketing health in a crowded media world. *Annual Review of Public Health, 25,* 419-437.

Riffe, D., Lacy, S., & Fico, F. (2013). *Analyzing Media Messages: Using Quantitative Content Analysis in Research*. 3rd edition. New York, NY: Routledge.

Rose, G. (2013). *Visual Methodologies: An Introduction to Researching with Visual Materials*. Thousand Oaks, CA: SAGE Publications.

Robinson, J. K., Joshi, K. M., Ortiz, S., & Kundu, R. V. (2011) Melanoma knowledge, perception, and awareness in ethnic minorities in Chicago: recommendations regarding education. *Psychooncology, 20*, 313–320

Rothman, A. J., Bartels, R. D., Wlaschin, J., & Salovey, P. (2006). The strategic use of gain- and loss-framed messages to promote healthy behavior: How theory can inform practice. *Journal of Communication, 56*, s202-s220.

Scully, M., Making, J., Maloney, S., & Wakefield, M. (2014). Changes in coverage of sun protection in the news: threats and opportunities from emerging issues. *Health Education Research, 29*, 378-387.

Scully, M., Makin, J., Maloney, S., & Wakefield, M. (2014). Changes in coverage of sun protection in the news: threats and opportunities from emerging issues. *Health Education Research*. doi: 10.1093/her/cyu013

Sinclair, C. A., Makin, J. K., Tang, A., Brozek, I., & Rock, V. (2014). The role of public health advocacy in achieving an outright ban on commercial tanning beds in Australia. *American Journal of Public Health*, 104, e7.

Stryker, J. E., Moriarty, C. M., & Jensen, J. D. (2008). Effects of newspaper coverage on public knowledge about modifiable cancer risks. *Health Communication, 23*, 380-390.

Stryker, J.E., Solky, B.A., Emmons, K.A. (2005). A content analysis of news coverage of skin cancer prevention and detection, 1979-2003. *Archives of Dermatology, 141*, 491-496.

Sunnybrook Health Sciences Centre (September 2, 2014). 'Angelina Effect' on breast cancer genetic screening [press release]. Retrieved from http://sunnybrook.ca/media/item.asp?c=1&i=1174&f=angelina-jolie-breast-cancer-genetic-screening

U.S. Food and Drug Administration (May 29, 2014). FDA to require warnings on sunlamp products [press release]. Retrieved from http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm399222.htm

Vainio H. & Bianchini, F. (2001). *Handbook of cancer prevention.* Lyon, France: International Agency for Research on Cancer.

Walsh, L. A. & Stock, M. L. (2011). UV photography, masculinity, and college men's sun protection cognitions. *Journal of Behavioral Medicine, 35*, 431-442.

Walsh, L. A. & Stock, M. L. (2012). UV photography, masculinity, and college men's sun protection cognitions. *Journal of Behavioral Medicine*, *35*, 431-432.

Warner, K. E., Goldenhar, L. M., & McLaughlin, C. G. (1992). Cigarette advertising and magazine coverage of the hazards of smoking: A statistical analysis. *New England Journal of Medicine*, *326*, 305-309.

Wehner, M. R., Chren, M-M., Shive, M. L., Resneck, J. S., Pagoto, S., Seidenberg, A. B., & Linos, E. (2014). Twitter: an opportunity for public health campaigns. *The Lancet*, *384*, 131-132.

Wehner, M. R., Chren, M. M., Nameth, D., Choudhry, A., Gaskins, M., Nead, K. T., Boscardin, W. J., & Linos, E. (2014). International prevalence of indoor tanning: A systematic review and meta-analysis. *JAMA Dermatology*, *150*, 390-400.

Whiteman, D. C., Whiteman, C. A., & Green, A. C. (2001). Childhood sun exposure as a risk factor for melanoma: a systematic review of epidemiologic studies. *Cancer Causes & Control*, *12*, 69-82.

World Health Organization & IARC (2006). *Exposure to Artificial UV Radiation and Skin Cancer.* Lyon, France: IARC Working Group. Retrieved from http://www.iarc.fr/en/publications/pdfs-online/wrk/wrk1/ArtificialUVRad&SkinCancer.pdf

Wu, S., Han, J., Laden, F., Qureshi, A. A. (2014). Long-term ultraviolet flux, other potential risk factors, and skin cancer risk: a cohort study. *Cancer Epidemiology, Biomarkers & Prevention*, *23*, 1080-1089.

Xie , Q. (V.) & Zhang, M. (2013). White or tan? A cross-cultural analysis of skin beauty advertisements between China and the United States. *Asian Journal of Communication*, *23*, 538-554.

APPENDIX A: FULL CODEBOOK

General Article Coding

Variables	Code Breakdown	Description
Article ID		Enter unique identified
Date		Enter date (month and year) article was published
Magazine		Enter title of periodical article was published in
Magazine Genre*	Women's (general) = 1 Women's (specific) =2 Women's (health) = 3 Men's (general)= 4 Men's (specific) = 5 Men's (health) = 6 Girl's = 7 News = 8	Enter magazine genre (women's, men's, girls', or news). Women's general: Good Housekeeping, Family Circle, Ladies Home Journal. Women's specific: Cosmo, Glamour, Vogue, Elle. Women's health: Women's Health, Shape, Self. Men's general: Esquire, Details, GQ. Men's specific: Sports Illustrated, Popular Science, Golf Digest, Field & Stream. Men's health: Men's Health, Men's Fitness, Muscle and Fitness. Girl's: Seventeen, Teen Vogue. News: Time, Newsweek, Maclean's.
Magazine Country	Canada = 1 United States = 2	Enter country magazine is published in
Words		Enter the number of words the article contains.
Pages		Number of pages the article takes up in the magazine. Do not count advertisements. Length should be coded as: 0.25 (applies to articles 0.25 pages or less), 0.5, 0.75, 1, 2, 3, etc.
Article focus	Skin Cancer = 1 Indoor Tanning = 2 Outdoor Tanning = 3 Indoor & outdoor tanning = 4 Spray Tanning/Fake Tan = 5 Bronzer (make-up) = 6 Sunscreen/protection = 7 Multiple = 8	Consider the main focus of the article as it relates to skin cancer or tanning.
Number Images		Enter the absolute number of images accompanying the article text. (If there are no images present, indicate 0: no image coding for that article will need to be completed.)

Pre/post 2006 IARC	No = 0 Yes = 1	Was the article published after the 2006 IARC report?
Pre/post 2009 classification	No = 0 Yes = 1	Was the article published after the 2009 carcinogen classification?
IARC report	No = 0 Yes = 1	This would include mentioning the report by name or mentioning the International Association for Research on Cancer (IARC)/WHO in reference to the key findings of the report (e.g., artificial UV exposure is linked to skin cancer, UV exposure from tanning beds is carcinogenic/cancer-causing). The IARC report was published in late 2006, so mentions of it will be published after that point.
IARC statistic	No = 0 Yes = 1	Does the article mention the statistic that the use of indoor tanning devices increases the risk of melanoma by 75%?
Skin Cancer Type	Melanoma = 1 Non-melanoma skin cancer = 2 Multiple (both) = 3 Nonspecific = 4 None/not applicable = 21 Other = 22	Indicate the main type of skin cancer discussed. If several are discussed, indicate "multiple". If skin cancer is discussed generically, indicate "non-specific". Non-melanoma skin cancers include basal cell and squamous cell carcinoma
Cancer Continuum	Prevention = 1 Detection = 2 Diagnosis = 3 Treatment = 4 Multiple = 5 None = 6	Indicate which aspect of the cancer continuum was the main focus of the article. Indicate "multiple" if several were discussed with equivalent emphasis. Detection refers to anything involved with first noticing the skin cancer (check-ups or skin self-exams). Diagnosis refers to the medical diagnosis of the skin cancer, biopsy, sharing that info with the patient, etc. If an article is about sunscreen, this would count as prevention.
UV Protection Slant	Positive = 1 Mixed = 2 Negative = 3 n/a = 21	Positive/pro UV protection would mean the text is entirely positive towards UV protection. Mixed would mean the text has both positive messages about UV protection and negative messages. Negative or anti-UV protection would mean the text is entirely negative towards UV protection. The text should be

	considered as a whole. N/a is for articles that do not mention an obvious stance on UV protection.

*categories were later collapsed into just four categories: women's, men's, girls', and news

General Image Coding

Variables	Code Breakdown	Description
Unique ID		Create and enter unique identifier based on title of article, date, and image number.
Accompanying Article ID		Enter unique identifier for article that the image accompanies.
Date		Enter date (month and year) image was published
Magazine Source Title		Enter title of periodical the image was published in
Magazine Genre	Women's (general) = 1 Women's (specific) =2 Women's (health) = 3 Men's (general)= 4 Men's (specific) = 5 Men's (health) = 6 Girl's = 7 News = 8	Enter magazine genre (women's, men's, girls', or news). Women's general: Good Housekeeping, Family Circle, Ladies Home Journal. Women's specific: Cosmo, Glamour, Vogue, Elle. Women's health: Women's Health, Shape, Self. Men's general: Esquire, Details, GQ. Men's specific: Sports Illustrated, Popular Science, Golf Digest, Field & Stream. Men's health: Men's Health, Men's Fitness, Muscle and Fitness. Girl's: Seventeen, Teen Vogue. News: Time, Newsweek, Maclean's.
Magazine Country	1 = Canada 2 = United States	Indicate which country the magazine is published within.
Image size	Less than quarter of a page = 1 Quarter of a page = 2 Half of a page = 3 Three-quarters of a page = 4 Full page = 5 Two page spread = 6	Indicate the approximate size of the image.
Relative size	Less than the text = 1 Equal to the text = 2 More than the text = 3	Relative to the space allocated for article text, indicate how much space the imagery (all image combined per article) occupies.
Image prominence	Not prominent = 0 Prominent =1	Images would be considered prominent if they are one quarter of a page in size or more and occur towards the start of the article text.
Image Type	Photograph =1 Illustration = 2 Diagram = 3 Other = 4	Indicate the type of image that accompanies the article.
Image Colour	Black and white = 1	Black and white images are

