Published in final edited form as:

Health Commun. 2015 November ; 30(11): 1102–1111. doi:10.1080/10410236.2014.921752.

A Study of the Frequency and Social Determinants of Exposure to Cancer-Related Direct-to-Consumer Advertising Among Breast, Prostate, and Colorectal Cancer Patients

Andy SL Tan, MBBS, MPH, MBA, PhD¹

¹Center of Excellence in Cancer Communication Research, Annenberg School for Communication, University of Pennsylvania, 3620 Walnut Street, Philadelphia, PA 19104

Abstract

Cancer-related direct-to-consumer advertising (DTCA) is controversial because cancer treatment is complex and entails more risks and costs than typical treatments that are advertised for other conditions. Drawing from the Structural Influence Model of Communication, this study explores communication inequalities in DTCA exposure across social determinants among a population-based sample of 2013 patients diagnosed with breast, prostate, or colorectal cancers. Three survey items assessed patients' frequency of encountering ads concerning treatment alternatives for cancer, dealing with side effects of treatment, and doctors or hospitals offering services for cancer following their diagnosis. The analysis showed that overall exposure to DTCA in this study population was modest (median was once per week). Breast cancer patients reported significantly higher exposure to all three ad categories and overall DTCA exposure than prostate and colorectal cancer patients. Older patients consistently reported lower overall exposure to DTCA across the three cancer types. Other significant correlates included ethnicity (higher exposures among African-American prostate cancer patients vs. white; lower exposures in Hispanic colorectal cancer patients vs. white), and cancer stage (higher exposures in stage IV prostate cancer patients vs. stages 0-II). Education level did not predict patients' DTCA exposure. The implications of these observed inequalities in DTCA exposure on cancer outcomes are discussed.

Introduction

Direct-to-consumer advertising (DTCA) of medical treatments is highly controversial and generates intense debate between proponents and critics of the value or detrimental effects of such promotional efforts. Whether the overall impact of DTCA would be mostly positive or negative demands continued examination because of the different stakeholders involved. From a patient empowerment perspective, DTCA could be viewed as more beneficial than detrimental because “consumers have been empowered with additional information to “level the field” with the health care community, contributing to more efficient doctor-patient exchanges” (Beltramini, 2010). This optimism about DTCA benefits is tempered by the realization that even if DTCA can raise population awareness about treatments, many

patients are forced to forgo medical care due to financial difficulty (Weaver, Rowland, Bellizzi, & Aziz, 2010). Extending from this broader debate, the appropriateness of DTCA to raise awareness among cancer patients demands special consideration because of the highly specialized nature of cancer diagnosis and treatment compared with other disease conditions, more serious risks involved with treatment, higher costs, and potentially adverse effects of widened communication and health disparities (Kontos & Viswanath, 2011; Lovett & Liang, 2011).

In a recent review, Gray and Abel classified the rapidly diversifying types of consumer marketing in oncology into DTCA for cancer-related medications, cancer facilities, imaging services, genetic tests, and cancer screening or surveillance tests (Gray & Abel, 2012). While previous studies analyzed the content of cancer-related DTCA for prescription medications, high technology imaging services, and genetic testing (Abel, Lee, & Weeks, 2007; Illes et al., 2004), research is lacking regarding ads that promote hospitals and doctors. Few studies assess how frequently cancer patients report exposure to any form of cancer-related DTCA (Abel, Burstein, Hevelone, & Weeks, 2009) and none has been conducted to assess exposure among cancer patients at the population level. Judging from content analyses of various forms of DTCA, the opportunity for exposure to cancer-related DTCA appears lower compared with DTCA for other illnesses (Bell, Kravitz, & Wilkes, 2000). Thus far, there is also minimal information on whether inequalities in DTCA exposure exist in the population across social groups that would warrant concern for widened cancer outcome disparities.

This present study aims to contribute to the literature in two ways—it describes cancer patients' frequency of exposure to DTCA and examines whether inequalities in exposure are present across social determinants, relying on data from a population-based survey. In this article, DTCA is broadly defined as “promotional efforts by a pharmaceutical company, healthcare provider, or medical facility to present information about treatments for patients diagnosed with cancer in the lay media environment” (adapted from Wilkes, Bell, & Kravitz, 2000). DTCA exposure is conceptualized here as the encoded exposure or minimal trace in individuals' memory of having seen or heard ads of cancer treatment. It is this memory that would be accessible for later recall and is the minimum that would have to occur to reasonably expect DTCA exposure to produce effects on various outcomes (Southwell, Barmada, Hornik, & Maklan, 2002). Recognizing that different patients may have varying exposure patterns, the study compares DTCA exposures between patients diagnosed with breast, prostate, and colorectal cancer¹ and explores whether social determinants including age, race and ethnicity, or education level would predict exposure within each cancer type. Given the paucity of prior research on inequalities of cancer-related DTCA exposure in cancer patient populations, the findings in this study would generate much needed evidence on the frequency of exposures to DTCA among cancer patients and communication inequalities.

¹These three cancer types were chosen because they are among the top three cancer diagnoses among males and females in the U.S. The incidence rates in 2013 (age-adjusted to 2000 US standard population per 100,000) for these cancers are as follows: 1) breast cancer in females (122), prostate cancer (151), colorectal cancer in females (40) and males (54) (American Cancer Society, 2013)

Cancer Disparities and Structural Influence Model of Communication

Studies have described persistent disparities in cancer incidence, receipt of treatment, mortality, and survival rates based on social determinants including race and socioeconomic status (American Cancer Society, 2013). For instance, between 1992 and 2002, in a cohort of Medicare beneficiaries, African-American patients diagnosed with lung, colon, or prostate cancers were less likely to receive recommended curative or adjuvant treatment than white patients for these conditions. These disparities in receiving treatment persisted even after adjusting for socioeconomic status and access to healthcare (Gross, Smith, Wolf, & Andersen, 2008). Based on data from the Surveillance, Epidemiology, and End Results (SEER) Program, the five-year survival rate of cancer patients in poorer counties were 10% lower compared with patients living in more affluent counties (Ward et al., 2004). Minority patients have lower five-year survival compared with non-Hispanic whites even after adjusting for county level poverty (Ward et al., 2004).

