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LGB Cancer Survivors are More Likely to Participate in Risky Behaviors than Straight Cancer
Survivors, United States, Behavioral Risk Factor Surveillance System, 2014

By

Thuy Hang T. Nguyen

B.S., Georgia State University

A Thesis Submitted to the Graduate Faculty
of Georgia State University in Partial Fulfillment
of the
Requirements for the Degree
MASTER OF PUBLIC HEALTH

ATLANTA, GEORGIA

30303

Approval Page

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Author's Statement Page

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ABSTRACT

LGB Cancer Survivors are More Likely to Participate in Risky Behaviors than Straight Cancer Survivors, United States, Behavioral Risk Factor Surveillance System, 2014

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Cancer registries do not collect sexual orientation in their records, leading to limited information about LGB cancer survivorship. Studies have shown that both the LGB population and the population of cancer survivors participate in risky behaviors (i.e. smoking, drinking, and being overweight/obese; sleep inadequacy among cancer survivors), but information about LGB cancer survivors is limited. 2014 Behavioral Risk Factor Surveillance System (BRFSS) data was used to determine if LGB cancer survivors were more likely to participate in risky behaviors than straight cancer survivors. LGB survivors were more likely to drink at least one alcoholic beverage within the past 30 days (AOR: 1.99, 95% CI: 1.44-2.75), to report being an ever smoker (AOR: 1.59, 95% CI: 1.12-2.25), and to binge drink (AOR: 1.99, 95% CI: 1.21-3.28) than straight cancer survivors. There is a strong association between sexual orientation among cancer survivors and risky behaviors. The findings of this study concludes that risky behaviors may be detrimental to the health and survivorship of LGB cancer survivors and further research is needed to determine the association between LGB cancer survivorship, being an adolescent and young adult (AYA), and risky behavior.

Keywords: cancer survivors; sexual minority; risky behavior; lesbians; bisexual; gay

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CHAPTER I – Introduction

Risky behaviors, such as smoking, drinking, and obesity, have been studied numerous times among cancer survivors. These behaviors have a negative impact on cancer survival (Browman et al., 1993; Calle et al., 2003; Do et al., 2003; Mayne et al., 2009; Parekh et al., 2012; Shiels et al., 2014). Sleep inadequacy has been shown to impact the health and quality of life of cancer survivors (Eyigor et al., 2010; George et al., 2016; Gooneratne et al., 2007). Inadequate sleep may lead to insomnia, and, consequently, fatigue and mood changes in cancer survivors (Savard & Morin, 2001).

Several studies have assessed health behaviors and survivorship-related factors among subpopulations of cancer survivors (ACS, 2013; Kaul et al., 2016; Li et al., 2016; Lown et al., 2016; Tyson et al., 2016; Quinn et al., 2015c; Tai et al., 2012; Warner et al., 2016). For example, studies have examined health behaviors among minority cancer survivors, such as African American cancer survivors and Hispanic cancer survivors (ACS, 2013; Li et al., 2016; Tyson et al., 2016). Researchers have also examined the health behavior and survivorship of cancer survivors by age, such as the adolescent and young adult (AYA) cancer survivors or the childhood cancer survivors (Kaul et al., 2016; Lown et al., 2016; Tai et al., 2012; Warner et al., 2016).

A study by Boehmer, et al. (2012) used California state level data to examine the health behaviors among LGB cancer survivors and heterosexual cancer survivors. Thus far, the study by Boehmer, et al. (2012) is the only study found that discussed risky health behavior among LGB cancer survivors. There is a small literature on LGB cancer survivorship. This is due to the lack of research tools and data sources that researchers can use in order to study the LGB cancer survivors appropriately (IOM, 2011).

Without proper research tools (e.g. research methods such as probability sampling or nonprobability sampling) and resources (e.g. national surveys or cancer registries), representation of the LGBT population cannot be determined (IOM, 2011), and it can become difficult for researchers to look specifically into the population of LGB cancer survivors. Among the national surveys, there are surveys that include sexual orientation in their questionnaires, such as the National Health Interview Survey (NHIS) or the National Health and Nutrition Examination survey (NHANES) (IOM, 2011; Massetti et al., 2016). The Behavioral Risk Factor Surveillance System (BRFSS) has a sexual orientation module, but it is an optional module, which means not all of the states have to ask for the participants' sexual orientation (IOM, 2011). Consequently, the nation's population of LGB is not well represented in those particular surveys. Cancer registries, while a great source of data on new cases of cancer, may not include sexual orientation in their records. For example, the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) provides national cancer incidence and mortality data for use (Massetti et al., 2016). When data is obtained for SEER from the medical chart review, the data collected on patient demographics may not include sexual orientation because it is rarely or inconsistently reported in the medical record (Bowen & Boehmer, 2007). SEER does record the patient's sex as male, female, hermaphrodite, or transsexual (Bowen & Boehmer, 2007; Massetti et al., 2016). The patient's gender identity is collected, but the data is not released due to patient confidentiality (Bowen & Boehmer, 2007). Thus, these data cannot be used to study cancer among persons in the LGBT community (Bowen & Boehmer, 2007). Aside from cancer registries and national surveys, it can become costly and time-consuming for researchers to conduct studies on LGB health among cancer survivors. This may be due to their recruitment process. In order to find a sufficient sample size of LGB individuals for their studies, researchers

may recruit from areas that are heavily populated by the LGB community. By doing so, researchers run the risk of over-representing the LGB population (Ard, 2012; IOM, 2011).

Studies have examined patterns of risky behaviors by sexual orientation (Conron et al., 2010; Diamant et al., 2000; Drabble et al., 2005) and determined that members of the LGB community are more likely to participate in risky behaviors than their heterosexual counterparts (Case et al., 2004; Trocki et al., 2009). However, there is little information on LGB cancer survivorship (Quinn et al., 2015b). The study by Boehmer et al. (2012), so far, is the only study that looked at health behaviors among LGB cancer survivors. This hinders the possibility of aiding this subpopulation of cancer survivors if they are participating in these risky behaviors as well. Scientists do not know if LGB cancer survivors are at a higher risk of decreased survival rates and/or developing cancer again.

