Published in final edited form as:

LGBT Health. 2014 June ; 1(2): 86–92. doi:10.1089/lgbt.2013.0022.

Disparities in Health Risk Behavior and Psychological Distress among Gay versus Heterosexual Male Cancer Survivors

Charles Kamen, Ph.D.^{1,*}, Oxana Palesh, Ph.D.², Arianna Aldridge Gerry², Michael A. Andrykowski, Ph.D.³, Charles Heckler, Ph.D.¹, Supriya Mohile, M.D.¹, Gary R. Morrow, Ph.D.^{1,**}, Deborah Bowen, Ph.D.^{4,**}, and Karen Mustian, Ph.D.^{1,**}

Oxana Palesh: opalesh@stanford.edu; Arianna Aldridge Gerry: aagerry@stanford.edu; Michael A. Andrykowski: michael.andrykowski@uky.edu; Charles Heckler: charles_heckler@urmc.rochester.edu; Supriya Mohile: supriya_mohile@urmc.rochester.edu; Gary R. Morrow: gary_morrow@urmc.rochester.edu; Deborah Bowen: dbowen@bu.edu; Karen Mustian: karen_mustian@urmc.rochester.edu

¹James P. Wilmot Cancer Center, University of Rochester Medical Center, 601 Elmwood Avenue, Rochester, NY 14642, USA

²Department of Psychiatry & Behavioral Sciences, Stanford University, 401 Quarry Road, Stanford, CA 94305-5718, USA

³Department of Behavioral Science, University of Kentucky College of Medicine, 133 Medical Behavioral Science Building, Lexington, KY 40536-0086, USA

⁴School of Public Health, University of Washington, Raitt Hall, Seattle, WA 98195, USA

Abstract

Background—Gay men have been found to have higher rates of cancer diagnoses than heterosexual men and poorer outcomes post-cancer diagnosis. The two purposes of this study are to examine rates of cancer diagnosis in a national sample of gay and heterosexual men, and to examine disparities in health risk behavior between gay and heterosexual men and gay and heterosexual cancer survivors.

Methods—The current study utilized data from a total sample of 14,354 men, including 373 gay men, collected as part of the Behavioral Risk Factor Surveillance System survey conducted in 2009 in the states of Arizona, California, Massachusetts, Ohio, and Wisconsin.

Results—This study replicated the finding that prevalence of self-reported cancer diagnoses differed significantly between gay and heterosexual men, with gay men 82% more likely to report a lifetime history of cancer diagnosis ($p < .05$); however, this disparity became non-significant after controlling for a weakened immune system proxy variable ($p = .06$). Gay men were more likely than heterosexual men to report health risk behaviors including less time spent exercising, more psychological distress, more current alcohol use, more current smoking, and a lifetime history of smoking. Some of these disparities in health risk behavior persisted for gay cancer survivors post-cancer diagnosis.

*Corresponding author: Charles Kamen, Ph.D., Assistant Professor (Research) at the James P. Wilmot Cancer Center (Behavioral Medicine Unit), University of Rochester Medical Center, 265 Crittenden Blvd, Rochester, NY 14642; tel (650) 644-8251; fax (650) 725-3762; charles_kamen@urmc.rochester.edu.

**Co-senior authors

All authors report no conflicts of interest to disclose.

Conclusions—This study offers a perspective on behavioral risk factors previously shown to be higher among gay men that may continue post-cancer diagnosis. Future research should test the degree to which these disparities are due to minority stress, as previous studies have indicated that increased health risk behaviors among sexual minority populations may result from exposure to chronic stress and discrimination. Developing behavior change interventions to address these risk behaviors is vital for improving cancer outcomes among gay men.

Keywords

Health disparities; Sexual orientation; Risk behavior; Men; Cancer; Oncology

Introduction

A recent report from the Institute of Medicine¹ highlights the lack of research attention paid to the health of sexual minority individuals. In the United States, an estimated 5.5 million men are currently living with cancer,² but relatively little is known about the development and sequelae of cancer in sexual minority men. Those few studies that have examined this issue in the United States have shown that same-sex sexual behavior among men, specifically oral sex, is linked with higher rates of head and neck cancers,³ that anal sex with a male partner is linked with higher rates of anal cancer,⁴ and that infection with HIV is also linked with higher rates of cancer, specifically Kaposi's sarcoma but also non-Hodgkin lymphoma.⁵

A recent epidemiological study⁶ conducted in the US showed that gay men were 1.9 times more likely to report a lifetime history of cancer diagnosis than heterosexual men. In a large sample of men in same-sex relationships surveyed in Denmark, Frisch et al.⁷ showed that gay men had a 2.1 times greater risk of developing cancer than expected based on the Danish national average. However, increased risk of cancer in this Danish sample was largely explained by higher rates of HIV-related cancers, such as Kaposi's sarcoma, non-Hodgkin lymphoma, and anal squamous carcinoma. Further research into the disparity in cancer diagnoses among gay men is needed. Research is also needed into health risk behaviors that may be associated with increased rates of cancer among gay men and that may continue at disparate rates among gay and heterosexual cancer survivors post-cancer diagnosis.