The Structural Influence Model of Communication (SIMC) (Kontos & Viswanath, 2011) is useful in outlining mechanisms that could explain these persistent disparities in cancer outcomes across population groups and provides the theoretical framework for this present research. SIMC posits that inequalities in health communication have important roles in mediating relationships between social determinants (e.g., age, race, education, and income), access to healthcare resources, and more distal health outcomes (e.g., health behaviors, adherence, and treatment outcomes). The underlying assumption for this model is the notion that “control of communication is power and that whoever has the capacity to generate, access, use and distribute information enjoys social power and advantages that accrue from it”. According to SIMC, communication inequalities associated with DTCA may arise at three distinct but related levels: 1) certain groups may be less likely to gain exposure to DTCA, 2) differential attention and processing of DTCA may occur, and 3) some groups may not engage in additional information seeking after viewing DTCA. We briefly discuss each of these levels of inequalities in the following paragraphs, with a special emphasis on inequalities in gaining exposure to DTCA as this is the focus of the current study.

First, opportunities for exposure to DTCA may differ between subgroups due to ad placements that target specific populations and not others or selective media usage by certain groups. To illustrate, a content analysis of women's magazines found that the frequency and type of pharmaceutical ads differed between white and black-oriented magazines. The overall number of pharmaceutical ads in white-oriented magazines exceeded those in black-oriented magazines by four to eight times. Additionally, drug ads in white-oriented magazines promoted medications for conditions such as osteoporosis, menopause, Alzheimer's disease, weight reduction, arthritis, high cholesterol, and tobacco cessation. Ads for these medications were absent in black-oriented magazines. Conversely, ads promoting antiviral treatment for HIV or oral contraceptives were prevalent in black-oriented magazines but did not appear in white-oriented ones (Omonuwa, 2001). Another reason for differential exposure across groups is selective media use or limited access to certain media in certain groups. For example, if a health service or treatment is advertised primarily through the internet, certain groups could be excluded if they are less likely to use the internet (e.g., those with lower educational attainment, low household income, and

Hispanics are least likely to have access to the internet) (Kontos, Emmons, Puleo, & Viswanath, 2010). Together, selective ad placement or media usage may contribute to widening inequalities in DTCA exposure across social groups.

The second level of inequality occurs when different groups attend to or process the contents of DTCA differently. High levels of literacy are demanded to comprehend DTCA content and supplemental information materials. For instance, studies reported the majority of DTCA of prescription medications (83%) exceeded the eighth-grade reading level (Chao, 2005). The average reading grade level of supplemental information for DTCA—print ads in magazines, drug manufacturer websites, and mailed brochures—was in the high school range for main texts of these materials and in the college-level range for summary sections of materials (Kaphingst, Rudd, DeJong, & Daltroy, 2004). DTCA frequently emphasize product benefits over risks (Kaphingst & DeJong, 2004). Particularly for those with limited literacy skills, privileging benefits of medications may result in poorer comprehension of adverse side effects (Kaphingst, Rudd, DeJong, & Daltroy, 2005). These studies raise concerns that cancer patients with average health literacy may find it difficult to understand and process treatment-related information in such advertising, assess the attendant risks of treatments, and make meaningful decisions about treatments based on their exposure to DTCA.

Third, additional health information seeking arising from cancer-related DTCA may differ between social groups, even with adequate exposure, attention and processing of content in such DTCA. Given the brevity of most televised DTCA (usually one minute or shorter), which precludes presentation of detailed information about treatments, viewers are often directed to find out more information from external sources (e.g., print ads, toll-free number, health providers, or website). This is especially important for cancer-related DTCA because cancer treatments entail higher risks and can involve complex decisions and consultations with various medical specialists. Evidence indicates that health information seeking behaviors are driven by social determinants including education, social class, or ethnicity (Niederdeppe, 2008; Ramanadhan & Viswanath, 2006). Other barriers including time or financial costs associated with searching information on the internet or arranging for physician consultations may prevent certain social groups from seeking external information after viewing a specific cancer treatment ad. The key implication here is some vulnerable groups may miss getting important additional relevant information for their treatment decision-making process, leading to widened disparities in downstream cancer outcomes.

To summarize, the SIMC hypothesizes that communication inequalities associated with cancer-related DTCA arise at three distinct but related levels: 1) exposure, 2) attention and processing, and 3) additional information seeking. If communication inequalities exist at one or more of these levels, DTCA may have differential effects on cancer outcomes between certain social groups. On one hand, if some groups were more likely to be exposed to DTCA or attend to such ads, they may become more aware of novel treatment options available for their cancers than others. This may widen health outcomes disparities between these groups. On the other hand, detrimental effects of DTCA such as inappropriate use of treatments may affect one group more than others due to inequalities in information processing or additional information seeking to verify DTCA claims. For instance, if certain social groups are more

likely to look for additional information about an advertised treatment, they could weigh benefits and risks of an advertised treatment better than other groups and come to better informed treatment decisions. Drawing from this framework, the present study focuses on the first level of communication inequality and aims to examine whether certain patient subgroups have higher exposure to DTCA than others.

Overview of DTCA Exposure and its Effects

National consumer surveys found overall public awareness of prescription medication DTCA to be high (Aikin, Swasy, & Braman, 2004). One survey conducted by the U.S. Food and Drug Administration (FDA) reported 81% of a national sample of adults were aware of DTCA in 2002 (Aikin et al., 2004). Smaller surveys have been conducted on awareness of specific cancer-related DTCA of prescription medications. In a study among cancer patients receiving active treatment for hematologic and breast cancers, Abel et al. (Abel et al., 2009) found 86% of respondents were aware of DTCA for at least one of 24 specific medications for cancer treatment or supportive care. The highest awareness levels were for DTCA promoting supportive medications during chemotherapy including Procrit (erythropoietin alfa) for improving red blood cell count and Neulasta (pegfilgrastim) for boosting immune cells. The median number of cancer-specific drug ads that patients were aware of was 3 out of the 24 medications (Abel et al., 2009). To date, research is lacking in assessing the awareness of DTCA from hospitals or healthcare providers among cancer patients.