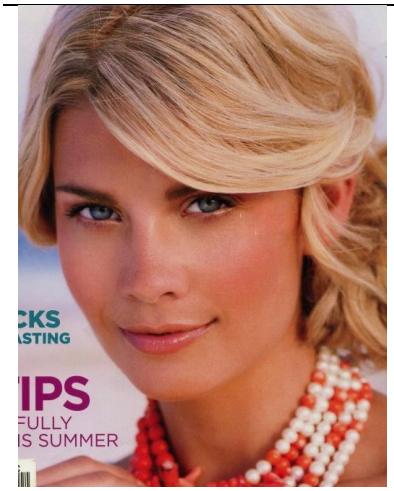
	Colour = 2	monochromatic. Colour images have the full spectrum of visible colours.
What was pictured	Object or scene = 1 Person or people = 2 Both = 3	Example of object or scene: beach or sunscreen bottle. Example of person or people: person at beach or people applying sunscreen.
Skin Cancer Type	Melanoma = 1 Non-melanoma skin cancer = 2 Multiple (both) = 3 Nonspecific = 4 None/not applicable = 21 Other = 22 Unable to determine = 20	Indicate the main type of skin cancer depicted, if visible. If several are depicted, indicate "multiple". If type of skin cancer is not noted, indicate "non-specific". Non-melanoma skin cancers include basal cell and squamous cell carcinoma. May need to use text or image captions to help determine the type of cancer shown.
Cancer Continuum	Prevention = 1 Detection = 2 Diagnosis = 3 Treatment = 4 Multiple = 5 None = 6 Palliative = 7	Indicate which aspect of the cancer continuum was the main focus of the image. Indicate "multiple" if several were depicted with equivalent emphasis. Detection refers to anything involved with first noticing the skin cancer (check-ups or skin self-exams). Diagnosis refers to the medical diagnosis of the skin cancer, biopsy, sharing that info with the patient, etc. If an image is of sunscreen, this would count as prevention.
Slant on UV protection	Positive = 1 Mixed = 2 Negative = 3 n/a = 21	Positive/pro UV protection would mean the image is entirely positive towards UV protection. Mixed would mean the image has both positive messages about UV protection and negative messages. Negative or anti-UV protection would mean the image is entirely negative towards UV protection. The image should be considered as a whole. N/a is for images that do not depict an obvious stance on UV protection.
Promotes solar UV exposure	No = 0 Yes = 1	Indicate whether the image promotes (depicts in a positive light) exposure to the sun (e.g., someone depicted sunbathing with a tan outside) Note: Bottles of sunscreen would not count as promoting UV exposure because there is no way to know whether their use is associated with significant exposure or not based on an image of a sunscreen bottle alone.

Tan level	No tan = 1 Light tan = 2 Dark Tan = Unable to determine = 20 n/a = 21	Indicate the tan level depicted/predominately emphasized. See visual guideline tool in table below. If multiple, choose whichever tan level most emphasized or promoted.
Pale look	No = 0 Yes = 1	Indicate whether the image promotes (depicts in a positive light) having pale skin. This could be someone attractive who has pale skin or a pale celebrity.
UV Photograph	No = 0 Yes = 1	Is the image depicted a UV photograph or not. These images are taken with special photographic techniques to help render physical damage to the skin visible. They are almost always black and white.
Graphic Image	0 = no 1 = yes (unsightly) 2 = yes (graphic)	Is the image that depicted considered an unsightly or graphic image? Unsightly images show unattractive moles or tiny scars. Graphic images show very unsightly cancers, open wounds, scars, body riddled with disease, etc. Graphic images are those that others will find threatening, upsetting, or scary. Unsightly images are those that others might find unattractive or a little bit "gross."
Other visual examples of skin cancers	No = 0 Yes = 1	These are visual examples (photographs) of skin cancer, but those which do not fit or illustrate the "ABCD" criteria. It could be, for example, just a single mole that is an "ugly duckling" (i.e., stands out as different, unusual, or unsightly)
Race/ethnicity	White/Caucasian =1 Black (e.g., African, Haitian, Jamaican) =2 East Asian (e.g., Chinese) = 3 Hispanic =4 Aboriginal = 5 Arab/West Asian (e.g., Egyptian, Armenian) = 6 South Asian (e.g., Indian) = 7 South East Asian (e.g., Thai) = 8 Mixed race/ethnicity = 9 Other = 18 Caucasian and other (group) = 19 Not applicable = 21 Unable to determine = 20	Indicate the race/ethnicity of the main subject pictured.

Facial expression or emotional tone	0 = neutral 1= positive 2 = negative 20 = unable to determine 21= n/a	Determine the emotional tone of the person pictured. This will be based primarily on their facial expression, but may also be partly inferred by their body language. Unable to determine would be for images where the face is not visible. N/a would be for products or images where no person is pictured.

Tan Levels: Visual Guidelines for Coding Images

Use this as a guide to determine tan level in images.

Visual Examples	Tan Level
	**No Tan (1).** There is no obvious or significant visual evidence of UV radiation exposure to the skin or spray tanning. Skin tone appears to be largely unaltered by any significant UV exposure or spray tanning. The visual suggestion of only very limited UV exposure or protected exposure.
	**Light Tan (2).** Some visual evidence of UV radiation exposure to the skin or spray tanning. Some might describe this as a "healthy glow." The visual suggestion of moderate UV exposure or use of self-tanners.
	**Dark Tan (3).** Obvious visual evidence of UV exposure to the skin or use of artificial tanners (sprays/lotion). A tan that is very noticeable. The visual suggestion of large amounts of time spent outdoors (sunbathing or working outdoors), or in tanning salons, or a very dark spray tan.

Codebook of Key Variables Related to Risk, UV Behaviours, and Early Detection in Article Text and Images*

For each article and image, code whether or not that variable is mentioned (for articles) or depicted (for images). If the variable is present code "1" for "yes"; if the variable is not present, code "0" for "no". Collect appropriate example quotes and image descriptions as appropriate.

Variable	Text Description 0 = no, 1 = yes	Image Description 0 = no, 1 = yes
Risk Factors		
UV exposure	Mention of UV exposure (solar or artificial) as risk factor for skin cancer (e.g., UV rays from the sun cause skin cancer)	Depiction of someone who has had skin cancer being exposed to UV radiation (e.g., depiction of someone diagnosed with skin cancer outdoors in the sun)
Light skin, hair, or eyes	Mention of having susceptible phenotype (light coloured hair, skin, or eyes) as risk factor for skin cancer (e.g., people with very fair skin are more prone to skin cancer)	Depiction of person who has had skin cancer with susceptible phenotype (e.g., a scar from skin cancer treatment on the body of a person with fair skin)
Moles	Mention of increased risk of skin cancer with abnormal moles or more than 50 moles (e.g., people with many moles are more likely get skin cancer)	Depiction of numerous or abnormal moles (e.g., images of abnormal-looking moles or image of a person with a large number of moles on their skin)
History of skin cancer	Mention of personal or family history of skin cancer as a risk factor (e.g., having had skin cancer before, or having a relative with skin cancer, raises the chances you will get skin cancer)	Depiction of recurrence of skin cancer or of family members affected by skin cancer (e.g., image of siblings both diagnosed with skin cancer)
Sunburns	Mention of sunburn as risk factor for skin cancer (e.g., sunburns increase the chances you will get skin cancer)	Depiction of someone with sunburn (i.e., red, blistered, or peeling skin), with some connection to skin cancer
Immune System/Medications	Mention of having a weakened immune system or taking certain medications as a risk factor (e.g., those who are on immune-suppressing medications after organ transplant have increased risk of skin cancer)	Depiction of having a weakened immune system or taking certain medications (e.g., photograph of medication that increases sun sensitivity)
UV Behaviours		
Tanned look	Promotes tanned ideal or having a tanned look (e.g., a tan is beautiful, sexy, or healthy-looking)	Depiction of a person with tanned skin (i.e., image of person depicted in a favourable way who appears to have skin darkened by UV

		exposure)
Self-tanners	Promotes use of self-tanners (lotions or sprays applied topically to produce appearance of suntan) (e.g., try a sunless tanner to fake a healthy glow)	Depiction of self-tanner, of someone applying self-tanner, or having a self-tan (for images of skin, there must be evidence the tan is from a self-tanner)
Solar UV avoidance	Promotes sun avoidance (e.g., avoid the sun during certain times of day)	Depiction of a person either not exposed to the sun or without suntan (e.g., depiction of a pale person indoors)
Discourages indoor tanning	Information discouraging the behaviour (e.g., it is dangerous, should be avoided, can cause deleterious health effects)	Negative depiction of indoor tanning (e.g., picture of a tanning bed with an "x" over it)
Encourages indoor tanning	Information encouraging the behaviour (e.g., it's good for you because it provides vitamin D, prevents sunburns, provides an attractive suntan, feels good)	Positive depiction of someone indoor tanning (e.g., attractive, healthy-looking person in a tanning bed)
Promotes shade	Promotes seeking shade to avoid UV exposure (e.g., bring a beach umbrella to provide protective shade)	Depiction of someone seeking shade (e.g., image of model sitting under the shade of a tree on the beach)
Promotes hats	Promotes wearing a hat to protect the face from UV exposure (e.g., a wide-brimmed hat will shield your face from the sun)	Depiction of a hat or of someone wearing a hat (e.g., image of person wearing a wide-brimmed hat)
Promotes clothes	Promotes use of protective clothing (e.g., protect your skin from the sun with long sleeves and long pants)	Depiction of protective clothing or of someone wearing protective clothing (e.g., long sleeved t-shirt, long pants)
Promotes sunscreen	Promotes use of sunscreen (e.g., use sunscreen daily, sunscreen can prevent skin cancer and skin aging)	Depiction of sunscreen or sunscreen application (e.g., image of a bottle of sunscreen, image of sunscreen being rubbed into skin)
SPF level (30+)	Promotes SPF level of 30 or higher (e.g., use sunscreen with an SPF of at least 30)	Depiction of sunscreen labelled with SPF 30 or higher (e.g., image of bottle of sunscreen with SPF 30 on label)
Early Detection		
ABCD criteria	Mention or description of the ABCD criteria (e.g., use the ABCD criteria to look for early signs of skin cancer)	Depiction of moles which exhibit the ABCD criteria (e.g., image of moles, each depicting one of the criteria)
Skin self-examination	Promotes skin self-checking for skin cancer (e.g., conduct a skin self-	Depiction of someone conducting a skin self-exam or example

	exam once per month, skin self-examination is important for detecting skin cancer early)	images of dangerous mole characteristics to look for (e.g., image of a person looking at a mole on their skin)
Physician skin examination	Promotes seeking a physician to do a skin examination for skin cancer (e.g., those at high risk should see their doctor for a skin examination)	Depiction of someone having a physician-led skin examination conducted (e.g., image of a doctor looking at a mole on patient's skin)
Additional Variables		
Dark Skin Risks	Mentioned of the unique risks of skin cancer for those with dark, deeply pigmented skin (e.g., people with dark skin can also get melanoma, especially on the palms of their hands or soles of their feet)	Depiction of the unique risks of skin cancer for those with dark skin, deeply pigmented skin (e.g., photographic portrait of a melanoma survivor who has dark skin)
Celebrity	Mention of a celebrity (e.g., famous actor, major athlete, well-known model, or famous politician)	Depiction of a celebrity (e.g., famous actor, major athlete, well-known model, or famous politician)

*Significant portions of this table appear in Chapters 3 and 6

Codebook of Health Belief Model Variables in Article Text and Images*

For each article and image code the following HBM constructs as absent (0) or present (1). For those that are coded as present, code the subcategory classification by entering the most appropriate corresponding number into the data spreadsheet. This selection should be based on which subcategory classification is most emphasized in the text or image. For articles or images with that particular absent, code the subcategory classification as "21" to represent "not applicable." Collect example quotes and image descriptions as appropriate.