1.1 Purpose of the Study

The purpose of this study is to determine if LGB cancer survivors are more likely to participate in risky behaviors than straight cancer survivors. The 2014 BRFSS survey was used to collect and to analyze data on demographic characteristics and risky behavior among LGB cancer survivors and straight cancer survivors.

1.2 Study Question

This study will answer the following question:

1. Are LGB cancer survivors more likely to participate in risky behaviors than straight cancer survivors?

CHAPTER II – Review of the Literature

2.1 Cancer Survivors

There are over 15.5 million cancer survivors in the United States (ACS, 2016). According to the Centers for Disease Control and Prevention (CDC), an individual is considered a cancer survivor once they have been diagnosed with cancer, and they are considered a cancer survivor for the rest of their life (CDC, 2016a). The CDC adopted this term from the National Coalition for Cancer Survivorship (NCCS, 2014). The National Cancer Institute also defines it in a similar manner as the CDC (NCI, 2014a). However, “cancer survivor” is most commonly used to identify an individual who has finished active treatment, and the American Cancer Society (ACS) has more definitions for the term “cancer survivor” on their official website (ACS, 2014b), but for this study, a cancer survivor is someone who has reported a cancer diagnosis, regardless of their treatment status.

In regards to the demographic characteristics of the population of cancer survivors, the number of cancer survivors aged 65 years or older is expected to increase by 42% by the year 2020 (Parry et al., 2011). This is due to the aging population of Baby Boomers and the advances in early detection and cancer treatments which contribute to increased survival for cancer patients (CDC & Lance Armstrong Foundation, 2004; Parry et al., 2011). Another age group of interest is the AYA cancer survivors. Rates of survival for the population of AYA cancer survivors (15-39 years of age) have shown little improvement for more than two decades (HHS et al., 2006). AYA cancer survivors report lower quality of life (QoL) compared to their healthy peers and older cancer survivors (Quinn et al., 2015c). Studies of health behavior among AYA survivors found that they are also more likely to participate in risky behaviors than the older cancer survivors (Coups et al., 2005; Kaul et al., 2016; Tai et al., 2012). Researchers have also described health behaviors among African American cancer survivors, who reportedly have the

highest cancer death rate and lowest survival rate compared to other races/ethnicities (ACS, 2013). This difference in death and survival rates may be due to disparities in socioeconomic status, lack of access to appropriate and timely treatment/follow-up care, and participation in risky health behaviors such as alcohol consumption, smoking, obesity, and lack of exercise (Li et al., 2016; ACS, 2013; CDC, 2016b).

Other demographic characteristics of interest are marital status, education, employment, income, and insurance coverage. These characteristics were deemed variables of interest based on the results of past studies. For example, married cancer survivors are less likely to have metastatic cancer and less likely to die from cancer and more likely to undergo surgical procedures and/or radiotherapy, compared to unmarried cancer survivors (Aizer et al., 2013). Based on education level, cancer survivors who are reportedly less educated have a higher cancer death rate than those who are more educated (Jemal et al., 2008). A longitudinal study reported that following cancer diagnosis, employment and hours of work decreased within 12 months; annual income decreased by nearly 40% and total family income decreased by 20% within two years (Zajacova et al., 2015). The financial burden may affect the cancer survivors' mental well-being. As for insurance coverage, a study on AYA cancer survivors reported that those who were aged 25-39 and did not have insurance coverage had 2.4 times higher odds of being diagnosed with a stage IV cancer compared to those who had private insurance. Individuals who do not have insurance may not get the treatment that they need, and they are at a higher risk of cancer mortality (Rosenberg et al., 2015).

2.1.1 Risky Behaviors among Cancer Survivors

Smoking tobacco is the leading preventable cause of death in the United States, and it is linked to numerous health conditions and diseases, such as cardiovascular disease, lung cancer,

and stroke (HHS, 2014). The prevalence of currently smoking tobacco is high among cancer survivors. Depending on the study, prevalence of smoking ranged from 15-20% among cancer survivors (Bellizzi et al., 2005; Gibson et al., 2015; Shoemaker et al., 2016; Underwood et al., 2012). Smoking prevalence was 33% among AYA cancer survivors in comparison to 22% of the adults with no history of cancer (Kaul et al., 2016). Cancer survivors who continue to smoke after their diagnosis are less likely to respond to treatment and have lower survival rates (Browman et al., 1993; Karam-Hage et al., 2014; NCI, 2014b). Those who currently smoke are also at a higher risk of developing a second cancer (Do et al., 2003; Shiels et al., 2014).

Alcohol usage is linked to various cancers: mouth, pharynx, esophagus, liver, colorectum, and breast cancer, and combining alcohol usage with smoking would increase the likelihood of developing mouth, larynx, and esophagus cancer (Baan et al., 2007; Secretan et al., 2009). Mayne et al. (2009) determined that drinking before receiving a cancer diagnosis and continuing to drink after receiving the diagnosis increased the risk of dying, and drinking alcohol can also increase the risk of developing a second cancer (Do et al., 2003). Studies of alcohol usage among cancer survivors reported disturbing results. Bellizzi et al. (2005) reported that cancer survivors and their controls had similar proportions of moderate-to-heavy alcohol use, with younger cancer survivors (18-40 years of age) reporting being current drinkers more often than older cancer survivors (65 years or older). Coups et al. (2005) reported that cancer survivors and their non-cancer controls had similar rates of risky drinking, but older survivors, aged 65 years or older, had a lower prevalence of risky drinking than cancer survivors who were aged 18-39 years.