Individual characteristics and structural factors account for exposure to DTCA. Studies indicate that demographic factors (e.g., age, gender, or race/ethnicity), socioeconomic status (e.g., education level), and media use are potential predictors of DTCA exposure and awareness (Abel et al., 2009). Several of these individual characteristics will be discussed in detail in the next section. Structural factors that could influence consumer awareness of ads include the amount of ad spending for specific medications (Frank, Berndt, Donohue, Epstein, & Rosenthal, 2002), audience segmentation through selective placement of ads to cater to different audiences (Ball, Manika, & Stout, 2011), and access to health insurance and healthcare services (Lee & Begley, 2010).

DTCA exposure is linked to consumer communication behaviors (e.g., information seeking behaviors and prescription requests from their physicians) and physician prescribing behaviors. In the FDA survey, 43% of respondents reported that DTCA prompted them to look for more information about the advertised drug or health condition from their healthcare provider, reference books, interpersonal contacts, and the internet (Aikin et al., 2004). In another national survey, about half of the respondents (47%) who indicated they had seen a drug ad that was personally relevant in the past year reported talking about information in the ad during a visit with their doctor (Murray, Lo, Pollack, Donelan, & Lee, 2004). In addition, DTCA exposure is also indirectly associated with physician prescription behaviors. Among respondents who discussed information from a drug ad with their physicians, 29% reported they were prescribed the medication mentioned in the ad (Murray et al., 2004). Currently, there is limited research that focuses on patient and physician behaviors with regards to cancer-related DTCA. In one study, 17% of cancer patients who were aware of DTCA reported discussing an advertised treatment with their physicians. Of

these patients who discussed DTCA with their physicians, about one in five (19%) reported receiving a prescription for the medication while 62% were told by their physicians that they did not need the medication (Abel et al., 2009). Another study reported that overall spending on DTCA for aromatase inhibitors (a class of oral medications for reducing the risk of breast cancer recurrence) is associated with a small but significant increase in appropriate prescriptions for women diagnosed with breast cancer (i.e., postmenopausal women) at the population level. Conversely, ad spending is not associated with an increase in inappropriate prescriptions (i.e., premenopausal women) (Abel et al., 2013).

Social Determinants of Inequalities in Exposure to DTCA

Age

Prior research indicates that exposure to DTCA of cancer-related prescription medications differs depending on patients' age. In one study, older cancer survivors receiving active treatment in a comprehensive cancer institute reported less awareness of DTCA of 24 prescription cancer drugs advertised in print magazines and internet websites compared with younger survivors (Abel et al., 2009). This finding is counterintuitive and warrants attention because cancer tends to be diagnosed among older adults and logically, cancer-related DTCA should be expected to target older adults. Other studies on general DTCA awareness were less conclusive. An earlier study found that older consumers had lower awareness of prescription drug ads in general (Alperstein & Peyrot, 1993). Another study found that older consumers had higher awareness than younger consumers of medication ads for some conditions that were more salient for older consumers (e.g., osteoporosis and hypercholesterolemia) but had lower awareness for other conditions (e.g., allergies) (Bell, Kravitz, & Wilkes, 1999). Research further suggests age-related memory changes that could result in declining recognition of exposure to media content in older adults (Southwell & Langteau, 2008). In addition, differences in remembering specific details in DTCA between younger and older adults (Abernathy & Adams-Price, 2006) could explain reduced recall of DTCA exposure in older adults. Drawing from the earlier studies that older adults tend to report lower ad awareness, the present study tests the following hypothesis that age would be associated with patients' self-reported exposure to DTCA.

H1: DTCA exposure would be lower among older cancer patients.

Sex

Content analyses found that general DTCA and cancer-related DTCA are more likely to target female audiences or occur in female-oriented print magazines than in male-oriented magazines (Abel et al., 2007). This could lead to women having more opportunity for exposure to DTCA compared with men. However, sex was not significantly associated with reported awareness of cancer-specific medications in a survey among cancer patients undergoing active treatment (Abel et al., 2009). Women were also more likely to pay attention to DTCA than men (Joseph et al., 2005) and this could lead to increased recall of DTCA exposure. These earlier studies led us to hypothesize that female patients would have higher DTCA exposure than male patients. In this research, due to the confounding of sex with cancer type (i.e., breast and prostate cancer patients), we test the hypothesis of sex

differences in DTCA exposure by examining differences between male and female colon cancer patients.

H2: DTCA exposure would be higher among female colon cancer patients.

Education

Educational attainment is another potential predictor of exposure to cancer-related DTCA in the population. For instance, awareness about DTCA for cancer genetic tests was significantly lower among those with high school or lower education (Kontos & Viswanath, 2011). Higher education level was also associated with improved memory of drug ads (Abernathy & Adams-Price, 2006). Prior studies indicate that DTCA content as well as the supplemental information in other forms tend to be at high difficulty reading levels (Chao, 2005), which may in turn deter patients with lower educational levels from paying attention to DTCA. Therefore, we expect that higher education levels would predict increased DTCA exposure.

H3: DTCA exposure would be higher among cancer patients with higher education levels.

Ethnicity/ Race

Inequalities in exposure may arise because fewer DTCA for treatment of serious health conditions including cancer are placed in media outlets that target minority ethnic groups compared to those targeting general audiences (Duerksen et al., 2005). Selective media use or limited access to certain media where DTCA is presented in certain populations could also lead to differential DTCA exposure (e.g., Hispanics are least likely to have access to the internet) (Kontos et al., 2010). There is however scant evidence or theoretical justification for ethnic or racial inequalities in cancer-related DTCA exposure above and beyond other important indicators of socio-economic status including education and household income. For instance, adjusting for household income, education, and employment, results from the 2007 HINTS indicated black and Hispanic adults were not significantly different from white adults in terms of having heard about cancer genetic testing (Kontos & Viswanath, 2011). More recent content analysis also shows no significant differences in DTCA volume between African American and general audience magazines (Crawley, Hisaw, & Illes, 2009). Despite the above information, this study submits that research to understand the role of race/ethnicity in predicting cancer-related DTCA exposure would be practically important and meaningful. Due to the mixed evidence suggested in these earlier studies, the assessment of race/ethnicity as a predictor proceeded with the following research question:

Research Question 1: Does DTCA exposure differ by race/ethnicity of cancer patients?