King and Williams⁸ outline biological and cultural factors that contribute to health disparities. Biological factors predisposing gay men to develop cancer include infection with HIV, which has been associated with compromised immune system and subsequent development of cancer.⁵ A second biological factor is infection with Human Papillomavirus (HPV), which can increase the likelihood that a man will develop anal, oral, and head and neck cancers.⁹

Cultural factor predisposing gay men to develop cancer and experience poorer health outcomes as cancer survivors include health risk behaviors, such as physical inactivity and substance use, as well as psychological distress. Sexual minority status has been consistently associated in the research literature with higher rates of psychological distress and substance use disorders.¹⁰ The minority stress theory posits that this higher rate of mental health issues is a reaction to chronic societal discrimination and prejudice directed at sexual minority

individuals.¹¹ Psychological distress and substance use, in turn, have been linked to poorer cancer outcomes, including increased mortality.¹² In addition, use of alcohol and tobacco has been linked with higher rates of oral, pharyngeal, laryngeal, and other types of cancer¹³ in diverse samples of cancer survivors.¹⁴ In terms of other health behaviors, research has indicated that while gay men report greater preoccupation with body image than heterosexual men, these body image concerns do not necessarily translate into higher engagement in physical activity.¹⁵ This is concerning, given the link between increased physical activity, lower cancer risk, and better outcomes post-cancer.¹⁶ Finally, gay and sexual minority men may experience prejudice, discrimination, or stigma in the process of seeking health care services that may result in psychological distress, lower likelihood of presenting for regular check-ups, and lower likelihood of establishing relationships with primary care physicians.¹ Thus it may be that some of the disparity in cancer diagnoses between sexual minority and heterosexual men could be explained by different rates of health risk behaviors and psychological distress.

At present, there remains a need for research to replicate the finding that gay men have higher prevalence of cancer diagnosis than heterosexual men. It is yet unclear to what extent this disparity may be due to HIV and other immune compromising conditions. There is also a need to attend to disparities in health risk behaviors previously shown to be more common among gay men, such as substance use and psychological distress, that may persist into cancer survivorship. We hypothesize that rates of cancer diagnosis will be higher in gay men than in their heterosexual counterparts, but that this disparity will be partially explained by the presence of immune compromising conditions. In addition, we hypothesize that rates of health risk behaviors and psychological distress will be higher in gay men than in their heterosexual counterparts, and that these rates will remain higher among gay cancer survivors post-cancer diagnosis.

Methods

Participants

Data for the current study were drawn from the 2009 Behavioral Risk Factor Surveillance System (BRFSS) national survey collected annually by telephone under the auspices of the Centers for Disease Control (<http://www.cds.gov/brfss>). As questions related to cancer diagnoses and sexual orientation were asked on a state-by-state basis, we used BRFSS survey data from five states that asked about both cancer and sexual orientation in 2009: Arizona, California, Massachusetts, Ohio, and Wisconsin. Random digit dialing was used to survey noninstitutionalized adults, age 18 and over, living in these five states.

For this study, we examined data collected from self-identified males who reported on their sexual identity and cancer status. A total of 24,694 men were surveyed in Arizona, California, Massachusetts, Ohio, and Wisconsin in 2009. Due to BRFSS sampling methodologies, wherein certain questions are asked only of certain splits, or sections of a state's total sample, 8,198 men (33.2% of the total) were not asked about their sexual orientation and an additional 2,142 men (8.7% of the total) opted not to report on their sexual orientation, cancer status, or both. This left a final sample of 14,354 men, comprising 58.1% of the total sample of men. These 14,354 men are included in subsequent analyses.