Obesity is a condition where an individual has an abnormally high proportion of body fat. It is associated with the development of the following cancer types: esophagus, pancreas, colon and rectum, breast, endometrium, kidney, thyroid, and gallbladder (NCI, 2012). Obesity has also

been linked to recurring cancer and death among cancer survivors who have had colorectal cancer and breast cancer as well as linked to prostate cancer mortality (Parekh et al., 2012). Cancer survivors have a high prevalence of obesity (Shoemaker et al., 2016). Calle et al. (2003) reported a significant trend of increasing body-mass index (BMI) with increasing death rates among cancer survivors. Study participants with a BMI of at least 40.0 had death rates in all of the cancers involved in the study (Calle et al., 2003).

Between 30-50% of those who were recently diagnosed with cancer or recently began cancer treatment reported difficulty sleeping (Savard & Morin, 2001). Cancer survivors reported that they have sleeping disturbances due to various reasons. An example would be cancer survivors experiencing pain from their chemotherapy (Glare et al., 2014), which may disturb them and they cannot sleep. For females, they become prematurely menopausal due to their treatment's effect on their estrogen level or their treatment aggravates their menopausal symptoms, causing them to experience hot flashes and night sweats (Chang et al., 2016; Couzi et al., 1995; Lorizio et al., 2012). Due to these sleep disturbances, cancer survivors may experience fatigue or mood disturbances (e.g. anxiety, dysphoria, or irritability) (Savard & Morin, 2001).

2.1.2 Subpopulations of Cancer Survivors

Researchers have looked at the prevalence of risky behavior among subpopulations of cancer survivors such as the AYA, childhood survivors, or African Americans. For example, Tai et al. (2012) reported a higher percentage of AYA cancer survivors who currently smoked and a greater proportion of them were obese, compared to the respondents who did not have a history of cancer. They also reported that there was no difference in drinking behavior between AYA cancer survivors and those without a history of cancer (Tai et al., 2012). Their study results are

used on CDC's Adolescent and Young Adult Survivorship website for the public to read and to educate themselves on the subpopulation (CDC, 2012).

Lown et al. (2016) conducted a study on the patterns and predictors of risky health behavior among adult survivors of childhood cancer. They reported that a greater proportion of the cancer survivors had a high probability of being insufficiently active with a low risk of smoking and drinking. Some of the risk factors that are involved with this group of cancer survivors were being overweight or obese, non-white, single, having a high school education and an income of less than \$60,000. Their study is published in the journal, *Cancer*, for the public to access and read (Lown et al., 2016).

The ACS creates a report almost every other year, providing updated cancer research information among the African American population. These reports cover various aspects of cancer survivorship among African Americans. The ACS 2013-2014 report provided incidence rates, mortality rates, and survival rates of selected cancers (i.e. breast, cervical, colorectal, prostate, etc.), and it discussed the prevalence of the risk factors among African Americans (i.e. tobacco use, obesity, physical activity, etc.). Intervention and prevention methods are discussed as well as a guide for the public to learn more about the health and cancer survivorship among African Americans (ACS, 2013). These subpopulations are being researched and providing the public with more information about them.

However, the subpopulation of LGB cancer survivors is not heavily researched because there is a lack of research tools and sources. Only one study was found that discussed risky behavior among LGB cancer survivors (Boehmer et al, 2012). Therefore, the LGB population do not have the information in order to learn more about the importance of developing a healthier

lifestyle and/or diet for themselves and to possibly prevent or reduce their risk of developing cancer.

2.2 LGBT

LGBT stands for Lesbian, Gay, Bisexual, and Transgender. These aforementioned terms are used to identify an individual's sexual orientation and gender identity. The LGBT are also known as sexual minorities. Sexual orientation consists of three aspects: identity, behavior, and desire (Ard et al., 2012; IOM, 2011). The terms, "lesbian", "gay", and "bisexual", describe the individual's sexual identity, defining the gender to which they are attracted. "Transgender" is an individual's gender identity; the term for an individual who does not identify with their biological sex at birth and may develop gender dysphoria (IOM, 2011; Mayer et al., 2008). There are also individuals who do participate in same-sex sexual behavior, but do not identify themselves as a part of a sexual minority; and there are individuals who experience same-sex attraction, but do not engage in same-sex sexual behavior (Ard et al., 2012; Mayer et al., 2008). People in the LGBT community come from different backgrounds, environments, and cultures; they are of different ages, races/ethnicities, and socioeconomic status (Grant et al., 2011; Lambda Legal, 2010; IOM, 2011).

2.2.1 LGBT Cancer Survivors

There have been studies on the prevalence of specific cancer types among the LGBT and on the importance of disclosure in order for the LGBT to receive the appropriate treatments from their healthcare providers (Quinn et al., 2015a; Quinn et al., 2015b). More specifically, Quinn et al. (2015a) created a literature review on seven types of cancer (anal, breast, colon, endometrial, lung, prostate, and cervical), providing epidemiologic information, three stages of cancer

prevention, late stage disease information, and psychosocial factors related to cancer survivorship as well as strategies to improve access to healthcare for the LGBTQ (Quinn et al., 2015a). Regarding disclosure, Quinn et al. (2015b) wrote a commentary, reporting that some LGBTQI may find it difficult to disclose their sexual orientation due to past negative experiences with the healthcare system. They have dealt with direct and indirect discrimination from their healthcare providers. Among transgender people, they have trouble finding knowledgeable healthcare providers who can discuss their sex health issues, and due to their transgender status, healthcare providers have denied their access to care (Quinn et al., 2015b). Quinn and their colleagues have increased awareness of the LGBT cancer survivor community, and they are making the effort to provide information about this subpopulation.