Method

Study Population

This study relied on survey data from patients who were diagnosed with breast, prostate, or colorectal cancers and whose names were sent to the Pennsylvanian Cancer Registry in 2005. The sampling frame consisted of 26,608 patients from the PCR. Of these patients, 3,994 (15% of the sampling frame) were randomly selected, after stratifying by these three

cancer types, to participate in the survey in September 2006, approximately 9 to 21 months after their initial diagnoses. After the initial data collection, an oversample among patients diagnosed with colorectal cancer, those with Stage IV disease, and African American patients was added to increase sample sizes for subgroup analyses. Overall, 679 breast cancer patients, 650 prostate cancer patients, and 684 colorectal cancer patients completed the survey. The American Association for Public Opinion Research response rates (AAPOR RR#4) (American Association for Public Opinion Research, 2006) for breast, prostate, and colorectal cancer patients in this study were 68%, 64%, and 61% respectively. Of the 2013 participants, 369 were not asked the questions on DTCA exposure because they randomly received a short version of the questionnaire with fewer items as part of another study (Kelly, Frazee, & Hornik, 2010). An additional 150 to 228 respondents for each of the three DTCA exposure items were missing because of item non-response. Therefore, data on overall DTCA exposure was available for 1505 or 75% of the initial sample. The survey questionnaire was designed following literature review, patient interviews, and expert consultation. These questionnaires were mailed to participants based on Dillman's procedure for mail surveys (Dillman & Dillman, 2000). The university's institutional review board approved the study.

Measures

DTCA exposure is operationalized as patients' self-reported frequency of encountering three different types of ads since their cancer diagnosis: 1) treatment alternatives for cancer, 2) drugs for dealing with side effects of treatment, and 3) hospitals or doctors offering services for cancer. Responses for each survey item ranged along a 5-level scale (never, less than every month, about twice a month, about once a week, almost every day). To allow easier interpretation of these response options in the descriptive analyses, each response choice was recoded to represent the frequency of encountering the aforementioned ads per week (i.e., never=0, less than every month=0.2, about twice a month=0.5, about once a week=1, and almost every day=7). An overall exposure to DTCA was computed by adding participants' responses to the three survey items (ranging from 0 to 21). Results from a separate validation study indicated that these items demonstrated reliability and construct validity (Tan & Hornik, 2014).

The key social determinants of exposure to DTCA that were examined were participants' age, sex, education, and ethnicity. Covariates included AJCC/UICC stage of cancer at diagnosis derived from cancer registry data (Greene et al., 2002). Of the 1505 participants in the analyzed sample, missing values for predictor variables ranged from 3 to 97 cases due to item non-response or insufficient information for cancer staging in the registry. Compared with the analyzed sample, the 508 participants who were excluded were slightly older (mean 66.9 years vs. 64.0 years); less likely to be African American (9.3% vs. 14.0%); more likely to be Hispanic or from other ethnic groups (6.9% vs. 3.3%); more likely to have stage 0-2 cancer (80.1% vs. 67.9%); and less likely to have stage 4 cancer (8.9% vs. 18.5%). Gender and education status did not differ between the analyzed sample and excluded cases.

Analyses

Descriptive analyses were performed using SPSS version 20.0 to describe the distributions of frequency of exposure to each category of ads and the overall frequency of exposure to DTCA across the three cancer types. Initial analyses showed that these variables were not normally distributed (skewness ranged from 2.05 to 3.61; kurtosis ranged from 2.40 to 11.74; all univariate Shapiro-Wilk tests were significant at $p < 0.0005$). Pairwise comparisons of exposure to each category of ads and overall exposure to DTCA between cancer types were conducted with the Kruskal-Wallis tests corrected for Type I errors using the Bonferroni approach. Multiple regression analyses were implemented using the Mplus software to fit full information maximum likelihood (FIML) models predicting the overall exposure to DTCA within each cancer type. Research has demonstrated that the FIML technique is superior to ad hoc methods for dealing with missing data in predictor variables (e.g., listwise deletion, pairwise deletion, mean imputation) and has the benefits of reducing bias and sampling variability in multiple regression models (Enders & Bandalos, 2001). Huber-White covariance adjustments were applied to the estimated standard errors as these are robust to non-normality in the data. The regression models applied post-stratification sample weights to adjust the final sample to represent the patient population from the cancer registry in terms of race, age, gender, marital status, time of diagnosis, and stage at diagnosis; adjust for survey non-response; and account for the oversampling of certain subgroups of patients.

Results

Table 1 summarizes the characteristics of the analyzed sample and patients within each cancer type. The average age of the sample was 64 years, half was female, 44% had some college education or higher, 83% were white, and 64% had early stage cancer (stages 0 to II). Additional details by cancer type are available in Table 1.

Table 2 presents the summary statistics of exposure to each category of ads and overall exposure to DTCA for the study sample and within each cancer type. The overall reported exposure to DTCA in the sample was modest ($M=2.6$ times per week, $SD=4.3$, median=once per week). However, a small proportion of the sample (16.1%) reported having more substantial exposure to DTCA ads of seven times a week or more. Based on the Kruskal-Wallis tests, the distribution of overall exposure to DTCA among breast cancer patients was significantly different from those of prostate and colorectal cancer patients (all $P_s < .0005$). Several pairwise comparisons of the distributions of exposure to each category of DTCA also showed significant differences across cancer types (all $P_s < .0005$). For ads about treatment alternatives, exposure among breast and prostate cancer patients differed from colorectal cancer patients. The exposure to ads about dealing with side effects was significantly different in all pairwise comparisons between these three cancer types. In addition, the distribution of exposure to ads on hospitals or doctors for breast cancer patients differed significantly when compared with those of prostate and colorectal cancer patients.