HBM Construct (0=absent, 1=present)	Description of Construct	Subcategory Classifications
Perceived Susceptibility	Information that would increase perceived risk of getting skin cancer (e.g., people with fair skin are more likely to get skin cancer). May include numerical personal risk information (e.g., skin cancer statistics), modifiable personal risk factors (e.g., UV exposure), or non-modifiable personal risk information (e.g., light coloured hair/skin/eyes, age, many moles, personal/family history, gender).	modifiable risk (1) non-modifiable risk (2) numerical risk information (3) n/a (21)
Perceived Severity	Information that would increase perceived seriousness of skin cancer or UV exposure as conveyed by specific consequences (e.g., UV exposure leads to premature skin aging, skin cancer can be fatal).	photoaging (wrinkles, brown spots) (1) discoloration (overly tanned, tan lines) (2) sunburn (3) negative effects of treatment (4) treatment physical pain (5) emotional pain (6) impact on quality of life (7) skin cancer (8) death (9) disfigurement (10) social (impact on work, family life, social relations) (11) financial effects (medical costs, lost income) (12) n/a (21)

Perceived Benefits (prevention)	Content that may influence beliefs about the effectiveness or benefits of skin cancer prevention behaviours (i.e., UV protection or avoidance) to reduce threat (risk or severity) (e.g., wearing sunscreen prevents skin cancer).	avoidance of photoaging (1) avoidance of discoloration (2) avoidance of sunburn (3) avoidance of skin cancer (4) avoidance of death (5) n/a (21)
Perceived Benefits (early detection)	Content that may influence beliefs about the effectiveness or benefits of early detection (i.e., SSE or physician-led skin exam) to reduce threat (risk or severity) (e.g., early detection reduces the chances of dying from skin cancer)	avoidance of morbidity (1) avoidance of mortality (2) avoidance of disfigurement (3) avoidance of fear/not knowing (4) n/a (21)
Perceived Barriers (prevention)	Potential negative aspects of UV protection/avoidance which may impede or deter uptake of the recommended behaviour. Content that may influence a person's beliefs about the costs or barriers of UV protection/avoidance. (e.g., applying sunscreen takes extra time and it's hard to remember to re-apply)	appearance reasons (1) health reasons (2) social reasons (3) psychotropic reasons (the pleasure of being exposed to the sun or artificial UV light) (4) inconvenience (5) forgetfulness (6) monetary cost (7) misinformation/confusion (incorrect information or false beliefs about a particular prevention behaviour) (8) lack of effectiveness (a particular prevention behaviour is not effective) (9) n/a (21)
Perceived Barriers (early detection)	Content that may influence beliefs about the costs or barriers related to the early detection of skin cancer (SSE or physician-led skin examination). The potential negative aspects of early detection, which may impede or deter uptake of the recommended behaviour (e.g., not knowing the early signs of skin cancer).	social reasons (1) inconvenience (2) fear of finding something (3) misinformation/confusion (4) lack of knowledge (not knowing how to look for early signs of skin cancer or not know how to book an appointment for a skin examination by a physician) (5) no doctor/dermatologist (6) forgetfulness (7) monetary cost (8) lack of effectiveness (belief that SSE is not effective) (9)

		n/a (21)
Cues to Action (explicit)	Informational content or mobilizing information that may activate readiness to change (e.g., website to visit, phone number to call). Commercial products (e.g., brand name of self-tanning lotion) will not considered cues to action.	Type: e-resource (website or app) (1), print (2), person (3), place (4), telephone number (5), organization (6), or other (22), n/a (21) Source: commercial (1), governmental (2), non-governmental (3), medical facility (4), individual MD (5), aesthetic industry (6), or other (22), n/a (21)
Cues to Action (implicit)	Informational content or mobilizing information that may activate readiness to change but that is shared in a less direct way. Implicit cues are more difficult to follow-up on than explicit cues (e.g., name of dermatologist, but no contact information). Commercial products (e.g., brand name of self-tanning lotion) will not considered cues to action.	Type: person (1), place (2), organization (3), other (22), n/a (21) Source: commercial (1), governmental (2), non-governmental (3), medical facility (4), individual MD (5), aesthetic industry (6), or other (22), n/a (21)
Self-efficacy (prevention)	Content that may increase confidence in one's ability to take action or engage in UV protection/avoidance behaviours to help prevent skin cancer. Specific and actionable information that serves as training/guidance (instructional) in performing UV protection/avoidance (e.g., how to properly apply sunscreen) or, for images, is a demonstration of the desired behaviour (e.g, peer-modelling of sunscreen application). Any instructions should be specific, actionable, and medically accurate.	UV avoidance (solar) (1) UV avoidance (indoor tanning) (2) UV avoidance (solar and indoor tanning) (3) UV protection (sunscreen) (4) UV alternatives (self-tanners or bronzers) (5) UV protection (clothes/hats/sunglasses) (6) other (prevention methods not fitting in these categories) (7) n/a (21)
Self-efficacy (early detection)	Content that may increase confidence in one's ability to take action or engage in behaviours to detect skin cancer early. Specific and actionable information that serves as training/guidance (instructional) in performing the recommended action (SSE) or, for images, is a demonstration of the desired behaviour (e.g., peer modeling of SSE or physician skin	dermatological/medical assistance (1) SSE how-to (when, where, how to look) (2) SSE warning signs (what to look for) (3) SSE how-to and warning signs combined (4) n/a (21)

	check). Any instructions should be specific, actionable, and medically accurate.

*Significant portions of this table appear in Chapter 8
n/a = not applicable

APPENDIX B: ADDITIONAL RESULTS

Additional Variables

The following are additional results not reported elsewhere in this thesis. The findings are based on the content of skin cancer and tanning articles (n = 608) and accompanying images (n = 930) from U.S. popular women's and men's magazines (n = 20) published between 2000 and 2012.

Graphic Images

There were 45 images (4.8%) were considered unsightly and just 8 images (0.9%) which were considered graphic (e.g., large scars, advanced skin cancers, disfigurement from disease etc.). This variable was only coded for images.

UV Photographs (images only)

There were four images (0.4%) that were UV photographs.

Dark Skin

There were 5 images (0.5%) that depicted, and 39 articles (6.4%) which mentioned, dark skin as a risk factor for skin cancer.

Celebrity

There were 58 images (6.2%) and 59 articles (9.6%) that depicted or mentioned celebrities.

UV protection slant

In images, the slant on UV protection was positive (27.3%), mixed (16.6%) and negative (18.0%). In text, the slant on UV protection was positive (47.7%), mixed (17.6%), or negative (1.3%).

Type of skin cancer

The type of skin cancer focused on in article text: melanoma (16.1%), non-melanoma (3.0%), both melanoma and non-melanoma (15.6%), non-specific about skin cancer type (25.1%), other (0.3%), or not mentioned (39.8%) (e.g., article was about sun protection but did not mention skin cancer at all). The type of skin cancer depicted in images: melanoma (1.6%), non-melanoma (1.4%), melanoma, non-melanoma, and non-cancerous moles (2.6%), unspecified skin cancer type or unable to determine (1.9%), or no skin cancer depicted (92.2%).

Facial Expression (image only)

When facial expression was visible (n=471), it was positive (60.1%), neutral (28.0%), or negative (1.9%).

Tan Level (image only)

When human subjects were depicted in images, they had: no tan (26.3%), a light tan (16.9%), a dark tan (14.9%), or their tan level could not be determined (2.9%). There were 369 out of 930 images for which this variable was not applicable (39.7%).

Pale Look (images only)

There were 141 images (15.2%) that promoted the pale look. This variable was only coded in images.

Sun Exposure (images only)

There were 241 images (25.9%) that promoted solar UV exposure (i.e., depicted exposure to the sun in a positive, favourable, or attractive way).

Cancer Continuum

In images, the following parts of the cancer continuum were depicted: prevention (33.7%), detection (8.0%), treatment (2.3%), or no aspect of the cancer continuum (56.1%). In text, the following parts of the cancer continuum were the foci of article text: prevention (50.8%), detection (8.9%), diagnosis (1.0%), treatment (3.1%), palliative (0.2%), multiple (11.8%), or none (24.2%).

News Magazine Descriptive Statistics

Three weekly news magazines were included in the dataset: *Time* (U.S.), *Newsweek* (U.S.), and *Maclean's* (Canadian). These magazines were selected based on their high-circulation rates and continuous publication over the study timeframe (2000 to 2012). The news magazines were excluded from the Studies 3 to 6 because they were published on a weekly basis compared to the magazines that were published on a monthly basis. Thus, comparisons between magazine genres regarding frequency of coverage would not have been accurate. (Doing a random sample of the magazine articles to account for greater frequency of publication would facilitated such comparisons, but the overall number of articles in news magazines was so few, n = 39, that such as sample was deemed too low, n = 10.) The news magazines were, however, included in Studies 1 and 2 – their inclusion in those studies was relevant because the magazines were being compared for volume of coverage relative to external events (2006 IARC report and 2009 carcinogen classification) and not relative to magazine genre.

Between 2000 and 2012, there were 39 articles about skin cancer and tanning (containing 37 images) published in these three magazines. Most of the articles were published in the months of June (n = 12) and August (n = 13), although at least one article was published during each month.

The articles range from 0.25 to 7 pages (M = 1.14, SD = 1.34), were 16 to 3041 words (M = 581.90, SD = 624.40) and contained between 0 and 5 images (M = 1.38, SD = 1.09). Articles focused on skin cancer (35.9%), indoor tanning (17.9%), outdoor tanning (7.7%), indoor and outdoor tanning (10.3%), self-tanning (5.1%), sunscreen use (20.5%), or had multiple foci (2.6%).