Only one study was found that examined risky behavior among cancer survivors who identified as lesbian, gay, or bisexual, but it was focused on the LGB population in California (Boehmer, et al. 2012). Boehmer, et al. (2012) stated that lesbians, gay men, and bisexual men and women in California reported smoking every day and being current smokers more often than their heterosexual counterparts. Report of alcohol consumption was similar between the lesbians, gay men, bisexuals, and heterosexuals. Lesbians, bisexual women, and heterosexual women had similar reports of being overweight or obese, and gay men and bisexual men were less likely to be overweight or obese than heterosexual men (Boehmer et al., 2012). Boehmer, et al. (2012) suggested expanding promotion efforts to encourage healthier lifestyle behaviors among the LGB cancer survivors and further research on LGB survivorship. Their report on smoking behavior is similar to past studies on LGB who smoke; lesbians and bisexual women are more likely to smoke than heterosexual women (Case et al., 2004; Diamant et al., 2000). Their results on alcohol usage and obesity were not similar to past LGB studies; alcohol usage is higher

among LGB individuals (Drabble et al., 2005; Stall et al., 2001). Lesbians and bisexual women are more likely to be overweight or obese than heterosexual women (Struble et al., 2010).

2.2.2 Risky Behaviors among LGB

Compared to heterosexual women, twice as many lesbians and bisexual women currently smoke (Case et al., 2004; Diamant et al., 2000), and other studies have shown that bisexual women smoke more than lesbians and heterosexual women. Trocki et al. (2009) reported 44.4% of the bisexual women smoked tobacco, compared to 34.1% of the heterosexual women with same-sex partners, 23.1% of the lesbians, and 19.1% of the exclusively heterosexual women. As for the men in the study by Trocki et al. (2009), smoking tobacco between the groups of men (gay men, bisexual men, heterosexual-identified men who have sex with men, and exclusively heterosexual men) did not have significant differences. Contrary to the study results of Trocki et al. (2009), Fallin et al. (2015) reported that gay men had a higher prevalence of smoking than heterosexual men (25.91% vs. 15.88%, respectively). Bisexual women were also reportedly smoking tobacco more often than lesbians and heterosexual women as well (Fallin et al., 2015).

Lesbians and bisexual women drink more than heterosexual women (Case et al., 2004; Diamant et al., 2000). In a study by Drabble et al. (2005), bisexual women reportedly had higher alcohol consumption, more alcohol-related problems, and sought help for alcohol-related problems more often, compared to exclusively heterosexual women; lesbians reported similar results. As for the men, gay men were about three times as likely to be drunk two times or more than exclusively heterosexual men (Drabble et al., 2005). Stall et al. (2001) evaluated the drinking habits of gay and bisexual men and men who have sex with men within the past 5 years, and they documented that nearly 9 out of 10 men reported at least some drinking within the past

six months. Eight percent (8%) of the men who have sex with men reported participation in frequent/heavy drinking (Stall et al., 2001).

Lesbians and bisexual women are more likely to be overweight or obese than heterosexual women (Case et al., 2004; Struble et al., 2010). Fredriksen-Goldsen et al. (2013) reported that older gay and bisexual men were less likely to be obese than heterosexual men. A study by Conron et al. (2010) used the Massachusetts BRFSS, from 2001-2008, and determined that gay men were less likely to be overweight or obese than heterosexual men, lesbians were more likely to be obese than heterosexual women, and bisexuals and heterosexuals had similar weights.

Based on these studies, lesbians, gays, and bisexuals are reportedly participating more often in risky behaviors (i.e. smoking, drinking, being overweight or obese). Due to their high prevalence of participating in these risky behaviors, the LGB population may be at increased risk of developing comorbid conditions, such as cardiovascular disease and asthma (Case et al., 2004; Diamant et al., 2000; Fredriksen-Goldsen et al., 2013), possibly because these risky behaviors are related to the development of cancer (Baan et al., 2007; HHS, 2014; NCI, 2012; Secretan et al., 2009).

CHAPTER III - Methods

3.1 Behavioral Risk Factor Surveillance System, 2014

The BRFSS is an annual, cross-sectional telephone survey that uses the random-digit-dialing technique in order to randomly select non-institutionalized participants, aged 18 years or older, who own a landline telephone or a cellphone. Those who participated by cellphone were people who resided in a private residence or college housing. In 2014, all 50 states, the District

of Columbia, Guam, and Puerto Rico participated in the survey. The questionnaire consisted of three parts: (i) the core questions, which were a standard set of questions that all of the participating states and territories must administer, (ii) optional modules, specific topics that states could choose to include in their survey by majority vote, and (iii) state-added questions, which were used to address each states' specific concerns (CDC, 2015b).

In 2011, CDC changed the BRFSS methodology in order to combine the landline telephone-based data set and the cellphone-based data set together. In 2014, the BRFSS created a combined landline- and cellphone-based data set, including three additional split versions of the questionnaire. To incorporate the cellphone-based data set and to weight the combined data, the BRFSS used iterative proportional fitting, or raking, to make sure that underrepresented groups within the sample are accurately represented. BRFSS also used design weights to adjust for the unequal probability of being selected, for non-coverage, and for nonresponses. This, in turn, created equal population estimates for each geographic region. The design weights for the 2014 BRFSS were adjusted for cellphone respondents who also had landline telephones in their households because of overlapping sample frames (CDC, 2015b). According to the American Association of Public Opinion Research (AAPOR), the combined landline and cellphone median weighted cooperation rate was 67.1%, and the median weighted response rate was 47.0% (CDC, 2015d). Separately, the response rate of landline telephones was 48.7% and the response rate of cellphones was 40.5% (CDC, 2015c).

3.2 Context of the Study

There were 464,664 BRFSS respondents (CDC, 2015f). The sample population included 19 states and one U.S. territory that administered the Sexual Orientation and Gender Identity optional module: Delaware, Hawaii, Idaho, Indiana, Iowa, Kansas, Kentucky, Louisiana,

Maryland, Minnesota, Montana, Nevada, New York, Ohio, Pennsylvania, Vermont, Virginia, Wisconsin, Wyoming, and Guam. There were 169,392 respondents in the sample population. All of these states and territory used the same questionnaire to administer this module (CDC, 2015a). In this module, respondents were asked if they identified as straight, lesbian or gay, bisexual, or other. They also had the option to respond with “don’t know/not sure” and “refused”. Those who responded as “other”, those who said they did not know their sexual orientation, and those who refused to answer the sexual orientation question were excluded (n=4,233 respondents). Respondents who responded as “other” were excluded because it was not clear in the BRFSS documentation what this response represented. The remaining respondents were those who reported being “lesbian or gay” or “bisexual” (n=3,865) and straight (145,142).