Table 3 presents the regression models predicting overall DTCA exposure for patients diagnosed with breast, prostate, or colorectal cancers. Hypothesis 1 was supported; older patients consistently reported less frequent overall exposure to DTCA across the three

cancer types (decreased frequency of exposure between 0.03 to 0.06 times per week for each additional year in age). Hypotheses 2 and 3 were not supported; sex and education level were not significant predictors of DTCA exposure. The association between race/ethnicity and exposure (research question 1) differed across cancer types. Among prostate cancer patients, African-American patients reported encountering DTCA 1.1 times per week more than white patients. Conversely, colorectal cancer patients who identified as Hispanic or other groups reported being exposed to 1 ad/week less than white patients. Across the three cancer types, the explanatory power of these models was small (R^2 ranged from 3% to 6%).

Discussion

This research was conceptualized based on the premise that communication inequalities may arise as a result of differential levels of cancer-related DTCA exposure as described in the Structural Influence Model of Communication. In this study population, patients diagnosed with breast, prostate, or colorectal cancers reported modest levels of exposure since their diagnosis to DTCA that concern cancer treatment alternatives, dealing with side effects of treatments, and hospitals or doctors offering cancer treatment services. Median frequency ranged from 0 to 0.5 times per week for each type of ad. The overall exposure to DTCA was correspondingly low (median frequency ranged from 0.7 to 1.4 times per week out of a maximum of 21). This level of reported exposure to DTCA is consistent with earlier reports that on average, cancer patients were aware of only 3 out of a list of 24 medications advertised in print magazines (Abel et al., 2009). The low levels of overall exposure observed in this present study further corroborates findings that ad spending for cancer-related DTCA is generally much lower than DTCA for other conditions (Bell et al., 2000; Wilkes et al., 2000). Although the average exposure to DTCA in this study population was modest, the analysis found that about 16% of the study population reported encountering DTCA seven times per week or more, which can be considered a substantial amount of exposure compared with other forms of deliberate public health communications and marketing campaigns. Compared with those who had lower DTCA exposures, patients with high DTCA exposure (seven times per week or more) tended to be younger (mean 59.1 years vs. 65.0 years); more likely to be female (69.0% vs. 47.1%); less likely to be white (74.5% vs. 84.4%); more likely to be African American (23.0% vs. 12.2%); Hispanic or from other ethnic groups (6.9% vs. 3.3%); and more likely to have stage 4 cancer (23.7% vs. 17.5%). Education status did not differ between patients with high DTCA exposure and those with modest exposure. The impact of DTCA on this group of high-exposure patients deserves careful study.

The analysis shows that patients diagnosed with breast cancer tend to report more frequent DTCA exposure than prostate or colorectal cancer patients. Earlier content analyses found that general DTCA and cancer-related DTCA are more likely to target female audiences or occur in female-oriented print magazines (Abel et al., 2007; Bell et al., 2000). Therefore, one interpretation of this finding could be female cancer patients are reporting higher DTCA exposures than male cancer patients. However, the analysis among colorectal cancer patients indicated that gender is not a significant correlate of DTCA exposure, meaning the differences observed in this study is more likely a function of differences between cancer type than of gender-based targeting. One reason could be higher ad spending on breast

cancer-specific treatments (e.g., anastrozole for breast cancer in women) leading to variations in cancer patients encountering ads that are most salient for their diagnosis. This is unlikely to be due to a higher incidence rate of breast cancer; incidence rates and number of new cases of prostate cancer are higher than those of breast cancer. Instead, increased breast cancer treatment ad spending may reflect the presence of more therapeutic options for breast cancer than prostate or colorectal cancers. For instance, there are 57 FDA-approved drugs for breast cancer treatment compared with prostate cancer (21 approved drugs) and colorectal cancer (22 approved drugs) (National Cancer Institute, 2013). However, it should be noted that not all approved drugs are advertised directly to patients. Future research should consider comparing the extent of cancer-specific DTCA and assessing the presence of inequalities between patients with various cancer types in terms of patient awareness of approved treatments, patient-provider discussions, and treatment decision-making.

The regression analyses of correlates of exposure to DTCA across cancer types suggest that there is some evidence of communication inequalities arising from DTCA exposure across social determinants. However, with the exception of age, the variation in exposure to DTCA was not explained consistently by social determinants among patients with the three cancer types. For instance, while older patients report lower exposures across all cancer types, patient ethnicity is correlated to DTCA exposure only among prostate and colorectal cancer patients. African-American prostate cancer patients reported higher DTCA exposure than white patients. This may relate to the elevated risk for prostate cancer among African-American males in the U.S. compared with other race or ethnic groups (American Cancer Society, 2013). The higher reports of DTCA exposure in African-American patients could reflect prostate cancer treatment ads that selectively target African-American patients or increased attention to ads among these patients due to pre-existing knowledge of increased risk. Conversely, colorectal cancer patients who identified as Hispanic or other groups reported lower DTCA exposure than white patients.

The implications for these observed race and ethnic differences in exposures on patient outcomes are uncertain at this point. It is not known if DTCA exposure inequalities observed in this study population would correspond to cancer treatment and survival inequalities across social groups. Varying recommendations for treatment, availability of safe and effective treatment options, and risk versus benefit considerations for an advertised treatment or service for the different cancer types and stages of disease complicate drawing implications from these inequalities. For instance, if an advertised treatment is appropriate based on treatment guidelines, patients who report less exposure to such DTCA might be less aware and less likely to receive this treatment. Conversely, if an advertised service entails greater risks and costs but is no more effective than standard care, patients who have higher ad exposure and pursue this treatment may be harmed. Further research would be necessary to assess whether DTCA might exacerbate cancer disparities as predicted in the Structural Influence Model or if DTCA might instead reduce cancer disparities.