Images were less than a quarter of a page (49.0%), a quarter of a page (33.3%), half a page (3.9%), three-quarters of a page (5.9%), or a full page (7.8%). Images were less than the text (60.8%), equal to the text (33.3%), or larger than the text (5.9%) in relative size. Images were mostly photographs (80.4%), with some illustrations or diagrams (19.6%) and were usually in colour (88.2%) compared to black and white (11.8%).

Descriptive statistics for report on skin cancer risk factors, UV behaviours, and early detection information in text and images are provided below (see below). Examining the reporting of skin cancer and tanning in North American news magazines more closely is an area of research to be developed further.

Table. Skin cancer risk factors, UV behaviours, and early detection information in news magazines

Variable	**Text**		**Image**	
	%	(*n*/39)	%	(*n*/37)
Risk Factors				
UV exposure	69.2	27	25.5	13
Light hair, skin, eyes	20.5	8	31.4	16
Moles (>50 or abnormal)	23.1	9	11.8	6
History of skin cancer	17.9	7	0	0
Sunburns	30.8	12	2.0	1
UV Behaviours				
Promotes tanned look	20.5	8	41.2	21
Promotes self-tanners	17.9	7	5.9	3
Promotes solar UV avoidance	20.5	8	9.8	5
Discourages indoor tanning	30.8	12	2.0	1
Promotes indoor tanning	12.8	5	11.8	6
Promotes shade	5.1	2	5.9	3
Promotes hats	17.9	7	7.8	4
Promotes clothes	25.6	10	15.7	8
Promotes sunscreen	53.8	21	13.7	7
SPF level (30+)	17.9	7	3.9	2
Early Detection				
Skin self-examination	17.9	7	11.8	6
Physician-led skin examination	23.1	9	0	0
ABCD criteria	7.7	3	0	0

APPENDIX C: KEY IARC REPORT AND CARCINOGEN CLASSIFICATION FINDINGS

Key messages from the 2006 IARC report included: UV exposure is linked to skin cancer, people with light skin/hair/eyes are especially at risk, indoor tanning should be avoided, there is a 75% increased risk of melanoma associated with tanning bed use, and sunburn is a risk factor for skin cancer.

Key messages from the 2009 carcinogen classification as reported in *The Lancet Oncology* included: newly classifying UV-emitting tanning devices as carcinogenic, re-iterating the carcinogenic nature and status of solar UV radiation, and that indoor tanning is particular common among young women and use before age 30 is particularly associated with increase risk of melanoma.

APPENDIX D: 2006 IARC REPORT PRESS RELEASE

Press Release from IARC

International Agency for Research on Cancer

Centre International de Recherche sur le Cancer

PRESS RELEASE

Nº 171

29 November 2006

Sunbed use in youth unequivocally associated with skin cancer

In October 2004, the French Ministry of Health contacted Dr Peter Boyle, the Director of the IARC[1], raising a particular concern about the continuous increase in incidence of melanoma in France and in the world. Melanoma is the most deadly form of skin cancer. For reference, while Europe registers 10-15 cases per 100,000 population and per year, Australia has an incidence of 50 cases/100,000 population every year. Melanoma is on the increase everywhere in the world and the number of cases doubles every 12-15 years in the most affected areas.

In 1992, an IARC Working Group made a thorough review of the available scientific data and concluded that solar radiation is carcinogenic to humans (Group 1)[2]. Solar radiation causes cutaneous melanoma and non-melanoma skin cancer. However, there is still uncertainty surrounding the role of exposure to artificial sources of UV radiation, i.e. from the use of sunbeds or sunlamps in tanning parlours, in the aetiology of skin cancer.

IARC Review of the literature

To respond to these concerns, IARC convened an international Working Group[3] that assessed the available evidence relating to health effects, both positive and detrimental, of exposure to artificial UV radiation through the use of indoor tanning facilities, in particular whether their use increases the risk for skin cancer.

Assessment

Epidemiologic studies do not provide consistent evidence that use of indoor tanning facilities in general is associated with the development of melanoma or non-melanoma skin cancer[4]. There are various technical explanations for this conclusion. Firstly, knowledge of levels of UV exposure during indoor tanning is very imprecise. Furthermore, early studies published had low power to detect long-term associations with artificial UV exposure that become evident only following a prolonged lag period. "Considering simultaneously all the available data", Dr Boyle said, "made it possible for us to reach a number of clear conclusions."

Conclusions

1. *Clear increase in melanoma risk associated with use of sunbeds in teens and twenties*
The data showed a prominent and consistent increase in risk for melanoma in people who first used sunbeds in their twenties or teen years: a 75% increase in risk of melanoma was calculated for such users of artificial tanning appliances, while this increase in the general population, although not statistically significant, is still not negligible.

2. *Increase in risk of squamous cell cancer (SCC) of the skin associated with use of sunbeds in teens*
Limited data suggest that the risk of squamous cell carcinoma is similarly increased after first use as a teenager.

3. *Immune system affected*
Data also suggest detrimental effects from use of sunbeds on the skin's immune response and possibly on the eyes (ocular melanoma).

4. *No positive health effects*
Artificial tanning confers little if any protection against solar damage to the skin, nor does use of indoor tanning facilities grant protection against vitamin D deficiency. Data also suggest detrimental effects from use of indoor tanning facilities on the skin's immune response and possibly on the eyes (ocular melanoma).

Public Health message

Dr Boyle concluded that "while IARC's mandate is one of scientific expertise and assessment of epidemiologic risk, in view of the strength and seriousness of the findings, effective action to restrict access to artificial tanning facilities (solariums, tanning salons, tanning parlours) to minors and young adults should be strongly considered."

Notes:

(1) The International Agency for Research on Cancer (IARC) is part of the World Health Organization. Its mission is to coordinate and conduct research on the causes of human cancer, the mechanisms of carcinogenesis, and to develop scientific strategies for cancer control. The mandate of the world cancer research agency is to coordinate international research to take advantage of synergies and disseminate scientific information through publications, meetings, courses, and fellowships.

(2) UV radiations A, B and C were all three independently rated as probably carcinogenic to humans by the IARC Working Group in 1992. In addition, they concluded that the "use of sunlamps and sunbeds *entails exposures that are probably carcinogenic to humans (Group 2A)*". While natural UV radiation does indeed stimulate the production of indispensable vitamin D, exposure to natural sun light should be moderate, and in any case artificial UV radiation exposure, as provided by sunbed exposure, should be avoided at all cost.

(3) The members of the Working Group were: Dr Philippe Autier[1], Dr Mathieu Boniol[1], Dr Peter Boyle[1], Dr Jean-Francois Doré[2], Dr Sara Gandini[3], Dr Adele Green (Chair)[4], Dr Julia Newton-Bishop[5], Dr Martin A. Weinstock[6], Dr Johan Westerdahl[7], Dr Béatrice Secretan (Coordinator)[1], Dr Stephen Walter[8]. Their conclusions are being published online by the International Journal of Cancer
[1]IARC - [2]INSERM U590, Centre Léon Bérard, Lyon, France - [3] European Institute of Oncology, Milan, Italy - [4]Queensland Institute of Medical Research, Australia - [5]Cancer Research UK -[6]Brown University Medical School - USA - [7] Lund University Hospital - Sweden [unable to attend] - [8]McMaster University - Ontario, Canada

(4) There are three main types of cancers of the skin: **Basal cell carcinoma** (BCC) is the most common form of cancer and the least aggressive. Basal cells are cells that line the deepest layer of the epidermis. A tumor of this layer is known as basal cell carcinoma. The sun is responsible for over 90 percent of all skin cancers, including BCC, and chronic overexposure to sunlight is the cause for most cases of basal cell carcinoma. BCCs occur most frequently on the face, ears, neck, scalp, shoulders, and back. **Squamous cell cancer** (SCC) is a malignant tumor. It is more aggressive than basal cell cancer, and is more likely than basal cell cancer to metastasize. **Melanoma** is the most dangerous type of skin cancer. It involves the cells that produce pigment (melanin), which is responsible for skin and hair color. The development of melanoma is related to sun exposure, particularly to sunburns during childhood, and is most common among people with fair skin, blue or green eyes, and red or blond hair.

World Health Organization
International Agency for Research on Cancer

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Publicly available. Retrieved from:

http://www.iarc.fr/en/media-centre/pr/2006/pr171.html

APPENDIX E: 2009 CARCINOGEN CLASSIFICATION PRESS RELEASES

Press Release from the WHO/IARC

Sunbeds and UV Radiation

29/07/2009

An IARC Working Group has classified UV-emitting tanning devices as "carcinogenic to humans" (Group 1). The Working Group was convened by the IARC Monographs programme and the conclusions are reported in an article and press release issued today by The Lancet Oncology .

Combined analysis of over 20 epidemiological studies shows that the risk of cutaneous melanoma is increased by 75% when the use of tanning devices starts before age 30. There is also sufficient evidence of an increased risk of ocular melanoma associated with the use of tanning devices. Studies in experimental animals support these conclusions and demonstrate that ultraviolet radiation (UVA, UVB, and UVC) is carcinogenic to humans.

These findings reinforce current recommendations by the World Health Organization to avoid sunlamps and tanning parlours and to protect yourself from overexposure to the sun.

Further information can be found in the 2006 report of an earlier IARC Working Group and from WHO's website at http://www.who.int/mediacentre/factsheets/fs287/fr/.

Publicly available. Retrieved from:

http://www.iarc.fr/en/media-centre/iarcnews/2009/sunbeds_uvradiation.php

Press Release from *The Lancet Oncology*

THE LANCET ONCOLOGY: Press Release

EMBARGO: 1830H (New York time) Tuesday 28 July 2009

PLEASE NOTE: THESE ARE LANCET ONCOLOGY RELEASES, PLEASE ENSURE YOU CREDIT THE LANCET ONCOLOGY IF USING THIS MATERIAL

SUNBEDS (UV TANNING BEDS), AND UV RADIATION MOVED UP TO HIGHEST CANCER RISK CATEGORY BY INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)

SUNBEDS (UV TANNING BEDS), AND UV RADIATION MOVED UP TO HIGHEST CANCER RISK CATEGORY BY INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)

The International Agency for Research on Cancer (IARC) has moved sunbeds (UV tanning beds) up to the highest cancer risk category—group 1—'carcinogenic to humans'. The use of sunlamps and sunbeds was until now classified as "probably carcinogenic to humans" (group 2A). IARC also moved ultraviolet radiation into group 1. These and other findings are revealed in a **Special Report** in the August edition of *The Lancet Oncology*, produced by Dr Fatiha El Ghissassi and her colleagues, IARC, Lyon, France, on behalf of the WHO International Agency for Research on Cancer Monograph Working Group.