Identification of gay and heterosexual men—A question added to the BRFSS by all five states included in this analysis asked, “Do you consider yourself to be: Heterosexual, that is, straight; Homosexual, that is, gay or lesbian; Bisexual; or Other.” For the purpose of the current study, we examined men who reported being “homosexual” in comparison with men who reported being “heterosexual.” We excluded bisexual men from analyses for two reasons. First, there were fewer self-identified bisexual than gay men, and very few bisexual cancer survivors (N = 13), limiting our ability to draw conclusions about this population. Second, recent research has indicated that bisexual individuals may have different experiences of cancer survivorship⁶ and may deserve separate analysis, which was precluded by their relatively small numbers in this sample.¹⁷

Of the total sample of 14,354 men included in this study, 373 men (2.5%) reported a “homosexual” or gay sexual orientation in BRFSS survey, while the other 13,981 reported a heterosexual sexual orientation. This percentage is close to recent data estimating that 2.2% of the United States male population is gay, according to the Williams Institute.¹⁸

Measures

Demographic variables—Single items in the 2009 BRFSS assessed age, sex, race, ethnicity, education, marital status, household income, and employment status.

Cancer survivorship status—A single item in the BRFSS asked, “Have you ever been told by a doctor, nurse, or other health professional that you had cancer?” Participants who responded “yes” to this item (i.e., cancer survivors) were then asked the type(s) of cancer with which they had been diagnosed.

Health risk behaviors—Health risk behaviors included lack of exercise and physical activity, lifetime history of tobacco use and current tobacco use, current alcohol use and binge drinking, health care utilization, and presence of a weakened immune system.

The BRFSS asked participants about “moderate” physical activity, defined as causing “small increases in breathing and heart rate,” as well as “vigorous” physical activity, defined as causing “large increases in breathing and heart rate.” Moderate physical activity was assessed with items asking, “how many days per week do you do these moderate activities for at least 10 minutes at a time?” and, “how much total time per day do you spend doing these activities?” These two items were used to calculate a total number of minutes per week spent doing moderate physical activity. Identical items assessed vigorous physical activity, and again were used to calculate a total number of minutes per week spent doing vigorous physical activity.

Lifetime history of tobacco use was assessed by asking participants whether during their lifetime they had ever smoked more than 100 cigarettes (equivalent to 5 packs). Current tobacco use was assessed by asking whether participants “now smoke cigarettes every day, some days, or not at all?” Participants were categorized as current smokers if they reported smoking cigarettes every day or some days.

Current alcohol use was assessed by asking participants whether during the past 30 days they had consumed “at least one drink of any alcoholic beverage.” Follow-up items asked, “how many days per week or per month did you have at least one drink of any alcoholic beverage?” and, “on the days when you drank, about how many drinks did you drink on the average?” These two items were used to calculate a total number of drinks consumed in the past 30 days for each participant.

Binge drinking was calculated with a single item asking, “how many times during the past 30 days did you have 5 or more drinks on an occasion?” Participants were categorized as having had a binge drinking episode if they reported having 5 or more drinks on at least one occasion over the past 30 days.

Finally, health care utilization was assessed by asking participants whether they had one or more than one person whom they thought of as their “personal doctor or health care provider.” Participants were also asked how long it had been since they last visited a doctor for a routine checkup, and were categorized based on whether or not they had visited a doctor for a routine checkup within the past year.

Weakened immune system—The five states included in this analysis asked BRFSS participants whether “a doctor, nurse, or other health professional ever said that you have any of the following health problems,” including “weakened immune system caused by a chronic illness such as cancer or HIV/AIDS or medicines such as steroids.” While this item would be expected to overlap with reported diagnosis of cancer, it could also serve as a proxy for weakened immune system due to other causes, such as HIV/AIDS, and was used to control for the presence of these immunosuppressing conditions in establishing the link between reported sexual minority status and cancer diagnosis.

Psychological distress—A single item on the BRFSS asked participants to report on the number of days over the past 30 days where they experienced poor mental health. Responses to this item could range from 0 to 30 days.