This research focused on inequalities in cancer patients' self-reported DTCA exposure across social determinants. As described earlier, communication inequalities associated with DTCA may arise also from differential attention to DTCA, information processing of DTCA, or additional information seeking after viewing DTCA across patients from various social

groups. To fully understand the impact of DTCA communication inequalities, future research is encouraged to assess whether exposure to DTCA would result in patients from certain social groups are less likely to attend to DTCA, whether certain groups are biased in their processing of risk and benefit information embedded in DTCA, and whether certain groups would be more or less likely to seek for additional information.

There are some limitations in this study. First, several other social determinants named in the Structural Influence Model (e.g., income, employment, neighborhood, or urbanicity) were not available in this study due to constraints of survey length. Related to this limitation, the predictors in this study accounted for small levels of variance in DTCA exposure. Future research should consider including additional measures of social determinants and other factors including media consumption in assessing inequalities in DTCA exposure comprehensively. Second, there are limitations associated with the survey measures of DTCA exposure. Additional research would be necessary to validate self-reported exposure to DTCA with objective data including ad buys of DTCA on various media channels (television, newspapers or magazines, radio, and internet). Such data on DTCA spending at the aggregate level has been used extensively in prior research on DTCA for cancer and other illnesses (Abel et al., 2013). Third, the sample is limited to cancer patients within the state of Pennsylvania. It is plausible that interstate variations in DTCA spending by cancer facilities may occur due to varying levels of competition between local or regional cancer centers. Future research involving a national sample of cancer patients may be necessary to detect if geographical variation in DTCA exposure is present. Fourth, the data was collected in 2006 and may not generalize to current levels of DTCA spending and exposure among cancer patients. However, a recent study found that there was no sharp increases in overall DTCA spending for prescription drug promotion in the time period after this present study; overall DTCA spending reached a peak of \$5.9 billion in 2006, declined gradually after 2006, and stabilized at \$4.4 billion by 2010 (Kornfield, Donohue, Berndt, & Alexander, 2013). This present research would serve as a source of baseline information for future studies to monitor current changes in cancer-related DTCA spending and patient exposure.

This study is strengthened by a few design characteristics. First, although limited to Pennsylvania, the population-based sample of cancer patients across three cancer types compares favorably to earlier studies conducted with population-based samples who are predominantly healthy and for whom DTCA was not personally salient (Aikin et al., 2004). In addition, this study also represents a more diverse sample of cancer patients when compared to studies that also focused on cancer patients but were limited by convenience samples of patients treated within a single hospital. Third, the study examines additional categories of DTCA including treatment alternatives and hospitals or doctors offering treatment services. This enables a more comprehensive assessment of cancer patients' exposures to these additional forms of cancer treatment advertising that are increasingly prevalent (American Medical Association, 2006). In contrast, earlier research focused predominantly on DTCA of prescription medications, imaging services, or genetic testing (Abel et al., 2007; Illes et al., 2004).

In conclusion, the findings in this study provide new evidence on the frequency of exposures to DTCA among cancer patients and assessed communication inequalities in DTCA

exposure. The frequency of overall exposure to cancer-related DTCA among a population-based sample of cancer patients in Pennsylvania is modest. Healthcare providers should routinely assess if their patients are aware of appropriate treatment and care options. However, continued monitoring of the content, ad spending, and patient awareness to various types of DTCA is recommended as some patients reported substantial frequency of exposure. For these patients who are better informed about treatment options, healthcare providers could create a ‘teachable moment’ to discuss the benefits, risks, and appropriateness of various treatments with their patients in a way that enhances the shared treatment decision-making process. While the study shows that patients’ exposure to DTCA differs across cancer type and age, there is minimal evidence to suggest that patients from minority racial groups or those with lower levels of education have systematically lower exposure to warrant immediate concern about widening cancer disparities among these patient subgroups.

Acknowledgments

This research was supported by P20CA095856 and P50CA095856 from the National Cancer Institute. I wish to thank Professors Hornik, Joseph N. Cappella, Paul Messaris, and Katrina Armstrong for their helpful comments on an earlier version of this manuscript.

References

- Abel GA, Burstein HJ, Hevelone ND, Weeks JC. Cancer-related direct-to-consumer advertising: awareness, perceptions, and reported impact among patients undergoing active cancer treatment. *Journal of Clinical Oncology*. 2009; 27:4182–4187. [PubMed: 19652071]
- Abel GA, Chen K, Taback N, Hassett MJ, Schrag D, Weeks JC. Impact of oncology-related direct-to-consumer advertising. *Cancer*. 2013; 119:1065–1072. [PubMed: 23132702]
- Abel GA, Lee SJ, Weeks JC. Direct-to-consumer advertising in oncology: A content analysis of print media. *Journal of Clinical Oncology*. 2007; 25:1267–1271. [PubMed: 17401016]
- Abernathy LT, Adams-Price CE. Memory and comprehension of magazine-based prescription drug advertisements among young and old adults. *Journal of Current Issues & Research in Advertising*. 2006; 28:1–13.
- Aikin, KJ.; Swasy, JL.; Braman, AC. Patient and physician attitudes and behaviors associated with DTC promotion of prescription drugs - Summary of FDA survey research results. Washington, D.C.: U.S. Food and Drug Administration; 2004. Retrieved from <http://www.fda.gov/downloads/Drugs/ScienceResearch/ResearchAreas/DrugMarketingAdvertisingandCommunicationsResearch/UCM152860.pdf>
- Alperstein NM, Peyrot M. Consumer awareness of prescription drug advertising. *Journal of Advertising Research*. 1993; 33:50–56.
- American Association for Public Opinion Research. Standard definitions: Final dispositions of case codes and outcome rates for surveys. AAPOR; 2006.
- Cancer facts and figures 2013. American Cancer Society; Atlanta, GA: 2013. Retrieved from <http://www.cancer.org/acs/groups/content/@epidemiologysurveillance/documents/document/acspc-036845.pdf>
- American Medical Association. Hospital ad spending rising. 2006 Feb 27. *amednews.com* Retrieved April 11, 2012, from <http://www.ama-assn.org/amednews/2006/02/27/bicb0227.htm>
- Ball JG, Manika D, Stout P. Consumers young and old: Segmenting the target markets for direct-to-consumer prescription drug advertising. *Health Marketing Quarterly*. 2011; 28:337–353. [PubMed: 22054029]
- Bell RA, Kravitz RL, Wilkes MS. Direct-to-consumer prescription drug advertising and the public. *Journal of General Internal Medicine*. 1999; 14:651–657. [PubMed: 10571712]