The authors say: "The use of UV-emitting tanning devices is widespread in many developed countries, especially among young women. A comprehensive meta-analysis concluded that the risk of skin melanoma is increased by 75% when use of tanning devices starts before 30 years of age. Additionally, several case–control studies provide consistent evidence of a positive association between the use of UV-emitting tanning devices and ocular melanoma. Therefore, the Working Group raised the classification of the use of UV-emitting tanning devices to Group 1, 'carcinogenic to humans'."

The characteristic genetic mutation that is caused by solar (ultraviolet/UV) radiation has long been attributed to UVB radiation. However, the same mutation was detected in the skin of UVA-treated mice, and in UVA-induced mouse skin tumours. Thus IARC reclassified UV radiation as a whole (UVA, UVB and UVC) as carcinogenic to humans, or group 1. UVA, UBC, and UVC radiation were each previously in group 2A, "probably carcinogenic to humans".

The working group also concluded that there was sufficient evidence for ocular melanoma in welders; however, because welders are exposed to other harmful agents, the risk could not be specifically attributed to UV radiation. The authors say: "A full review of the carcinogenic hazards of welding will be undertaken with high priority."

All types of ionising radiation were also classified as Group 1. This was the first time all these types of radiation were reviewed by one working group during one meeting. Examples of ionising radiation are:

- Radon gas (seeping from soil, rocks, and building materials), which enters the lungs and causes damage (affecting the whole population). The **Special Report** says that radon is the second leading cause of lung cancer (8—15% of cases) after tobacco smoke
- Plutonium and its decay products, affecting the bones, liver and lungs of plutonium workers.
- Radium and its decay products, affecting the bones of medical patients
- Phosphorous-32 and its decay products, causing acute leukaemia in medical patients
- Radioiodines, affecting the thyroids in children and adolescent survivors of nuclear reactor accidents

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For full Special Report see: <http://press.thelancet.com/tlosunbeds.pdf>

APPENDIX F: SAMPLE SPSS ANALYSIS OUTPUT

Example Output for Temporal Comparisons (2006 IARC report)

postIARC

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	351	46.1	46.1	46.1
	yes	410	53.9	53.9	100.0
	Total	761	100.0	100.0	

Year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2001	32	4.2	4.2	4.2
	2002	55	7.2	7.2	11.4
	2003	56	7.4	7.4	18.8
	2004	67	8.8	8.8	27.6
	2005	66	8.7	8.7	36.3
	2006	75	9.9	9.9	46.1
	2007	87	11.4	11.4	57.6
	2008	56	7.4	7.4	64.9
	2009	69	9.1	9.1	74.0
	2010	77	10.1	10.1	84.1
	2011	62	8.1	8.1	92.2
	2012	59	7.8	7.8	100.0
	Total	761	100.0	100.0	

postIARC * UVexp Crosstabulation

			UVexp		
			No	Yes	Total
postIARC	no	Count	212	137	349
		% within postIARC	60.7%	39.3%	100.0%

		% within UVexp	46.6%	45.7%	46.2%
		% of Total	28.1%	18.1%	46.2%
	yes	Count	243	163	406
		% within postIARC	59.9%	40.1%	100.0%
		% within UVexp	53.4%	54.3%	53.8%
		% of Total	32.2%	21.6%	53.8%
Total		Count	455	300	755
		% within postIARC	60.3%	39.7%	100.0%
		% within UVexp	100.0%	100.0%	100.0%
		% of Total	60.3%	39.7%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.062[a]	1	.803		
Continuity Correction[b]	.031	1	.861		
Likelihood Ratio	.062	1	.803		
Fisher's Exact Test				.823	.431
Linear-by-Linear Association	.062	1	.803		
N of Valid Cases	755				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 138.68.

b. Computed only for a 2x2 table

postIARC * TanLook Crosstabulation

			TanLook		
			No	Yes	Total
postIARC	no	Count	224	125	349
		% within postIARC	64.2%	35.8%	100.0%
		% within TanLook	42.5%	54.8%	46.2%
		% of Total	29.7%	16.6%	46.2%
	yes	Count	303	103	406
		% within postIARC	74.6%	25.4%	100.0%
		% within TanLook	57.5%	45.2%	53.8%
		% of Total	40.1%	13.6%	53.8%
Total		Count	527	228	755
		% within postIARC	69.8%	30.2%	100.0%
		% within TanLook	100.0%	100.0%	100.0%
		% of Total	69.8%	30.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.717[a]	1	.002		
Continuity Correction[b]	9.228	1	.002		
Likelihood Ratio	9.706	1	.002		
Fisher's Exact Test				.002	.001
Linear-by-Linear Association	9.705	1	.002		
N of Valid Cases	755				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 105.39.

b. Computed only for a 2x2 table

postIARC * SelfCheck Crosstabulation

			SelfCheck		
			No	Yes	Total
postIARC	no	Count	518	35	553
		% within postIARC	93.7%	6.3%	100.0%
		% within SelfCheck	43.6%	44.3%	43.6%
		% of Total	40.9%	2.8%	43.6%

	yes	Count	670	44	714
		% within postIARC	93.8%	6.2%	100.0%
		% within SelfCheck	56.4%	55.7%	56.4%
		% of Total	52.9%	3.5%	56.4%
Total		Count	1188	79	1267
		% within postIARC	93.8%	6.2%	100.0%
		% within SelfCheck	100.0%	100.0%	100.0%
		% of Total	93.8%	6.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.015[a]	1	.903		
Continuity Correction[b]	.000	1	.996		
Likelihood Ratio	.015	1	.903		
Fisher's Exact Test				.907	.496
Linear-by-Linear Association	.015	1	.903		
N of Valid Cases	1267				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 34.48.

b. Computed only for a 2x2 table

Correlations

		Year	ITAvoid
Year	Pearson Correlation	1	.603*
	Sig. (2-tailed)		.038
	N	12	12
ITAvoid	Pearson Correlation	.603*	1
	Sig. (2-tailed)	.038	
	N	12	12

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		Year	ProSunscreen
Year	Pearson Correlation	1	.719**

	Sig. (2-tailed)		.008
	N	12	12
ProSunscreen	Pearson Correlation	.719**	1
	Sig. (2-tailed)	.008	
	N	12	12

**. Correlation is significant at the 0.01 level (2-tailed).

Example Output for Temporal Comparisons (2009 carcinogenic classification)

postClass1 * DisIndoorTan Crosstabulation

Count

		DisIndoorTan		
		No	Yes	Total
postClass1	no	176	32	208
	yes	159	39	198
Total		335	71	406

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.307[a]	1	.253		
Continuity Correction[b]	1.026	1	.311		
Likelihood Ratio	1.308	1	.253		
Fisher's Exact Test				.296	.156
Linear-by-Linear Association	1.304	1	.253		
N of Valid Cases	406				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 34.63.

b. Computed only for a 2x2 table

postClass1 * TanLook Crosstabulation

Count

		TanLook		
		No	Yes	Total
postClass1	no	155	53	208

	yes	148	50	198
Total		303	103	406

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.003[a]	1	.958		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.003	1	.958		
Fisher's Exact Test				1.000	.525
Linear-by-Linear Association	.003	1	.958		
N of Valid Cases	406				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 50.23.

b. Computed only for a 2x2 table

Example Output for Women's and Men's Magazines

GenreNew2

	Observed N	Expected N	Residual
women	456	290.5	165.5
mens	125	290.5	-165.5
Total	581		

Test Statistics

	GenreNew2
Chi-Square	188.573[a]
df	1
Asymp. Sig.	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 290.5.

ContentType * UVexp Crosstabulation

			UVexp		
			No	Yes	Total
ContentType	text	Count	379	229	608
		% within ContentType	62.3%	37.7%	100.0%
		% within UVexp	29.6%	88.8%	39.5%
		% of Total	24.6%	14.9%	39.5%
	image	Count	901	29	930
		% within ContentType	96.9%	3.1%	100.0%
		% within UVexp	70.4%	11.2%	60.5%
		% of Total	58.6%	1.9%	60.5%
Total		Count	1280	258	1538
		% within ContentType	83.2%	16.8%	100.0%
		% within UVexp	100.0%	100.0%	100.0%
		% of Total	83.2%	16.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	314.278[a]	1	.000		
Continuity Correction[b]	311.808	1	.000		
Likelihood Ratio	327.579	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	314.073	1	.000		
N of Valid Cases	1538				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 101.99.

b. Computed only for a 2x2 table

ContentType * DisIndoorTan Crosstabulation

			DisIndoorTan		
			No	Yes	Total
ContentType	text	Count	522	86	608
		% within ContentType	85.9%	14.1%	100.0%
		% within DisIndoorTan	36.2%	90.5%	39.5%
		% of Total	33.9%	5.6%	39.5%

	image	Count	921	9	930
		% within ContentType	99.0%	1.0%	100.0%
		% within DisIndoorTan	63.8%	9.5%	60.5%
		% of Total	59.9%	0.6%	60.5%
Total		Count	1443	95	1538
		% within ContentType	93.8%	6.2%	100.0%
		% within DisIndoorTan	100.0%	100.0%	100.0%
		% of Total	93.8%	6.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	110.150[a]	1	.000		
Continuity Correction[b]	107.888	1	.000		
Likelihood Ratio	116.020	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	110.079	1	.000		
N of Valid Cases	1538				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 37.56.

b. Computed only for a 2x2 table

GenreNew * ABCD Crosstabulation

			ABCD		
			No	Yes	Total
GenreNew	women	Count	767	15	782
		% within GenreNew	98.1%	1.9%	100.0%
		% within ABCD	86.6%	78.9%	86.4%
		% of Total	84.8%	1.7%	86.4%
	men	Count	119	4	123
		% within GenreNew	96.7%	3.3%	100.0%
		% within ABCD	13.4%	21.1%	13.6%
		% of Total	13.1%	0.4%	13.6%
Total		Count	886	19	905
		% within GenreNew	97.9%	2.1%	100.0%

	% within ABCD	100.0%	100.0%	100.0%
	% of Total	97.9%	2.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.920[a]	1	.337		
Continuity Correction[b]	.386	1	.535		
Likelihood Ratio	.811	1	.368		
Fisher's Exact Test				.312	.251
Linear-by-Linear Association	.919	1	.338		
N of Valid Cases	905				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.58.

b. Computed only for a 2x2 table

Example Output for Canadian Magazines

MagSource

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Canadian Living	21	13.6	13.6	13.6
	Chatelaine	24	15.6	15.6	29.2
	Homemakers	12	7.8	7.8	37.0
	Fashion	32	20.8	20.8	57.8
	Elle Canada	18	11.7	11.7	69.5
	Flare	47	30.5	30.5	100.0
	Total	154	100.0	100.0	

ContentType * TanLook Crosstabulation

	TanLook		
	No	Yes	Total

ContentType	text	Count	89	63	152
		% within ContentType	58.6%	41.4%	100.0%
		% within TanLook	46.4%	34.8%	40.8%
		% of Total	23.9%	16.9%	40.8%
	image	Count	103	118	221
		% within ContentType	46.6%	53.4%	100.0%
		% within TanLook	53.6%	65.2%	59.2%
		% of Total	27.6%	31.6%	59.2%
Total		Count	192	181	373
		% within ContentType	51.5%	48.5%	100.0%
		% within TanLook	100.0%	100.0%	100.0%
		% of Total	51.5%	48.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.146[a]	1	.023		
Continuity Correction[b]	4.678	1	.031		
Likelihood Ratio	5.164	1	.023		
Fisher's Exact Test				.027	.015
Linear-by-Linear Association	5.132	1	.023		
N of Valid Cases	373				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 73.76.

b. Computed only for a 2x2 table

MagCountry

	Observed N	Expected N	Residual
Canada	154	166.0	-12.0
US	178	166.0	12.0
Total	332		

Test Statistics

	MagCountry
Chi-Square	1.735[a]

df	1
Asymp. Sig.	.188

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 166.0.