Data Analysis

Analyses were performed using the complex sampling procedure in SPSS (version 20.0). This procedure accounted for sample weights provided in the BRFSS, which are probability weights calculated by the CDC based on demographic characteristics (age, race, gender) of individuals sampled as compared to the population as a whole. This procedure also accounted for state-specific strata. First, descriptive statistics were calculated to examine demographic characteristics of the participants. Gay and heterosexual men were compared on race, ethnicity, relationship status (partnered vs. nonpartnered), current age, education, and annual household income using χ^2 and independent samples t-tests. Variables that emerged as significantly different between the two groups were used as covariates in later analyses. Then gay and heterosexual men were compared using a series of χ^2 tests to examine differences in prevalence of cancer and dichotomously coded health risk behaviors. Logistic regression was used to examine differences in prevalence of cancer due to sexual minority status, accounting for the weakened immune system proxy variable. For categorical health risk variables, logistic regression was used to compare gay men to heterosexual men,

using heterosexual men as the reference group. Independent samples t-tests compared gay and heterosexual men on continuous, quantitative health risk and psychological distress variables. Effect sizes were calculated as the difference between the two group means for clinically relevant and interpretable variables. Finally, looking specifically at the subsample of cancer survivors, gay and heterosexual men reporting cancer diagnoses were compared on rates of risk factors using t-tests and logistic regression. For all adjusted odds ratios, 95% confidence intervals were calculated. The criterion for statistical significance was $p < 0.05$.

Results

Participant characteristics

The total sample of 14,354 men was 83.8% ($N = 12,022$) Caucasian, 4.2% ($N = 597$) African-American, 3.6% ($N = 519$) Asian/Asian-American, .4% ($N = 64$) Native Hawaiian/Pacific Islander, and 2.1% ($N = 303$) Native American/American Indian. In addition, 15.0% ($N = 2,158$) reported a Hispanic/Latino origin. Gay men were significantly less likely to report a Hispanic/Latino origin than heterosexual men (9.9% vs. 15.2%; $\chi^2 = 10.92$, $p = .004$). While 61.6% ($N = 9,377$) of the sample as a whole reported being partnered (i.e., being married or having a committed but unmarried relationship partner), this percentage differed for gay and heterosexual men: 38.3% ($N = 143$) of the 373 gay men reported being partnered, as compared with 66.0% ($N = 9,234$) of the heterosexual men ($\chi^2 = 122.57$, $p < .001$). Accordingly, Hispanic/Latino ethnicity and partnership status were used as covariates in subsequent analyses comparing gay and heterosexual men.

The mean age of men in this sample was 54.75 years (range 18 to 102; $SD = 16.77$). The modal level of education was college graduate or more (52.0%, $N = 7,466$), followed by high school graduate (14.6%; $N = 2,100$) and some college (13.8%; $N = 1,980$). Nearly one-quarter (24.0%; $N = 3,444$) of men in this sample reported annual household incomes over \$75,000. Age, education, and annual income did not differ significantly between gay and heterosexual men.

Prevalence and types of cancer by sexual minority status

Overall, 11.1% ($N = 1,598$) of the total sample reported having ever received a cancer diagnosis. The most common types of cancer reported by men in this sample included prostate cancer, reported by 26.6% ($N = 413$) of men diagnosed with cancer; melanoma (10.5%, $N = 168$); colon cancer (5.8%, $N = 90$); bladder cancer (3.7%, $N = 58$); and “other” cancers (7.2%, $N = 111$).

Accounting for BRFSS sample weights, ethnicity, and partnership status, prevalence of cancer diagnoses differed significantly between gay and heterosexual men, with gay men more likely to report that they had received a cancer diagnosis ($\chi^2 = 4.11$, $p < .05$; adjusted odds ratio (AOR) = 1.82, 95% CI = 1.09 to 3.05). Specifically, 53 of the 373 gay men (14.2%) reported a lifetime history of cancer diagnosis, compared with 1,545 of the 13,981 heterosexual men (11.1%). Looking at specific types of cancer, gay men had significantly higher prevalence than heterosexual men of oral cancer (weighted prevalence: 0.3% vs. 12.3%; $\chi^2 = 122.07$, $p < .001$) and pancreatic cancer (weighted prevalence: 0.2% vs. 2.5%;

$\chi^2 = 14.39, p = .003$) but a lower prevalence of prostate cancer (weighted prevalence: 24.4% vs. 11.7%; $\chi^2 = 5.52, p = .04$). However, when accounting for the weakened immune system proxy variable in the logistic regression model predicting overall prevalence of cancer diagnosis, the difference between gay and heterosexual men became non-significant ($\chi^2 = 3.43, p = .06$; AOR = 2.04, 95% CI = .95 to 4.36).