- Bell RA, Kravitz RL, Wilkes MS. Direct-to-consumer prescription drug advertising, 1989-1998. A content analysis of conditions, targets, inducements, and appeals. *J Fam Pract.* 2000; 49:329–335. [PubMed: 10778839]
- Beltramini RF. DTC advertising's programmatic research and its effect on health communication. *Health Communication.* 2010; 25:574–575. [PubMed: 20845147]
- Chao BA. Evaluating the educational content of direct-to-consumer fulfillment materials. *American Journal of Health-System Pharmacy: AJHP: Official Journal of the American Society of Health-System Pharmacists.* 2005; 62:620–625. [PubMed: 15757884]
- Crawley LM, Hisaw L, Illes J. Direct-to-consumer advertising in black and white: Racial differences in placement patterns of print advertisements for health products and messages. *Health Marketing Quarterly.* 2009; 26:279–292. [PubMed: 19916095]
- Dillman, DA.; Dillman, DA. *Mail and Internet surveys : the tailored design method.* 2nd. New York: J. Wiley; 2000.
- Duerksen SC, Mikail A, Tom L, Patton A, Lopez J, Amador X, et al. Sadler GR. Health disparities and advertising content of women's magazines: a cross-sectional study. *BMC Public Health.* 2005; 5:85. [PubMed: 16109157]
- Enders CK, Bandalos DL. The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling.* 2001; 8:430–457.
- Frank, RG.; Berndt, ER.; Donohue, J.; Epstein, A.; Rosenthal, M. Trends in direct-to-consumer advertising of prescription drugs. Henry J. Kaiser Family Foundation; 2002. Retrieved from <http://www.kff.org/rxdrugs/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=14881>
- Gray SW, Abel GA. Update on direct-to-consumer marketing in oncology. *Journal of Oncology Practice.* 2012; 8:124–127. [PubMed: 23077440]
- Greene, FL.; Page, DL.; Fleming, ID.; Fritz, A.; Balch, CM.; Haller, DG.; Morrow, M., editors. *AJCC cancer staging manual.* 6th. New York: Springer-Verlag; 2002.
- Gross CP, Smith BD, Wolf E, Andersen M. Racial disparities in cancer therapy. *Cancer.* 2008; 112:900–908. [PubMed: 18181101]
- Illes J, Kann D, Karetsky K, Letourneau P, Raffin TA, Schraedley-Desmond P, et al. Atlas SW. Advertising, patient decision making, and self-referral for computed tomographic and magnetic resonance imaging. *Archives of Internal Medicine.* 2004; 164:2415–2419. [PubMed: 15596630]
- Joseph M, Stone G, Haper J, Stockwell E, Johnson K, Huckaby J. The effect of manufacturer-to-consumer prescription drug advertisements: An exploratory investigation. *Journal of Medical Marketing.* 2005; 5:233–244.
- Kaphingst KA, DeJong W. The educational potential of direct-to-consumer prescription drug advertising. *Health Affairs.* 2004; 23:143–150. [PubMed: 15318574]
- Kaphingst KA, Rudd RE, DeJong W, Daltroy LH. Literacy demands of product information intended to supplement television direct-to-consumer prescription drug advertisements. *Patient Education and Counseling.* 2004; 55:293–300. [PubMed: 15530767]
- Kaphingst KA, Rudd RE, DeJong W, Daltroy LH. Comprehension of information in three direct-to-consumer television prescription drug advertisements among adults with limited literacy. *Journal of Health Communication.* 2005; 10:609–619. [PubMed: 16278198]
- Kelly BJ, Frazee TK, Hornik RC. Response rates to a mailed survey of a representative sample of cancer patients randomly drawn from the Pennsylvania Cancer Registry: a randomized trial of incentive and length effects. *BMC Medical Research Methodology.* 2010; 10:65. [PubMed: 20630101]
- Kontos EZ, Emmons KM, Puleo E, Viswanath K. Communication inequalities and public health implications of adult social networking site use in the United States. *Journal of Health Communication.* 2010; 15(Suppl 3):216–235. [PubMed: 21154095]
- Kontos EZ, Viswanath K. Cancer-related direct-to-consumer advertising: a critical review. *Nat Rev Cancer.* 2011; 11:142–150. [PubMed: 21258398]
- Kornfield R, Donohue J, Berndt ER, Alexander GC. Promotion of prescription drugs to consumers and providers, 2001–2010. *PLoS ONE.* 2013; 8:e55504. [PubMed: 23469165]