In the core questionnaire, respondents were asked two questions about their cancer history: if they had ever been told by a doctor, nurse, or other healthcare professional that they had skin cancer and if they had ever been told by a doctor, nurse, or other healthcare professional that they had any other type of cancer. The responses to these two questions were combined: respondents who responded “yes” to either or both cancer questions were identified as cancer survivors. Again, as mentioned earlier, a cancer survivor is defined as someone who has been diagnosed with cancer, from the time of their diagnosis and for the rest of their life, regardless of their treatment status. Respondents who responded “no” to both questions were identified as respondents who never had a cancer diagnosis. Respondents who responded “don’t know” or “refused” to both questions were excluded. The combination of the cancer-related questions in the sample population resulted in 27,531 respondents who reported receiving a cancer diagnosis, who are also known as cancer survivors, and 141,200 respondents who never had a cancer diagnosis.

These two new variables, the sexual orientation variable (representing the straight, lesbian or gay, and bisexual respondents) and the cancer variable (representing respondents who reported receiving a cancer diagnosis or not receiving a diagnosis), were then used to create four groups: straight cancer survivors (n=24,282), LGB cancer survivors (n=504), straight respondents with no cancer diagnosis (n=120,326), and LGB respondents with no cancer diagnosis (n=3,344). Only the cancer survivor groups, straight cancer survivors and LGB cancer survivors, were used for the rest of the data analysis. Therefore, the total size of the sample population in this study was 24,786 respondents.

Due to limited sample sizes, individuals who reported being transgender are not specifically identified in the study analysis. While this study does include individuals who are transgender, the analysis of risky behaviors among LGB cancer survivors were conducted without regard to gender identity.

Demographic characteristics were taken from the core section of the questionnaire as well. The respondents' reported age at interview was categorized into three groups: 18-39, 40-64, and 65+. Race and ethnicity groups were collapsed into two categories: white and non-white (non-Hispanic black, Hispanic, American Indian/Alaska Native, Asian, and other/multiracial). Marital status was collapsed into two categories: married/living together and single (divorced, widowed, separated, or never married). Education level was categorized into four groups: some high school, high school graduate/GED recipient, some college, and college graduate. Employment status was collapsed into two categories: employed and non-employed, which consisted of those who reported being out of work for 1 year or more, out of work for less than 1 year, a homemaker, a student, or retired. Income level was dichotomized as two categories: <\$25,000 or >\$25,000. Insurance coverage was categorized as yes or no.

As for risky behaviors, obesity was categorized into two groups: overweight/obese or not overweight/obese, using the calculated variable provided by the BRFSS. Respondents who reported a BMI at or greater than 25.0 were categorized as “overweight/obese”, and respondents who reported a BMI below 25.0 were categorized as “not overweight/obese” (CDC, 2015e). Respondents were asked about drinking at least one alcoholic beverage within the past 30 days, and this continuous variable was turned into a dichotomized variable. Those who reported drinking one or more alcoholic beverages within the past 30 days were categorized as responding ‘yes’ and those who reported zero alcoholic beverages were categorized as responding ‘no’. The calculated variable for binge drinking, provided by the BRFSS, was used. Respondents who reported that they did not drink in the past 30 days or those who reported that they did drink alcohol in the past 30 days, but did not report having five or more drinks of alcohol on occasion were categorized as responding “no”. Respondents who reported they did drink in the past 30 days and had five or more drinks on one or more occasions within the past 30 days were categorized as responding “yes” (CDC, 2015e). Respondents were asked if they have ever smoked at least 100 cigarettes in their entire lifetime. Those who reported ‘no’ were categorized as never smokers, and those who reported ‘yes’ were categorized as ever smokers. For inadequate sleep, respondents were asked how many hours of sleep did they get per 24 hours. Their responses were categorized into three groups: <7 hours, 7-9 hours, or 10+ hours.

3.3 Statistical Analysis

The Surveyfreq procedure was used to assess the prevalence of the demographic characteristics and risky behaviors among straight and LGB cancer survivors. Statistically significant differences for the demographic characteristics and risky behavior of the cancer

survivors were determined using chi-square statistics and comparing the chi-square values with the pre-determined alpha level: $<.05$.

Using the Surveylogistic procedure, unadjusted models and adjusted multivariable models were created to evaluate the association between sexual orientation among the cancer survivors and the risky behaviors. Simple logistic regression was used to evaluate the association between sexual orientation and each significant risky behavior in the unadjusted models. Multivariable logistic regression was used to determine the association between sexual orientation and each significant risky behavior, with the inclusion of the significant demographic characteristics, in the adjusted models. Unadjusted and adjusted odds ratios (AORs) and 95% confidence intervals (CI) were calculated. Some cells within the LGB sample do not have any or only a few cases, thus the results of the models should be interpreted with caution. All statistical analyses were performed using SAS version 9.3 due to the complex sampling design.

CHAPTER IV - Results

4.1 Demographic Characteristics

Demographic characteristics were compared between LGB cancer survivors and straight cancer survivors in Table 1. LGB cancer survivors were more likely to be aged 18-39 years (23.50% vs. 6.29%, respectively) and single (53.67% vs. 38.22%, respectively) than straight cancer survivors. More than 80% of both straight and LGB cancer survivors reported being white, but there were more LGB cancer survivors (14.64%) who reported being non-white than straight cancer survivors (10.56%). More straight cancer survivors (31.84%) reportedly graduated from high school or received their GED than LGB cancer survivors (22.00%), but

more LGB cancer survivors (34.44%) graduated from college than straight cancer survivors (27.81%).