Health risk behaviors and psychological distress by sexual minority status

Comparing gay men and heterosexual men, self-identification as a gay man was associated with less time spent engaged in moderate exercise (weighted mean difference: 31.9 fewer minutes, $t = 3.03, p = .003$) and vigorous exercise (weighted mean difference: 19.9 fewer minutes, $t = 2.63, p = .009$); a higher likelihood of reporting a lifetime history of smoking ($\chi^2 = 7.70$, OR = 1.69, 95% CI = 1.05 to 2.70, $p = .001$), a higher likelihood of currently smoking ($\chi^2 = 8.32$, OR = 2.54, 95% CI = 1.40 to 4.60, $p < .001$), consuming a higher number of drinks over the last 30 days (weighted mean difference: 9.6 more drinks over the last 30 days, $t = -2.35, p = .02$), and a higher likelihood of reporting a weakened immune system ($\chi^2 = 13.64$, OR = 2.74, 95% CI = 1.59 to 4.71, $p < .001$). Finally, gay men reported more days of psychological distress in the last 30 days (weighted mean difference: 3.51 more days; $t = -4.47, p < .001$). See Tables 1 and 2.

Health risk behaviors and psychological distress among cancer survivors by sexual minority status

The subsample of gay men who were cancer survivors ($N = 53$), when compared with heterosexual cancer survivors ($N = 1,545$), reported less time engaged in moderate exercise (weighted mean difference: 116.5 fewer minutes, $t = 2.16, p = .04$), consuming a higher number of drinks per day (weighted mean difference: 1.2 more drinks per day, $t = -2.89, p = .004$), and consuming a higher number of drinks over the last 30 days (weighted mean difference: 46.3 more drinks, $t = -5.10, p < .001$). Gay cancer survivors also reported more days of psychological distress than heterosexual cancer survivors (weighted mean difference: 2.96 more days; $t = -2.37, p = .02$). See Tables 3 and 4.

Discussion

The current study highlights that the disparity in cancer diagnosis between gay and heterosexual men may be explained, at least in part, by immune compromising conditions; it also delineates risk behaviors that are more commonly reported among gay men, that continue post-cancer diagnosis, and that may impact gay male cancer survivors' health outcomes. Gay men in our study were more likely to report a lifetime history of cancer diagnosis than heterosexual men, but this disparity was attenuated when accounting for the weakened immune system proxy variable. This suggests cancer diagnosis disparities exist for gay men, and that variance in this disparities may be explained in part by comorbid immune compromising diseases such as HIV.⁵ Our findings extend results of a recent study that found gay men are twice as likely to report cancer diagnoses as their heterosexual peers; this previous study did not account for weakened immune system.⁶ In the current study, after accounting for the weakened immune system proxy variable, the difference in cancer diagnosis prevalence between gay and heterosexual men still showed a trend toward

significance. Further research is needed to parse the relationship between sexual orientation, HIV and other immune compromising conditions, and cancer.

In addition, gay men diagnosed with cancer report higher rates of some health risk behaviors than their heterosexual peers, including alcohol use, lack of exercise, and psychological distress. Consistent with our hypotheses and with the findings of research into minority stress processes,^{10–11} gay men overall engaged in greater substance use behaviors and experienced more psychological distress. These behaviors have been related to increased prevalence of cancer diagnoses and poorer cancer outcomes in previous studies.¹³ The finding that these behaviors continue post-cancer diagnosis is of concern and is an indication of the need for research into the longitudinal association between substance use, distress, and long-term cancer-related outcomes among gay men.^{19,20}

We also found gay men engaged in less moderate intensity exercise than heterosexual men. Several studies have demonstrated positive effects of physical activity on cancer survivorship, including managing side effects,²¹ improving physical function,^{22–23} improving psychological health and quality of life,^{24–25} reducing likelihood of disease recurrence,²⁶ and increasing survival.^{27–28} Given these many benefits, it is striking that engagement in moderate exercise was reduced among gay men both with and without cancer diagnoses. Unfortunately, the cross-sectional nature of the current data does not permit us to draw conclusions about the impact of reduced rate of exercise on development of cancer and quality of life post-cancer; further research is necessary to establish the longitudinal relationships between these variables.

Finally, we found no significant differences among gay and heterosexual cancer survivors in reporting a primary care physician or recent access to health care. It may be that engagement in health risk behaviors (e.g., inactivity and substance use) has more impact on disparities in cancer diagnosis among gay men than lack of health promotion behaviors (e.g., routine medical care). These behavioral risk factors are salient targets for improving cancer-related outcomes, and interventions targeting these behaviors may help close the gap in post-cancer disparities among sexual minority individuals.