- Lee D, Begley CE. Racial and ethnic disparities in response to direct-to-consumer advertising. *American Journal of Health-System Pharmacy*. 2010; 67:1185–1190. [PubMed: 20592325]
- Lovett KM, Liang BA. Risks of online advertisement of direct-to-consumer thermography for breast cancer screening. *Nature Reviews Cancer*. 2011; 11:827–828.
- Murray E, Lo B, Pollack L, Donelan K, Lee K. Direct-to-consumer advertising: Public perceptions of its effects on health behaviors, health care, and the doctor-patient relationship. *J Am Board Fam Pract*. 2004; 17:6–18. [PubMed: 15014047]
- National Cancer Institute. Drugs approved for breast cancer. 2013. Retrieved July 15, 2013, from <http://www.cancer.gov/cancertopics/druginfo/breastcancer>
- Niederdeppe J. Beyond knowledge gaps: Examining socioeconomic differences in response to cancer news. *Human Communication Research*. 2008; 34:423–447.
- Omonuwa SC. Health disparity in black women: lack of pharmaceutical advertising in black vs. white-oriented magazines. *Journal of the National Medical Association*. 2001; 93:263–266. [PubMed: 11491276]
- Ramanadhan S, Viswanath K. Health and the information nonseeker: a profile. *Health Communication*. 2006; 20:131–139. [PubMed: 16965250]
- Southwell BG, Barmada CH, Hornik RC, Maklan DM. Can we measure encoded exposure? Validation evidence from a national campaign. *Journal of Health Communication*. 2002; 7:445–453. [PubMed: 12455763]
- Southwell BG, Langteau R. Age, memory changes, and the varying utility of recognition as a media effects pathway. *Communication Methods and Measures*. 2008; 2:100–114.
- Tan ASL, Hornik RC. Measuring exposure to direct-to-consumer advertising: a validation study in the context of cancer-related treatment advertising. *Communication Methods and Measures*. 2014; 8:52–78. [PubMed: 24693332]
- Ward E, Jemal A, Cokkinides V, Singh GK, Cardinez C, Ghafoor A, Thun M. Cancer disparities by race/ethnicity and socioeconomic status. *CA: A Cancer Journal for Clinicians*. 2004; 54:78–93. [PubMed: 15061598]
- Weaver KE, Rowland JH, Bellizzi KM, Aziz NM. Forgoing medical care because of cost. *Cancer*. 2010; 116:3493–3504. [PubMed: 20549763]
- Wilkes MS, Bell RA, Kravitz RL. Direct-to-consumer prescription drug advertising: Trends, impact, and implications. *Health Affairs*. 2000; 19:110–128. [PubMed: 10718026]

Table 1
Demographic Characteristics Of Analyzed Sample By Cancer Type

	All patients (n=1505)	Breast (n=511)	Prostate (n=470)	Colorectal (n=524)
	% or <i>M</i> (SD)	% or <i>M</i> (SD)	% or <i>M</i> (SD)	% or <i>M</i> (SD)
Age at diagnosis (years) ^a	64.0 (12.4)	60.4 (13.3)	66.7 (9.6)	65.2 (12.9)
Female ^a	50.6	100.0	0.0	47.9
Education level ^b				
High school and lower	55.1	52.3	53.2	59.7
Some college and higher	44.1	46.6	46.6	39.3
Race				
White	82.8	81.4	80.6	86.1
African-American	14.0	14.7	16.8	10.7
Hispanic and other	3.3	3.9	2.5	3.3
Stage of disease ^b				
Stage 0-II	63.5	75.9	74.6	54.0
Stage III	12.7	6.0	4.8	28.8
Stage IV	17.3	18.1	20.6	17.2

Note.

^a 3 missing values.

^b 12 missing values.

^c 97 missing values.

Table 2
Distribution Of Weekly Exposure To Cancer-Related Direct-To-Consumer Advertising By Cancer Type

	All patients (n=1505)		Breast (n=511)		Prostate (n=470)		Colorectal (n=524)	
	<u>M (SD)</u>	<u>Median</u>	<u>M (SD)</u>	<u>Median</u>	<u>M (SD)</u>	<u>Median</u>	<u>M (SD)</u>	<u>Median</u>
Treatment alternatives (0 to 7)	0.7 (1.6)	0.2	0.9 (2.0)	0.2	0.5 (1.2)	0.2	0.5 (1.4)	0.2
Dealing with side effects (0 to 7)	0.7 (1.7)	0.2	1.1 (2.1)	0.2	0.4 (1.2)	0.0	0.7 (1.6)	0.2
Hospitals or doctors (0 to 7)	1.3 (2.3)	0.5	1.9 (2.7)	0.5	0.8 (1.7)	0.2	1.2 (2.2)	0.5
Summed exposure (0 to 21)	2.6 (4.3)	1.0	3.7 (5.3)	1.4	1.7 (2.9)	0.7	2.2 (4.1)	0.7

Notes. Superscripts denote statistically significant pairwise comparisons of distribution of DTCA exposures to ads within each row between cancer types based on Kruskal-Wallis tests, correcting for Type I errors using the Bonferroni approach (all $ps < .0005$). For example, the superscript "a" in the first row (treatment alternatives ads) denotes that the distribution of exposure for this category of ads was significantly different between breast and colorectal cancer patients.

Table 3
Predictors Of Summed Weekly Exposure To DTCA By Cancer Type

<u>Predictor variables</u>	<u>Breast cancer (n=511)</u>			<u>Prostate cancer (n=470)</u>			<u>Colorectal cancer (n=524)</u>		
	<u>B</u>	<u>95% CI</u>		<u>B</u>	<u>95% CI</u>		<u>B</u>	<u>95% CI</u>	
Age at diagnosis (years)	-0.059**	-0.095	- -0.023	-0.044***	-0.067	- -0.021	-0.030*	-0.057	- -0.002
Gender ^d – Female	-			-			0.750	-0.100	- 1.600
Education ^b – Some college and higher	-0.359	-1.420	0.702	0.197	-0.235	- 0.629	-0.332	-1.181	- 0.517
Race-ethnicity ^c									
African-American	0.920	-0.535	- 2.375	1.116***	0.315	- 1.918	1.175	-0.122	- 2.471
Hispanic and other	0.586	-2.096	3.268	-0.387	-1.220	- 0.445	-1.095**	-1.951	- -0.240
Stage of disease ^d									
Stage III	0.002	-2.486	- 2.491	-0.121	-0.843	- 0.601	0.447	-0.505	- 1.399
Stage IV	0.672	-0.621	- 1.966	0.899**	0.264	- 1.535	0.792	-0.640	- 2.224
Intercept	7.235			4.114			2.890		
R-squared	0.030			0.060			0.034		

Notes. B denotes weighted full information maximum likelihood estimates of unstandardized coefficients.

* p<.05;

** p<.01;

*** p<.001.

^a Male is the reference category.

^b High school and lower is the reference category.

^c White is the reference category

^d Stage 0 to II is the reference category (because there were no prostate cancer patients with stages 0 or I)