There were more LGB cancer survivors (43.67%) who reported being employed than straight cancer survivors (35.29%), but income levels were similar between the two groups. More than 90% of both straight and LGB cancer survivors reported having insurance coverage, but amongst those who reported not having insurance coverage, a larger percentage of LGB cancer survivors (9.20%) indicated not having health insurance coverage compared with straight cancer survivors (3.44%).

Among the demographic characteristics, age, marital status, employment, and insurance coverage were statistically significantly different between the two groups, based on the pre-determined p-value: $<.05$. Thus, these statistically significant demographic characteristics will be included in the adjusted multivariable models.

4.2 Risky Behaviors

Table 1 describes the frequency of risky behaviors in the two groups. Both straight and LGB cancer survivors had a higher prevalence of being overweight or obese (68.35% vs. 67.26%, respectively). LGB cancer survivors had a higher prevalence of drinking at least one alcoholic beverage within the past 30 days (64.08% vs. 49.00%, respectively), ever smoking (64.41% vs. 52.32%, respectively), and binge drinking (19.10% vs. 8.51%, respectively) than straight cancer survivors; the differences across all three of these risky behaviors were statistically significant. Straight and LGB cancer survivors had similar prevalence rates regarding the number of hours they slept within 24 hours.

4.3 Unadjusted Logistic Regression Models

Table 2 reports the unadjusted multivariable logistic regression models of the focal risk behavior. LGB cancer survivors were more likely to report drinking at least one alcoholic beverage within the past 30 days (OR 1.86, 95% CI: 1.36-2.54), being an ever smoker (OR 1.65, 95% CI: 1.17-2.33), and binge drinking (OR 2.54, 95% CI: 1.57-4.10) than straight cancer survivors.

4.4 Adjusted Logistic Regression Models

After adjusting for all covariates in all of the adjusted models (see Table 2), cancer survivors who reportedly drink at least one alcoholic beverage within the past 30 days were more likely to identify as LGB (AOR 1.99, 95% CI: 1.44-2.75) than straight. Single cancer survivors (AOR 0.65, 95% CI: 0.59-0.72) were less likely to drink at least one alcoholic beverage within the past 30 days than those who were married or living together. Non-employed cancer survivors (AOR 0.50, 95% CI: 0.44-0.56) were less likely to drink at least one alcoholic beverage within the past 30 days than employed cancer survivors, and those who do not have insurance coverage (AOR 0.66, 95% CI: 0.49-0.89) were less likely to drink at least one alcoholic beverage within the past 30 days than those who do have insurance coverage.

Cancer survivors who reported being an ever smoker were 35% more likely to identify as LGB (AOR 1.59, 95% CI: 1.12-2.25) than straight. Single cancer survivors (AOR 1.27, 95% CI: 1.16-1.40) were more likely to identify as an ever smoker than those who were married or living together. Non-employed cancer survivors (AOR 1.46, 95% CI: 1.30-1.64) were more likely to identify as an ever smoker than employed cancer survivors. Cancer survivors who do not have insurance coverage (AOR 1.64, 95% CI: 1.23-2.20) were more likely to identify as an ever smoker than those who do have insurance coverage.

Among cancer survivors who reported binge drinking, they were more likely to identify as LGB (AOR 1.99, 95% CI: 1.21-3.28) than straight. Cancer survivors who were aged 18-39 years (AOR 4.06, 95% CI: 2.91-5.67) and cancer survivors who were aged 40-64 years (AOR 2.26, 95% CI: 1.85-2.77) were more likely to binge drink than cancer survivors who were 65 years of age or older. Non-employed cancer survivors (AOR 0.60, 95% CI: 0.50-0.73) were less likely to binge drink than employed cancer survivors.

CHAPTER V - Discussion and Conclusion

5.1 Discussion of Study Question

In this present study, the association between sexual orientation among cancer survivors and risky behavior was assessed using the 2014 BRFSS. The results of the study revealed that cancer survivors who identify as being LGB were more likely to participate in risky behaviors, specifically drinking at least one alcoholic beverage within the past 30 days, being an ever smoker, and binge drinking, than those who identify as straight.

Among the demographic characteristics, LGB cancer survivors had a higher prevalence of being young, single, and did not have a job nor insurance coverage. LGB cancer survivors also had a higher prevalence of drinking at least one alcoholic beverage within the past 30 days, being an ever smoker, and binge drinking. Some of these results are consistent with past studies on cancer survivors and the LGB population. Younger cancer survivors participate more often in risky behaviors such as smoking and drinking alcohol (Kaul et al, 2016; Tai et al., 2012; Warner et al., 2016), and studies on the LGB population reported that lesbians, gays, and bisexuals smoke and drink alcohol more often than heterosexuals (Case et al., 2004; Diamant et al., 2000; Drabble et al, 2005; Fallin et al., 2015; Stall et al., 2001; Trocki et al., 2009).

The higher prevalence in singles among LGB cancer survivors may be due to the issue that the 2014 BRFSS was conducted before gay marriage was legalized in 2015 (*Obergefell v. Hodges*, 2015). In 2014, 35 states legalized same-sex marriage (Pew Research Center, 2015), with other states offering varied degrees of legal protection for partners in domestic partnerships or legally recognized civil unions (Kail et al., 2015). Of the 19 states that administered the sexual orientation module, 16 states were among those who already legalized gay marriage (Pew Research Center, 2015). Guam, the U.S. territory, also legalized gay marriage (Servino, 2015). Also, the other marital status category, “married/living together”, includes couples that are not married but living together. LGB couples may exist in that category as well. Lastly, the results stated that the LGB cancer survivors more often reported being non-employed and uninsured. Since the LGB cancer survivors are younger, they may be students or homemakers that are dependent on their parents or spouse financially, or on a more concerning note, these LGB cancer survivors are younger and out of work. Without financial support from being employed, these LGB cancer survivors may not be able to afford insurance coverage, and, consequently, cannot receive treatment.