Further investigation is needed into links between disparities observed in this study and the minority stress model,¹⁰ which posits that increased substance use and decreased health behaviors among sexual minority populations result from exposure to chronic stress and societal discrimination. The finding that gay men in general experience more psychological distress and consume more alcohol and tobacco is consistent with previous studies^{19–20} and are disparities that may be engendered by chronic stress.¹⁰ The finding that gay men in this sample continued to consume alcohol and experience distress post-cancer diagnosis will be important to replicate in future research. Finally, higher rates of psychological distress among gay men both with and without cancer underscore the need to examine the impact of chronic stress and mental health disparities on development of cancer and quality of life post-cancer.

Study Limitations

Despite its unique findings, there are several limitations to the current study. First, the BRFSS (2009) is a cross-sectional survey, which limits our ability to make any assertions of causality or longitudinal associations between variables. Second, the data utilized were for the states of Arizona, California, Massachusetts, Ohio, and Wisconsin only. It may be that gay men and cancer survivors living in other parts of the United States may have different risk behaviors and experiences of cancer. In addition, the Surveillance, Epidemiology and End Results (SEER) registry is the gold standard when it comes to estimating cancer prevalence, but unfortunately does not assess sexual orientation as part of its demographic questionnaire. While the nature of the sample and the inability to use the SEER registry limits the generalizability of our findings, the findings are unique in that they examine cancer disparities among gay men from a large, nationwide sample. Third, the current investigation utilizes secondary data analysis, and is thus limited in the variables available for examination. The nature of the questions asked by the BRFSS also led to a large number of statistical tests, which increases the chance for spurious findings; future research will need to replicate our results. Fourth, the study used self-reported sexual orientation, health behaviors, cancer diagnoses, and presence of a weakened immune system. Other studies have utilized telephone methodologies to collect data on sexual orientation,²⁹ and the results of this screening method in the current study produced results similar to national estimates for the population of gay men. However, it is unknown how adequately telephone screening methodologies assess sexual orientation,³⁰ and so the BRFSS may have underrepresented the number of gay men in our sample. The weakened immune system variable was also broad and did not specifically ask about diagnosis with HIV. While these limitations prevent causal inference for the relationship among behavioral risk factors, HIV, and cancer-related disparities, the study addresses a gap in the current research by examining disparities in both cancer diagnoses and health risk behavior post-cancer diagnosis among gay men.

This is the first study known to authors that both examines disparities in cancer diagnosis and specifically describes disparities in health risk behavior among gay and heterosexual male cancer survivors using a nationwide sample. It is therefore consonant with the recommendations of the Institute of Medicine's report on the health of sexual minority individuals.¹ Future studies should attempt to longitudinally model the degree to which disparities in behavioral risk factors noted in this and other studies lead to disparate rates of disease, possibly including cancer, among sexual minority populations. Studies should also examine how rates of risk behavior post-cancer diagnosis influence long-term health outcomes for gay and heterosexual cancer survivors. Developing interventions aimed at reducing the impact of these behavioral risk factors is vital for improving the health of cancer survivors of all sexual orientations and for reducing cancer-related disparities.

References

1. The Health of Lesbian, Gay, Bisexual, and Transgender People: Building a Foundation for Better Understanding. Washington (DC): National Academies Press (US); 2011. [cited 2012 May 1]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22013611>
2. Howlader N, Ries LAG, Mariotto AB, et al. Improved estimates of cancer-specific survival rates from population-based data. J Natl Cancer Inst. 2010; 102:1584–98. [PubMed: 20937991]