MagCountry * Moles Crosstabulation

			Moles		
			No	Yes	Total
MagCountry	Canada	Count	218	3	221
		% within MagCountry	98.6%	1.4%	100.0%
		% within Moles	43.0%	12.5%	41.6%
		% of Total	41.1%	0.6%	41.6%
	US	Count	289	21	310
		% within MagCountry	93.2%	6.8%	100.0%
		% within Moles	57.0%	87.5%	58.4%
		% of Total	54.4%	4.0%	58.4%
Total		Count	507	24	531
		% within MagCountry	95.5%	4.5%	100.0%
		% within Moles	100.0%	100.0%	100.0%
		% of Total	95.5%	4.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.772[a]	1	.003		
Continuity Correction[b]	7.562	1	.006		
Likelihood Ratio	10.174	1	.001		
Fisher's Exact Test				.003	.002
Linear-by-Linear Association	8.756	1	.003		
N of Valid Cases	531				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.99.

b. Computed only for a 2x2 table

Example Output for Teen Magazines

MagSource

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Seventeen	31	73.8	73.8	73.8
	Teen Vogue	11	26.2	26.2	100.0
	Total	42	100.0	100.0	

ImgType

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	photo	161	98.8	98.8	98.8
	illustration	2	1.2	1.2	100.0
	Total	163	100.0	100.0	

ImgSize

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than quarter of page	83	50.9	50.9	50.9
	quarter of a page	53	32.5	32.5	83.4
	half page	10	6.1	6.1	89.6
	three-quarters page	4	2.5	2.5	92.0
	full page	12	7.4	7.4	99.4
	two page spead	1	.6	.6	100.0
	Total	163	100.0	100.0	

ContentType * LightSkin Crosstabulation

	LightSkin		
	No	Yes	Total

ContentType	text	Count	36	6	42
		% within ContentType	85.7%	14.3%	100.0%
		% within LightSkin	20.5%	20.7%	20.5%
		% of Total	17.6%	2.9%	20.5%
	image	Count	140	23	163
		% within ContentType	85.9%	14.1%	100.0%
		% within LightSkin	79.5%	79.3%	79.5%
		% of Total	68.3%	11.2%	79.5%
Total		Count	176	29	205
		% within ContentType	85.9%	14.1%	100.0%
		% within LightSkin	100.0%	100.0%	100.0%
		% of Total	85.9%	14.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.001[a]	1	.977		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.001	1	.977		
Fisher's Exact Test				1.000	.573
Linear-by-Linear Association	.001	1	.977		
N of Valid Cases	205				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.94.

b. Computed only for a 2x2 table

ContentType * TanLook Crosstabulation

			TanLook		
			No	Yes	Total
ContentType	text	Count	12	30	42
		% within ContentType	28.6%	71.4%	100.0%
		% within TanLook	13.3%	26.1%	20.5%
		% of Total	5.9%	14.6%	20.5%
	image	Count	78	85	163
		% within ContentType	47.9%	52.1%	100.0%
		% within TanLook	86.7%	73.9%	79.5%

	% of Total	38.0%	41.5%	79.5%
Total	Count	90	115	205
	% within ContentType	43.9%	56.1%	100.0%
	% within TanLook	100.0%	100.0%	100.0%
	% of Total	43.9%	56.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.041[a]	1	.025		
Continuity Correction[b]	4.289	1	.038		
Likelihood Ratio	5.214	1	.022		
Fisher's Exact Test				.036	.018
Linear-by-Linear Association	5.016	1	.025		
N of Valid Cases	205				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.44.

b. Computed only for a 2x2 table

ContentType * Sunscreen Crosstabulation

			Sunscreen		
			No	Yes	Total
ContentType	text	Count	15	27	42
		% within ContentType	35.7%	64.3%	100.0%
		% within Sunscreen	10.1%	47.4%	20.5%
		% of Total	7.3%	13.2%	20.5%
	image	Count	133	30	163
		% within ContentType	81.6%	18.4%	100.0%
		% within Sunscreen	89.9%	52.6%	79.5%
		% of Total	64.9%	14.6%	79.5%
Total		Count	148	57	205
		% within ContentType	72.2%	27.8%	100.0%

	% within Sunscreen	100.0%	100.0%	100.0%
	% of Total	72.2%	27.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	35.020[a]	1	.000		
Continuity Correction[b]	32.772	1	.000		
Likelihood Ratio	31.946	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	34.849	1	.000		
N of Valid Cases	205				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.68.

b. Computed only for a 2x2 table

MagSource

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Seventeen	31	25.4	25.4	25.4
	Teen Vogue	12	9.8	9.8	35.2
	Cosmo	55	45.1	45.1	80.3
	Glamour	24	19.7	19.7	100.0
	Total	122	100.0	100.0	

MagGenre

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Women's Specific	79	64.8	64.8	64.8
	Girls'	43	35.2	35.2	100.0
	Total	122	100.0	100.0	

ContentType * SelfCheck Crosstabulation

			SelfCheck		
			No	Yes	Total
ContentType	text	Count	36	6	42
		% within ContentType	85.7%	14.3%	100.0%
		% within SelfCheck	18.8%	42.9%	20.5%
		% of Total	17.6%	2.9%	20.5%
	image	Count	155	8	163
		% within ContentType	95.1%	4.9%	100.0%
		% within SelfCheck	81.2%	57.1%	79.5%
		% of Total	75.6%	3.9%	79.5%
Total		Count	191	14	205
		% within ContentType	93.2%	6.8%	100.0%
		% within SelfCheck	100.0%	100.0%	100.0%
		% of Total	93.2%	6.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.616[a]	1	.032		
Continuity Correction[b]	3.259	1	.071		
Likelihood Ratio	3.893	1	.049		
Fisher's Exact Test				.043	.043
Linear-by-Linear Association	4.593	1	.032		
N of Valid Cases	205				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.87.

b. Computed only for a 2x2 table

Genre

	Observed N	Expected N	Residual
women	79	61.0	18.0
girls	43	61.0	-18.0
Total	122		

Test Statistics

	Genre
Chi-Square	10.623[a]
df	1
Asymp. Sig.	.001

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 61.0.

MagGenre * TanLook Crosstabulation

			TanLook		
			No	Yes	Total
MagGenre	Women's Specific	Count	55	24	79
		% within MagGenre	69.6%	30.4%	100.0%
		% within TanLook	82.1%	44.4%	65.3%
		% of Total	45.5%	19.8%	65.3%
	Girls'	Count	12	30	42
		% within MagGenre	28.6%	71.4%	100.0%
		% within TanLook	17.9%	55.6%	34.7%
		% of Total	9.9%	24.8%	34.7%
Total		Count	67	54	121
		% within MagGenre	55.4%	44.6%	100.0%
		% within TanLook	100.0%	100.0%	100.0%
		% of Total	55.4%	44.6%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	18.698[a]	1	.000		
Continuity Correction[b]	17.074	1	.000		
Likelihood Ratio	19.068	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	18.543	1	.000		
N of Valid Cases	121				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.74.

b. Computed only for a 2x2 table

MagGenre * DisIndoorTan Crosstabulation

			DisIndoorTan		
			No	Yes	Total
MagGenre	Women's Specific	Count	60	19	79
		% within MagGenre	75.9%	24.1%	100.0%
		% within DisIndoorTan	72.3%	50.0%	65.3%
		% of Total	49.6%	15.7%	65.3%
	Girls'	Count	23	19	42
		% within MagGenre	54.8%	45.2%	100.0%
		% within DisIndoorTan	27.7%	50.0%	34.7%
		% of Total	19.0%	15.7%	34.7%
Total		Count	83	38	121
		% within MagGenre	68.6%	31.4%	100.0%
		% within DisIndoorTan	100.0%	100.0%	100.0%
		% of Total	68.6%	31.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.714[a]	1	.017		
Continuity Correction[b]	4.773	1	.029		

Likelihood Ratio	5.592	1	.018		
Fisher's Exact Test				.023	.015
Linear-by-Linear Association	5.667	1	.017		
N of Valid Cases	121				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.19.

b. Computed only for a 2x2 table

MagGenre * ABCD Crosstabulation

			ABCD		
			No	Yes	Total
MagGenre	Women's Specific	Count	66	13	79
		% within MagGenre	83.5%	16.5%	100.0%
		% within ABCD	63.5%	76.5%	65.3%
		% of Total	54.5%	10.7%	65.3%
	Girls'	Count	38	4	42
		% within MagGenre	90.5%	9.5%	100.0%
		% within ABCD	36.5%	23.5%	34.7%
		% of Total	31.4%	3.3%	34.7%
Total		Count	104	17	121
		% within MagGenre	86.0%	14.0%	100.0%
		% within ABCD	100.0%	100.0%	100.0%
		% of Total	86.0%	14.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.091[a]	1	.296		
Continuity Correction[b]	.593	1	.441		
Likelihood Ratio	1.152	1	.283		
Fisher's Exact Test				.412	.224
Linear-by-Linear Association	1.082	1	.298		
N of Valid Cases	121				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.90.