Cancer survivors who drink at least one alcoholic beverage within the past 30 days are more likely to identify as LGB, but they are less likely to be single, non-employed, or uninsured. The results show that LGB cancer survivors who drink at least one alcoholic beverage within the past 30 days are employed, can afford insurance, and has a partner. If LGB cancer survivors are employed, then this means that they can also afford to drink alcohol. However, based on the strong association between this risky behavior and being LGB and past studies that have shown that LGB people drink alcohol more often than heterosexuals (IOM, 2011), the LGB cancer survivors may need to reduce their alcohol intake to avoid developing cancer again or increase

their mortality rate. The ACS published recommended guidelines regarding alcohol consumption, and they advised that women drink only one alcoholic drink per day and two alcoholic drinks per day for men (Kushi et al., 2012).

The cancer survivors who reported being an ever smoker are more likely to identify as LGB, and they are more likely to be single, non-employed, and not covered by insurance. This signifies that LGB cancer survivors are more likely to be single, non-employed and uninsured. This is a concern because, without employment, these cancer survivors cannot afford insurance, and consequently, they may not receive necessary treatments. This would be detrimental to the well-being of the LGB cancer survivors, and their lack of insurance could put them at a higher risk of mortality (Rosenberg et al., 2015). The study by Kaul et al. (2016) had similar results, where they reported that cancer survivors who currently smoke were single and uninsured. Smoking cessation interventions or tobacco prevention strategies could be implemented and focused on LGB cancer survivors who have low socioeconomic status. Despite being insignificant in the adjusted model for ever-smoking cancer survivors, these programs and strategies should focus on the younger cancer survivors as well. AYA cancer survivors are more likely to be current smokers than individuals who do not have cancer (Kaul et al., 2016), and LGB cancer survivors have a high prevalence of cancer survivors who reported being aged 18-39 years in this present study.

As for the cancer survivors who reported binge drinking, those who reported being 18-39 years of age were four times more likely to binge drink than those who reported being 65 years-old or older. The odds of binge drinking and being 40-64 years of age among cancer survivors were 2.26 times the odds of being 65 years of age or older, which was still lower than the odds of the youngest age group. Studies have shown that AYA cancer survivors are more likely to drink

than older cancer survivors (Bellizzi et al., 2005; Coups et al., 2005), and this is due to the studied fact that AYA cancer survivors are more likely to participate in risky behavior (Warner et al., 2016). By bingeing on alcohol, they may consequently decrease their survival rate. Intervention and prevention programs should be implemented in order to educate cancer survivors about the detrimental effects of drinking alcohol in excess.

5.2 Implications of Study Results

Based on the results of the present study, LGB cancer survivors may be at a higher risk of developing a recurring cancer or secondary cancer as well as increasing the risk of their mortality because they are more likely to participate in risky behaviors than straight cancer survivors. Other factors beyond this study may also affect the health outcomes of the LGB cancer survivors, such as receipt of appropriate care, insurance, compliance with treatment, to name a few factors. Due to the lack of data on LGB cancer survivorship, the findings of this present study, along with the study by Boehmer et al. (2012), makes a strong contribution to the small literature.

AYA cancer survivorship may be a factor in the association between sexual orientation among cancer survivors and risky behaviors. Its presence was most evident when looking at the association between sexual orientation and binge drinking as well as when examining the prevalence of 18-39 year-olds among LGB cancer survivors. A study by Grov et al. (2006) reported that the men and women in their youngest cohort of LGB participants (18-24 year-olds) reported “coming out” at a younger age than the men and women in the oldest cohort (55+ years-old). With the results from the study by Grov et al. (2006), stating that younger LGB individuals are more likely to disclose their sexual orientation, it would explain the high prevalence of younger LGB cancer survivors in the present study. Then, knowing that AYA cancer survivors

and the LGB population are more likely to participate in risky behavior, it is necessary to examine if being AYA, or a younger age, is a confounder in the association between sexual orientation and risky behaviors. Research on AYA cancer survivorship should also look into protective factors that may influence AYA cancer survivors to participate less often in risky behaviors.

5.3 Limitations

The BRFSS data was self-reported, therefore it is open to recall and social desirability biases. The BRFSS data also is subject to survival bias, an error of concentration on those who “survived” cancer and overlooking those who did not. The data did not include those who were under 18 years of age or those who were institutionalized (i.e. cancer survivors who were in the hospital, nursing home, or hospice).

Since the sexual orientation module was an optional module, some states did not administer the module. As a result, the sample may not be fully representative of the entire United States. The LGB sample size was significantly smaller than the straight sample size, which resulted in missing clusters within the LGB sample, which may affect the accuracy and/or precision of the results for understanding the health risk behaviors of LGB individuals. Gender identity was not assessed in this present study, thus the transgender population was not represented.

5.4 Future Areas of Research

Further research on the population of LGBT cancer survivorship is needed. A study that assesses the population of transgender cancer survivor is needed as well because the present study did not observe gender identity.

A longitudinal study that focuses on AYA cancer survivors should be created in order to determine if there is a definite association between AYA, sexual orientation, and risky behavior. Such a longitudinal study should also examine known protective and other social factors that may influence AYA cancer survivors to participate less often in risky behaviors.

Public health intervention programs could assist with multiple issues. Smoking cessation programs could develop tobacco intervention strategies that are focused on younger cancer survivors. Public health professionals also could develop a guidebook to educate healthcare providers about disclosure, LGBT health issues, LGBT experience with discrimination, and good mannerism when dealing with LGBT patients. And, a more comprehensive longitudinal study could help to evaluate and make sure these programs are effective.

5.5 Conclusion

Sexual orientation among cancer survivors is associated with the risky behaviors examined in this study. These risky behaviors are well known to be detrimental to the health and survivorship of cancer survivors generally. The fact that these behaviors occur more frequently among LGB cancer survivors suggests that this vulnerable population may be at increased risk of developing a recurrent or second cancer and co-morbid conditions as well as reducing their survival rates. Programs are needed to educate healthcare providers about their LGB cancer patients. Cancer programs should address directly the unique needs of LGB cancer survivors in order to provide them with the information that they need in order to discourage participation in risky behaviors and to encourage healthy behaviors to increase their quality of life and survival rates. Finally, further research is needed to better understand the association between sexual orientation and other risky behaviors.