3. Heck JE, Berthiller J, Vaccarella S, et al. Sexual behaviours and the risk of head and neck cancers: a pooled analysis in the International Head and Neck Cancer Epidemiology (INHANCE) consortium. *Int J Epidemiol*. 2010; 39:166–81. [PubMed: 20022926]
4. Frisch M. On the etiology of anal squamous carcinoma. *Dan Med Bull*. 2002; 49:194–209. [PubMed: 12238281]
5. Grulich AE, van Leeuwen MT, Falster MO, Vajdic CM. Incidence of cancers in people with HIV/AIDS compared with immunosuppressed transplant recipients: a meta-analysis. *Lancet*. 2007; 370:59–67. [PubMed: 17617273]
6. Boehmer U, Miao X, Ozonoff A. Cancer survivorship and sexual orientation. *Cancer*. 2011; 117:3796–804. [PubMed: 21557209]
7. Frisch M, Smith E, Grulich A, Johansen C. Cancer in a population-based cohort of men and women in registered homosexual partnerships. *Am J Epidemiol*. 2003; 157:966–72. [PubMed: 12777359]
8. Amick, BC. *Society and Health*. Oxford University Press; 1995.
9. Palefsky J. Human papillomavirus and anal neoplasia. *Curr HIV/AIDS Rep*. 2008; 5:78–85. [PubMed: 18510893]
10. Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence. *Psychol Bull*. 2003; 129:674–97. [PubMed: 12956539]
11. Meyer, IH., Dean, L. Internalized homophobia, intimacy and sexual behaviour among gay and bisexual men. In: Herek, G., editor. *Stigma and Sexual Orientation*. Thousand Oaks, CA: Sage; 1998. p. 160-86.
12. Hamer M, Chida Y, Molloy GJ. Psychological distress and cancer mortality. *Journal of psychosomatic research*. Mar; 2009 66(3):255–258. [PubMed: 19232239]
13. Blot WJ, McLaughlin JK, Winn DM, et al. Smoking and drinking in relation to oral and pharyngeal cancer. *Cancer Res*. 1988; 48:3282–7. [PubMed: 3365707]
14. Brown LM, Hoover RN, Greenberg RS, et al. Are racial differences in squamous cell esophageal cancer explained by alcohol and tobacco use? *J Natl Cancer Inst*. 1994; 86:1340–5. [PubMed: 8064893]
15. Kaminski P, Chapman B, Haynes S, Own L. Body image, eating behaviors, and attitudes toward exercise among gay and straight men. *Eating Behaviors*. 2005; 6:179–87. [PubMed: 15854864]
16. Giovannucci E, Ascherio A, Rimm EB, et al. Physical activity, obesity, and risk for colon cancer and adenoma in men. *Annals of internal medicine*. 1995; 122:327–34. [PubMed: 7847643]
17. Rust PCR. Bisexuality: the state of the union. *Annu Rev Sex Res*. 2002; 13:180–240. [PubMed: 12836732]
18. Gates, GJ. *How many people are lesbian, gay, bisexual, and transgender?*. Los Angeles: The Williams Institute, UCLA School of Law; 2011.
19. Gruskin EP, Greenwood GL, Matevia M, et al. Disparities in Smoking Between the Lesbian, Gay, and Bisexual Population and the General Population in California. *American Journal of Public Health*. 2007; 97:1496–502. [PubMed: 17600265]
20. Gruskin EP, Greenwood GL, Matevia M, et al. Cigar and smokeless tobacco use in the lesbian, gay, and bisexual population. *Nicotine Tob Res*. 2007; 9:937–40. [PubMed: 17763109]
21. US Department of Health and Human Services: The President's Cancer Panel. *Annual Report 2006–2007*. Washington (DC): 2007. Promoting Healthy Lifestyles: Policy, Program, and Personal Recommendations for Reducing Cancer Risk.
22. Ganz PA. A Teachable Moment for Oncologists: Cancer Survivors, 10 Million Strong and Growing! *Journal of Clinical Oncology*. 2005; 23:5458–60. [PubMed: 16043826]
23. Lowe SS, Watanabe SM, Baracos VE, Courneya KS. Determinants of physical activity in palliative cancer patients: an application of the theory of planned behavior. *J Support Oncol*. 2012; 10:30–6. [PubMed: 21996569]
24. Galvao DA, Nosaka K, Taaffe DR, et al. Resistance Training and Reduction of Treatment Side Effects in Prostate Cancer Patients. *Medicine & Science in Sports & Exercise*. 2006; 38:2045–52. [PubMed: 17146309]
25. Segal RJ. Resistance Exercise in Men Receiving Androgen Deprivation Therapy for Prostate Cancer. *Journal of Clinical Oncology*. 2003; 21:1653–9. [PubMed: 12721238]

26. Segal RJ, Reid RD, Courneya KS, et al. Randomized Controlled Trial of Resistance or Aerobic Exercise in Men Receiving Radiation Therapy for Prostate Cancer. *Journal of Clinical Oncology*. 2008; 27:344–51. [PubMed: 19064985]
27. Meyerhardt JA. Physical Activity and Survival After Colorectal Cancer Diagnosis. *Journal of Clinical Oncology*. 2006; 24:3527–34. [PubMed: 16822844]
28. Schmitz, K. Physical activity in breast cancer survivorship. In: Courneya, KS., Friedenreich, CM., editors. *Physical Activity and Cancer*. 1. Springer; 2010.
29. Midanik LT, Drabble L, Trocki K, Sell RL. Sexual Orientation and Alcohol Use: Identity versus Behavior Measures. *Journal of LGBT Health Research*. 2007; 3:25–35.
30. Sell RL, Becker JB. Sexual orientation data collection and progress toward Healthy People 2010. *Am J Public Health*. 2001; 91:876–82. [PubMed: 11392926]

Table 1

Weighted prevalence estimates of cancer diagnosis and dichotomous health risk variables among heterosexual and gay men.