b. Computed only for a 2x2 table

Example Output HBM

ContentType * HBMsuscept Crosstabulation

			HBMsuscept		
			absent	present	Total
ContentType	text	Count	298	276	574
		% within ContentType	51.9%	48.1%	100.0%
		% within HBMsuscept	36.7%	41.4%	38.8%
		% of Total	20.1%	18.7%	38.8%
	image	Count	515	390	905
		% within ContentType	56.9%	43.1%	100.0%
		% within HBMsuscept	63.3%	58.6%	61.2%
		% of Total	34.8%	26.4%	61.2%
Total		Count	813	666	1479
		% within ContentType	55.0%	45.0%	100.0%
		% within HBMsuscept	100.0%	100.0%	100.0%
		% of Total	55.0%	45.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.533[a]	1	.060		
Continuity Correction[b]	3.334	1	.068		
Likelihood Ratio	3.529	1	.060		
Fisher's Exact Test				.061	.034
Linear-by-Linear Association	3.530	1	.060		
N of Valid Cases	1479				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 258.47.

b. Computed only for a 2x2 table

HBMsuscept1

	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	numerical risk info	58	10.1	10.1	10.1
	non-modifiable risk factors	34	5.9	5.9	16.0
	modifiable risk factors	184	32.1	32.1	48.1
	not applicable	298	51.9	51.9	100.0
	Total	574	100.0	100.0	

HBMsuscept1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	numerical risk info	3	.3	.3	.3
	non-modifiable risk factors	225	24.9	24.9	25.2
	modifiable risk factors	161	17.8	17.8	43.0
	not applicable	516	57.0	57.0	100.0
	Total	905	100.0	100.0	

ContentType * HBMbarpre Crosstabulation

			HBMbarpre		
			absent	present	Total
ContentType	text	Count	336	238	574
		% within ContentType	58.5%	41.5%	100.0%
		% within HBMbarpre	35.2%	45.3%	38.8%
		% of Total	22.7%	16.1%	38.8%
	image	Count	618	287	905
		% within ContentType	68.3%	31.7%	100.0%
		% within HBMbarpre	64.8%	54.7%	61.2%
		% of Total	41.8%	19.4%	61.2%
Total		Count	954	525	1479
		% within ContentType	64.5%	35.5%	100.0%
		% within HBMbarpre	100.0%	100.0%	100.0%
		% of Total	64.5%	35.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.585[a]	1	.000		
Continuity Correction[b]	14.162	1	.000		
Likelihood Ratio	14.488	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	14.575	1	.000		
N of Valid Cases	1479				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 203.75.

b. Computed only for a 2x2 table

HBMbarpre1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	appearance	200	22.1	22.1	22.1
	health	2	.2	.2	22.3
	social	38	4.2	4.2	26.5
	psychotropic	40	4.4	4.4	30.9
	inconvenience	1	.1	.1	31.0
	forgetfulness	1	.1	.1	31.2
	misinformation/confusion	2	.2	.2	31.4
	efficacy	4	.4	.4	31.8
	not applicable	617	68.2	68.2	100.0
	Total	905	100.0	100.0	

HBMbarpre1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	appearance	60	10.5	10.5	10.5
	health	15	2.6	2.6	13.1
	social	17	3.0	3.0	16.0
	psychotropic	20	3.5	3.5	19.5
	inconvenience	23	4.0	4.0	23.5
	forgetfulness	18	3.1	3.1	26.7

	misinformation/confusion	50	8.7	8.7	35.4
	efficacy	34	5.9	5.9	41.3
	not applicable	337	58.7	58.7	100.0
	Total	574	100.0	100.0	

ContentType * HBMeffdet Crosstabulation

			HBMeffdet		
			absent	present	Total
ContentType	text	Count	463	110	573
		% within ContentType	80.8%	19.2%	100.0%
		% within HBMeffdet	35.5%	63.6%	38.8%
		% of Total	31.3%	7.4%	38.8%
	image	Count	842	63	905
		% within ContentType	93.0%	7.0%	100.0%
		% within HBMeffdet	64.5%	36.4%	61.2%
		% of Total	57.0%	4.3%	61.2%
Total		Count	1305	173	1478
		% within ContentType	88.3%	11.7%	100.0%
		% within HBMeffdet	100.0%	100.0%	100.0%
		% of Total	88.3%	11.7%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	50.827[a]	1	.000		
Continuity Correction[b]	49.650	1	.000		
Likelihood Ratio	49.386	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	50.792	1	.000		
N of Valid Cases	1478				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 67.07.

b. Computed only for a 2x2 table

GenreNew2 * ImmuneMeds Crosstabulation

			ImmuneMeds		
			No	Yes	Total
GenreNew2	women	Count	436	14	450
		% within GenreNew2	96.9%	3.1%	100.0%
		% within ImmuneMeds	78.3%	82.4%	78.4%
		% of Total	76.0%	2.4%	78.4%
	mens	Count	121	3	124
		% within GenreNew2	97.6%	2.4%	100.0%
		% within ImmuneMeds	21.7%	17.6%	21.6%
		% of Total	21.1%	0.5%	21.6%
Total		Count	557	17	574
		% within GenreNew2	97.0%	3.0%	100.0%
		% within ImmuneMeds	100.0%	100.0%	100.0%
		% of Total	97.0%	3.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.162[a]	1	.687		
Continuity Correction[b]	.011	1	.918		
Likelihood Ratio	.170	1	.680		
Fisher's Exact Test				1.000	.481
Linear-by-Linear Association	.162	1	.688		
N of Valid Cases	574				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.67.

b. Computed only for a 2x2 table

APPENDIX G: EXAMPLE QUOTES AND IMAGE DRESCRIPTIONS FROM U.S. MAGAZINES*

Variable	Example Quote	Example Image Description
Risk Factors		
UV exposure	"'Any amount of UV exposure raises your skin cancer risk,' said Dr. Weinstock." (Scary Truths Tanning Salons Deny, *Cosmopolitan*, December 2009)	Image of a woman who was diagnosed with skin cancer on a beach in the sunshine. (I Got Skin Cancer at 27, *Shape*, July 2010)
Susceptible phenotype	"Though anyone can develop skin cancer, you're more vulnerable if you're a blond or a redhead with blue, green, or gray eyes and pale skin that burns easily." (Risky Rays, *Good Housekeeping*, July 2005)	Photograph of a fair-skinned, blue-eyed man, who is a melanoma survivor, working out in a gym. (The Battle of His Life, *Muscle and Fitness*, October 2007)
Moles	"Talk to your doctor about your own personal risk factors: If you have lots of moles […] you may need even more frequent screening […]." (Your Skin This Summer: What's Normal, What's Not, *Glamour*, May 2010)	12 photos of moles including normal, dysplastic, basal cell carcinoma, squamous cell carcinoma, and melanoma. (Take the Test, *Glamour*, May 2008)
Personal or Family History	"After all, once you have one tumor your chances of getting more can climb by as much as 30 percent." (On Guard, *Vogue*, February 2006) "If your mother, father, siblings, or children have had melanoma, your risk is 50 percent greater than the average person's." (No More SPF Excuses!, *Women's Health*, June 2012)	n/a
Sunburns	"And just one childhood burn can more than double your risk of developing skin cancer, according to the Skin Cancer Foundation." (Are you at risk of skin cancer? *Men's Health*, June 2006)	Image of a burned marshmallow with a face and golf visor on it accompanying an article about skin cancer risk. (Burned to a Crisp, *Golf Digest*, July 2008)

UV Behaviors		
Promotes tanned look	"'A tan is sexy in our culture.'" (The Prodigal Sun, *Elle US*, August 2000) "A sun-kissed guy looks like his life is about more than being chained to a computer." (Dude I'm so Baked, *GQ*, June 2008)	Attractive, smiling woman on the beach in a bikini with a dark tan. (Brand New Way to Get a Safer Tan, *Shape*, July 2002)
Promotes self-tanners	"With the newest self-tanners, you can have a beach-ready glow in 30 minutes." (The Best Self-tanners, *Shape*, May 2002)	Image of three bottles of self-tanner with product names visible. (Go for the Bronze, *Family Circle*, August 2006)
Promotes solar UV avoidance	"Try to avoid sun exposure between the hours of 11am and 3pm, when UV rays are the strongest." (21st Century Tan Plan, *Cosmopolitan*, July 2001)	Photo of an attractive woman with pale skin depicted indoors. (Made in the Shade, *Elle US*, June 2003)
Discourages indoor tanning	"Exposure to tanning beds before age 35 significantly increases your risk of melanoma." (12 New Rules to Save Your Skin, *Good Housekeeping*, June 2008) "Avoid tanning beds!" (Advice to Live By, *Self*, June 2011)	Infographic showing elevated skin cancer rates increasing with rising tanning bed use. (Scary Truths Tanning Salons Deny, *Cosmopolitan*, December 2009)
Promotes indoor tanning	"'Whenever I would have cramps, my ob/gyn advised me to [lie] in the tanning bed to ease the pain,' one respondent wrote." (A Prescription for Cancer, *Self*, June 2011)	Photograph of attractive young woman in a tanning bed. (Teen Tanning Dangers, *Family Circle*, May 2006)
Promotes shade	"If you're out during these times, stay in the shade under a beach umbrella or a big leafy tree." (Summer Smarts, *Shape*, May 2007)	Woman in a bikini on a beach shaded under a large beach umbrella. (68 Summer Wise-ups, *Self*, May 2001)
Promotes hats	"A wide brim hat is your ear's best friend. Banish baseball caps – they don't provide enough coverage." (Girls Just Wanna Have Sun, *Self*, May 2004)	A woman on the beach wearing a wide-brimmed hat which shades her face. (The Health Threat You Can't Ignore, *Shape*, May 2007)

Promotes clothes	"Most golf-apparel brands have clothing that protects against the sun's ultraviolet rays (look for UPF on the label)." (Suits of Armor, *Golf Digest*, August 2012)	A group of men standing on a sunny golf course wearing pants, long-sleeved shirts, and hats. (Safe Sun, *Golf Digest*, August 2011)
Promotes sunscreen	"Areas of your physique that aren't covered by clothing will need sunscreen." (You're Too Sensitive, *Muscle & Fitness*, August 2007)	Woman in beach hut applying sunscreen to her body. Image is labelled with most overlooked body parts. (Secrets of Dermatologists, *Ladies Home Journal*, May 2001)
SPF level (30+)	"Dr. Marmur also recommends going for a higher SPF 30 to 50 on beach days." (Still Think Tanning is Sexy?, *Glamour*, May 2012)	Photo of five sunscreens, each labeled with an SPF of 30 or higher. (Block Party, *Elle US*, July 2007)
Early Detection		
ABCD	"Melanoma, the most dangerous, typically appears as a brown or black flat freckle or mole and exhibits one or more of the ABCDs: asymmetry, irregular borders, variegated colors or a diameter greater than 5 millimeters (about the size of a pencil eraser)." (10 Facts About Skin Cancer, *Shape*, August 2003)	Five photographs each depicting one of: asymmetry, border, color, diameter, and evolution. (Diagnosis: Skin Cancer, *Self*, June 2009)
Skin self-examination	"The American Cancer Society recommends that you—with the help of a partner, if possible—check your moles very carefully each month." (The Cancer Risk You Can't Ignore, *Family Circle*, August 2003)	An illustrated body map indicated where on the body men tend to develop certain skin cancers. (Is it a Mole or Melanoma? *Men's Health*, June 2006)
Physician-led skin exam	"To find cancers in their earliest, most treatable stages, it's vital to see a dermatologist at least once a year for a thorough skin check." (Spot Check, *Ladies Home Journal*, August 2010)	Photograph of a patient's facial skin being examined by a dermatologist. (My 20 Years of Skin Cancer, *Ladies Home Journal*, August 2010)

*Note: quotes and image descriptions from Canadian magazines appear in Chapter 6, Table 12.