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Table 1. Demographic characteristics and risky behavior among straight cancer survivors and LGB cancer survivors

DEMOGRAPHICS	STRAIGHT CANCER SURVIVORS			LGB CANCER SURVIVORS			p-value
	Freq	Wt Freq	%(95%)	Freq	Wt Freq	%(95%)	
Age at interview							<.0001
18-39	690	455,983	6.29 (5.51-7.06)	60	46,870	23.50 (15.83-31.18)	
40-64	8,376	2,993,582	41.27 (40.09-42.45)	216	91,798	46.03 (38.03-54.04)	
65+	15,027	3,803,789	52.44 (51.28-53.61)	228	60,747	30.46 (24.01-36.91)	
Races/ethnicities							0.1388
White	22,261	6,495,445	89.44 (88.52-90.36)	441	165,968	85.36 (79.26-91.45)	
Non-white	1,842	766,845	10.56 (9.64-11.48)	57	28,473	14.64 (8.55-20.74)	
Marital status							0.0001
Married/Living tog	13,588	4,505,303	61.78 (60.65-62.91)	198	92,039	46.33 (38.24-54.41)	
Single	10,619	2,787,649	38.22 (37.09-39.35)	301	106,626	53.67 (45.59-61.76)	
Education							0.0636
Some high school	1,453	791,861	10.86 (9.90-11.82)	42	25,736	12.91 (7.48-18.33)	
HS grad/GED	7,217	2,322,650	31.84 (30.77-32.92)	99	43,877	22.00 (15.52-28.49)	
Some college	6,606	2,150,796	29.49 (28.42-30.56)	108	61,334	30.76 (22.78-38.74)	
College grad	8,954	2,028,324	27.81 (26.88-28.74)	255	68,468	34.33 (27.16-41.51)	
Employment							0.0382
Employed	7,523	2,571,885	35.29 (34.14-36.44)	187	87,080	43.67 (35.54-51.79)	
Non-employed	16,674	4,716,406	64.71 (63.56-65.86)	317	112,335	56.33 (48.21-64.46)	
Income level							0.8961
< \$25K	5,602	1,712,774	27.11 (25.95-28.27)	147	49,702	27.58 (20.55-34.62)	
> \$25K	15,027	4,605,040	72.89 (71.73-74.05)	315	130,492	72.42 (65.39-79.45)	
Insurance coverage							<.0001
Yes	23,600	7,054,450	96.56 (96.08-97.05)	467	180,851	90.80 (86.51-95.10)	
No	642	251,112	3.44 (2.95-3.92)	35	18,314	9.20 (4.90-13.49)	
RISKY BEHAVIORS							
Obesity							0.7899
Overweight/Obese	15,499	4,839,111	68.35 (67.23-69.47)	336	130,755	67.26 (59.21-75.30)	
Not overweight/obese	7,936	2,240,989	31.65 (30.53-32.77)	155	63,662	32.75 (24.70-40.79)	
At least 1 drink within the past 30 days							<.0001
Yes	11,502	3,554,459	49.00 (47.84-50.17)	277	125,483	64.08 (56.94-71.23)	
No	12,580	3,698,827	51.00 (49.83-52.16)	220	70,324	35.92 (28.77-43.06)	
Smoking status							0.0039
Ever smoker	12,246	3,811,783	52.32 (51.15-53.49)	304	128,343	64.41 (56.61-72.21)	
Never smoker	11,929	3,474,002	47.68 (46.51-48.86)	199	70,909	35.59 (27.79-43.39)	
Binge drinking							<.0001
Yes	1,697	613,703	8.51 (7.86-9.17)	60	36,144	19.10 (11.79-26.40)	
No	22,264	6,595,242	91.49 (90.83-92.14)	434	153,118	80.90 (73.60-88.21)	
Inadequate sleep							0.3151
<7 hours	6,753	2,288,008	31.66 (30.51-32.80)	164	72,884	36.62 (28.94-44.31)	
7-9 hours	16,177	4,661,786	64.50 (63.34-65.66)	320	120,114	60.35 (52.59-68.12)	
10+ hours	1,020	277,863	3.84 (3.45-4.24)	17	6,017	3.02 (1.01-5.04)	

Table 2. Logistic regression models of risky behaviors among cancer survivors

Characteristics	At least 1 alcoholic beverage within the past 30 days		Ever smoker		Binge drinking	
	Unadjusted model OR (95% CI)	Adjusted model OR (95% CI)	Unadjusted model OR (95% CI)	Adjusted model OR (95% CI)	Unadjusted model OR (95% CI)	Adjusted model OR (95% CI)
Sexual orientation						
LGB	1.86 (1.36-2.54)	1.99 (1.44-2.75)	1.65 (1.17-2.33)	1.59 (1.12-2.25)	2.54 (1.57-4.10)	1.99 (1.21-3.28)
Straight	1.00	1.00	1.00	1.00	1.00	1.00
Age at interview						
18-39	0.98 (0.75-1.28)			1.17 (0.88-1.56)		4.06 (2.91-5.67)
40-64	0.94 (0.84-1.06)			0.96 (0.86-1.07)		2.26 (1.85-2.77)
65+	1.00			1.00		1.00
Marital status						
Married/Living tog	1.00			1.00		1.00
Single	0.65 (0.59-0.72)			1.27 (1.16-1.40)		0.90 (0.75-1.07)
Employment						
Employed	1.00			1.00		1.00
Non-employed	0.50 (0.44-0.56)			1.46 (1.30-1.64)		0.60 (0.50-0.73)
Insurance coverage						
Yes	1.00			1.00		1.00
No	0.66 (0.49-0.89)			1.64 (1.23-2.20)		1.07 (0.72-1.59)