	Heterosexual Men, n=13,981*		Gay Men, n=373*		AOR**	95% CI	p value
	%	(SE)	%	(SE)			
Cancer Diagnosis	5.7	(0.3)	9.9	(2.3)	2.04	.95–4.36	.06
Lifetime Tobacco Use	40.4	(1.0)	53.3	(5.9)	1.69	1.05–2.70	.001
Current Tobacco Use	15.2	(0.7)	31.3	(6.4)	2.54	1.40–4.60	<.001
Any Binge Drinking	28.9	(1.0)	23.6	(4.2)	.76	.48–1.21	.51
Personal Doctor	70.8	(1.0)	78.9	(5.2)	1.55	.83–2.89	.09
Regular Checkup	60.7	(1.1)	66.2	(5.3)	1.27	.79–2.05	.10
Weakened Immune System	28.0	(1.0)	43.0	(7.4)	2.74	1.59–4.71	<.001

* Note: We report unweighted sample sizes, but weighted percentages and standard errors.

** Note: Adjusted Odds Ratio accounts for probability weighting, state-specific strata, Hispanic ethnicity, and partnership status.

Table 2

Weighted comparison of means for continuous health risk variables among heterosexual and gay men.

	Heterosexual Men, n=13,981*		Gay Men, n=373*		<i>t</i>	<i>p</i> value
	M	(SE)	M	(SE)		
Days Drank Alcohol	10.92	(9.71)	11.67	(10.03)	-.39	.69
Alcoholic Drinks per Day	2.82	(3.69)	3.03	(4.47)	-.03	.97
Alcoholic Drinks/30 Days	31.48	(49.65)	41.14	(51.04)	-2.35	.02
Moderate Exercise Time	169.62	(332.61)	137.72	(184.52)	3.03	.003
Vigorous Exercise Time	99.93	(199.26)	80.00	(119.48)	2.63	.009
Psychological Distress/30 Days	2.41	(6.33)	5.92	(9.65)	-4.47	<.001

* Note: We report unweighted sample sizes, but weighted mean estimates and standard errors.

Table 3

Weighted prevalence estimates of cancer diagnosis and dichotomous health risk variables among heterosexual and gay cancer survivors.

	Heterosexual Survivors n=1,545*		Gay Survivors, n=53*		AOR**	95% CI	p value
	%	(SE)	%	(SE)			
Lifetime Tobacco Use	54.9	(2.6)	36.1	(9.7)	.47	.20–1.09	.06
Current Tobacco Use	7.7	(1.2)	1.9	(1.6)	.23	.04–1.29	.18
Any Binge Drinking	21.5	(1.7)	20.6	(8.9)	.95	.32–2.79	.51
Personal Doctor	91.4	(1.6)	100.0	(0.0)			
Regular Checkup	80.4	(1.1)	76.6	(10.5)	.80	.25–2.59	.89
Weakened Immune System	54.1	(1.7)	28.1	(9.3)	.85	.33–2.19	.73

* Note: We report unweighted sample sizes, but weighted percentages and standard errors.

** Note: Adjusted Odds Ratio accounts for probability weighting, state-specific strata, Hispanic ethnicity, and partnership status.

Table 4

Weighted comparison of means for continuous health risk variables among heterosexual and gay cancer survivors.

	Heterosexual Survivors, n=1,545*		Gay Survivors, n=53*		<i>t</i>	<i>p</i> value
	M	(SE)	M	(SE)		
Days Drank Alcohol	12.45	(.59)	13.54	(2.99)	.17	.87
Alcoholic Drinks per Day	2.12	(.11)	3.36	(1.19)	-2.89	.004
Alcoholic Drinks/30 Days	26.70	(1.60)	72.97	(36.26)	-5.10	<.001
Moderate Exercise Time	282.58	(24.24)	166.08	(31.65)	2.16	.04
Vigorous Exercise Time	193.12	(19.52)	152.34	(72.26)	.74	.45
Psychological Distress/30 Days	2.38	(6.78)	5.34	(9.46)	-2.37	.02

* Note: We report unweighted sample sizes, but weighted mean estimates and standard errors.