APPENDIX H: EXAMPLE TEXT CODING

ELLE BEAUTY
SUMMER SPECIAL

Ray BAN

Be a golden girl, but play it safe. What's new in sun protection? TEXT: ALISON GARWOOD-JONES

Remember when protecting your skin from the sun's harmful rays meant slathering an SPF 4 on your body and—if you were feeling *really* cautious—a 15 on your face? Today, SPF 15 is considered the low end of the protection spectrum, while 30 is fast becoming the accepted norm. Meanwhile, store shelves are filling up with more and more products in the 40s and 50s; at last count, 60 was the highest SPF on the Canadian mass market, but Australia still leads the way with an SPF 90. There's a good reason for this trend of bumping up the SPF in these products, says Tom Meyer, Ph.D., research director for the Coppertone Solar Research Center in Memphis, Tenn. "The public uses about half the amount of product we use when we are testing for SPF, which means they are getting about half the labelled SPF value." (SPF refers to the amount of sunburn-causing UV rays the product will block. UVA rays, which prematurely age skin by causing damage to deeper tissue, don't have a numbering system—yet.)

Dr. Kucy Pon, a Toronto-based dermatologist, says that convincing people to wear sunscreen is still a huge problem. "If you plan on being in the sun, we recommend spreading at least two tablespoons of SPF 15 over your entire body; that doesn't include reapplications every three hours," she explains. "But the average person doesn't use that much because sunscreens can be expensive and cosmetically inelegant—especially the physical blocks, with zinc oxide and titanium dioxide, which tend to be thick and greasy." Consequently, Pon recommends going higher than SPF 15 to ensure adequate protection.

"SPREAD AT LEAST TWO TABLESPOONS OF SPF 15 OVER YOUR ENTIRE BODY."

Spot on After you've applied your sunscreen, if you're wondering how to gauge whether or not you're getting too much sun, attach a SunSignals sensor (pictured on the opposite page) to your hat, bikini strap or skin. These nifty little stickers are ultraviolet indicators that go from sunny yellow to deep orange when it's time to seek shade. Note: They are only sensitive to UVB burning radiation, not UVA. □

Coppertone SPF 30
Continuous Spray
Sunblock ($13)

THEMO SANDER; MAKEUP: LANCASTER; GEOFFREY ROSS (PRODUCT)

132 ELLE CANADA

ELLECANADA.COM

Coding of article text: Date: June 2006. Magazine: *Elle Canada*. Magazine genre: women's. Country: Canada. Length: 1 page. 357 words. After IARC report: no. Number images: 2. Article focus: sunscreen. After carcinogen classification: no. IARC statistic: no. Type of skin cancer: none. Cancer continuum: prevention. UV slant: positive. Risk factors: none. UV behaviours: promotes sunscreen use; promotes shade. Early detection information: none. Health Belief Model constructs present and subcategory: severity (photoaging); benefits of prevention (avoid sunburn); barriers to prevention (inconvenience, monetary cost); implied cue to action (person, individual MD); self-efficacy prevention (UV protection with sunscreen).

APPENDIX I: EXAMPLE IMAGE CODING

you probably know that the sun is the leading cause of skin cancer (not to mention wrinkles and brown spots), so hopefully you're already shielding yourself from its rays. But you shouldn't stop there. New research shows that a few simple lifestyle changes can further reduce your odds of becoming one of the million new cases this year. To make it easy, we put together a 24/7 protection plan—follow it to stay healthy (and hold onto your youthful air) for years to come.

IN THE A.M.

Morning is the time to prepare your skin for battling a day's worth of ultraviolet rays.

● Serve up a better breakfast Start the day with a glass of pomegranate juice and top your cereal or yogurt with fresh blueberries; both fruits are high in antioxidant anthocyanins and vitamin C. A diet rich in antioxidants has been proven to help your body defend itself against the damage UV rays can do to your skin cells (i.e., cause mutations in your DNA that lead to skin cancer). Then indulge in that midmorning latte; it has cell-protecting benefits too. "Coffee contains some little known but powerful antioxidants, including caffeic and chlorogenic acids," says Donald Hensrud, M.D., chair of the division of preventive medicine at the Mayo Clinic in Rochester, Minnesota. To avoid the jitters, Hensrud suggests sticking to two cups a day.

● Supplement your protection Researchers have found that taking the extract of the South American fern Polypodium leucotomos (PL) in supplement form can help halt UV-induced skin damage and skin cancer. "In human studies, PL has been shown to decrease inflammation and prevent cellular mutations and photoaging," says Leslie Baumann, M.D., a Miami Beach dermatologist. Because PL pills, such as **Heliocare** ($53 for 60 capsules; *amazon.com*), are expensive, Baumann recommends downing three tablets an hour before heading out in the sun (as she does before playing a round of golf), rather than taking them daily. A newer, less costly version that may be as effective: SunPill ($20 for 30 tablets; *sunpill.com*), which also contains PL.

● Aim for a D There's a lot of buzz about vitamin D (sometimes dubbed "the sunshine vitamin") these days. Simply put, exposure to UVB rays makes our bodies produce this nutrient, which is said to help prevent many types of cancer. But lest you think that gives you an excuse to spend your days at the beach or on a tanning bed (which increases your risk for the deadliest type of skin cancer, melanoma, by 75 percent if used in your youth), dermatologists are quick to point out that there are better ways to get your D.

STEP OUT EARLY
Try to hit the beach in the early morning or late afternoon, when rays are weaker

74 | LOOK GREAT | SHAPE June 2009 | Shape.com

Coding of Image: Date: June 2009. Magazine: *Shape*. Magazine genre: women's. Country: U.S. Size: about half a page. Relative size: equal to text. Image prominence: prominent. Image type: photograph. Image colour: colour. Pictured: person. Skin cancer type: n/a. Cancer continuum: n/a. Slant on UV protection: negative. Promotes solar UV exposure: yes. Tan level: light tan. Pale look: no. UV photograph: no. Graphic image: no. Race/ethnicity: Caucasian. Facial expression: positive. Risk factors: none. UV behaviours: promotes tanned look. Early detection information: none. Health Belief Model Constructs (and subcategories): susceptibility (modifiable risk factor); barriers to prevention (appearance reasons).

APPENDIX J: PERMISSIONS

Permissions for Published or Accepted Articles

BMC Public Health (Chapter 3):

Research article

Coverage of skin cancer and recreational tanning in North American magazines before and after the landmark 2006 International Agency for Research on Cancer report

Jennifer E McWhirter and **Laurie Hoffman-Goetz***

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The electronic version of this article is the complete one and can be found online at: http://www.biomedcentral.com/1471-2458/15/169

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Journal of Cancer Education (Chapter 4):

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Licensed content title	North American Magazine Coverage of Skin Cancer and Recreational Tanning Before and After the WHO/IARC 2009 Classification of Indoor Tanning Devices as Carcinogenic
Licensed content author	Jennifer E. McWhirter
Licensed content date	Jan 1, 2014
Type of Use	Thesis/Dissertation
Portion	Full text
Number of copies	6
Author of this Springer article	Yes and you are the sole author of the new work
Order reference number	None
Title of your thesis / dissertation	Visual and Text Coverage of Skin Cancer and Recreational Tanning in Popular North American Magazines from 2000 to 2012
Expected completion date	Apr 2015
Estimated size(pages)	300
Total	0.00 CAD

Journal of Cancer Education (Chapter 5):

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Licensed content author	Jennifer E McWhirter
Licensed content date	Jan 1, 2015
Type of Use	Thesis/Dissertation
Portion	Full text
Number of copies	6
Author of this Springer article	Yes and you are the sole author of the new work
Order reference number	None
Title of your thesis / dissertation	Visual and Text Coverage of Skin Cancer and Recreational Tanning in Popular North American Magazines from 2000 to 2012
Expected completion date	Apr 2015
Estimated size(pages)	300
Total	0.00 USD

Journal of the American Academy of Dermatology (Chapter 5):

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Permission for Use of Image (Figure 6)

---------- Forwarded message ----------
From: **Thomas Leveritt** <thomas.leveritt@gmail.com>
Date: Sun, Mar 15, 2015 at 10:32 PM
Subject: Re: permission to use photo in PhD dissertation
To: Jennifer McWhirter <jennifer.mcwhirter@gmail.com>

Hi Jenn,

Yes, of course - and thanks for asking.

In general I'm doing UV stuff for a lot of organisations right now, almost all of it for May release. Also some magazines are starting to contact me directly to run images alongside their own editorial, so it's an interesting time, in that it feels like UV imaging is the new standard look and feel for beauty marketing - which inter alia means that industry will shortly be doing all the heavy lifting on skin cancer. Happy to talk about this more if you want - if not, best of luck with the doctorate.

All the best

Tom

On 15 Mar 2015 22:15, "Jennifer McWhirter" <jennifer.mcwhirter@gmail.com> wrote:

Dear Thomas,

I'm a huge fan of your UV photography work and think it's wonderful that you are using it to encourage people to protect their skin from the sun.

I'm in the final stages of writing up my PhD dissertation on media coverage of skin cancer and UV exposure behaviours. A major part of my work has been examining the types of images published alongside media articles about these topics. In one section of my write-up, I discuss evidence from behavioural research about the power of UV photographs to encourage healthy skin behaviours. I'd like to be able to show the people who read my dissertation exactly what I'm referring to by including a relevant example image. The best such images are yours and I wondered if it would be okay with you if I included the image below in my discussion section. I would, of course, indicate the photo was created by you.

Thanks for considering.

Jenn