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# Assessing the relationship between symptoms and health care utilization in colorectal cancer survivors of different sexual orientations

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## Abstract

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Authors' contributions: UB conceived of the study and led the writing. AO guided the statistical analysis. MW and FB performed the analysis. MAC, KCW, and MW were heavily involved in the facilitation of the data collection. All authors helped with the interpretation of the results and edited and approved the final manuscript.

Conflict of Interests: None of the authors report a conflict of interest.

Ethics Approval: All aspects of the study were approved by the Institutional Review Boards of Boston University and the respective cancer registries from which we obtained colorectal cancer cases for this study.

Consent to participate: All participants were consented as explained in our IRB applications.

**Objective:** The purpose of this study was to determine the association of physical and psychological symptoms with health care utilization in sexual minority and heterosexual colorectal cancer survivors.

**Methods:** Four hundred eighteen colorectal cancer survivors who were in remission an average of three years after their diagnosis were surveyed about their non-emergency health care visits during the preceding three months. Survivors reported whether they had experienced any of 21 symptoms common among colorectal cancer survivors in the past week. The relation between having had two or more health care visits in the preceding three months and symptoms experienced was assessed using logistic regression, controlling for cancer registry, sexual orientation, sex, age, race/ethnicity, income, and comorbidities.

**Results:** Of the survivors, 12% reported no symptoms, while 12% reported six or more symptoms. Sexual minority survivors reported significantly more weight concerns, more health-related and general anxiety as well as worse body image than heterosexual survivors. Frequent worrying about weight and experiencing sore skin around the anal area or stoma were the two symptoms that significantly contributed towards explaining survivors' increased health care utilization.

**Conclusion:** Weight concerns, which are more common among the heaviest survivors, may prompt survivors to seek help from health care providers, which may lead to more frequent visits. On the other hand, some symptoms, despite their prevalence, had no relationship with the frequency of health care visits, raising questions about whether survivors share these concerns with providers.

## Keywords

sexual minorities; oncology; health services; colorectal neoplasms; patient-reported outcomes

As cancer survivors live longer and the number of cancer survivors increases, concerns have been voiced about rising medical costs and demand on the US health care system.[1,2] Various pilot programs and oncology care models are underway to reduce costs of care while emphasizing equitable quality of care for all cancer survivors.[3] Existing research linked cancer survivors' health care use to physical limitations, comorbidities, psychological distress, as well as physical and psychological symptoms.[4–8]

Health care utilization of sexual minority cancer survivors is an underexplored topic and has never been examined in the context of colorectal cancer. There have been inconsistent findings in previous studies that have assessed sexual minority survivors' health care utilization. One study found sexual minority survivors reported more frequently being unable to see a physician because of costs.[9] However, an earlier study found lesbian cancer survivors were 7.4 times more likely to have visited a physician during the past year than female heterosexual cancer survivors, and bisexual men were 7.8 times more likely to visit physicians compared with heterosexual men.[10] Neither study examined the reasons for physician visits, leaving unknown the extent to which sexual minority survivors' physician visits can be explained by physical or psychological symptoms.

Identifying symptoms linked to increased health care utilization is important because mitigating these symptoms may contribute to reduced health care costs and improved survivorship. Breast cancer has frequently been the context of studies about symptomatology among cancer survivors. Previous breast cancer survivor studies noted the associations between symptoms and treatments (i.e., mastectomy, radiation therapy, hormone therapy) differed by sexual orientation, in that sexual minority survivors experienced worse symptoms than heterosexual breast cancer survivors.[11,12] Few studies have focused on colorectal cancer, even though 26% of colorectal cancer survivors report bothersome symptoms two or more years after diagnosis.[13–15] Further, colorectal cancer survivors' symptom prevalence by sexual orientation is unknown. This study examined associations between symptoms and health care utilization among colorectal cancer survivors, and whether the associations differed by sexual orientation.

## METHODS

All aspects of the study were approved by the Institutional Review Boards of Boston University and the respective cancer registries from which we obtained colorectal cancer cases for this study.

### Study setting

Because cancer registries do not collect sexual orientation data, we used a purposeful selection of cases from diverse geographic areas with a high likelihood of sexual minority individuals. We selected the geographic regions based on high proportions of same-sex partner households recorded in the 2010 Census and similarity in cancer registry policies regarding patient contact for research studies. After careful evaluation, cases were obtained from the: California Cancer Registry; Seattle-Puget Sound Registry; Georgia Cancer Registry; and Florida Cancer Data System. For each registry, we further restricted the geographic reach to areas with high numbers of men and women with colorectal cancer and same-sex partnered households. Participant eligibility criteria included: diagnosis of colon or rectal carcinoma less than 5 years prior to recruitment; Stage I, II, or III at diagnosis; English-speaking; and an upper age limit of 85 years. At first contact, we determined each respondent's sexual orientation. All self-reported sexual minority individuals, defined as lesbian, gay, or bisexual, or reporting a same-sex partner were eligible. Every 10th self-identified heterosexual individual was eligible to participate.

### Participant recruitment and data collection

All potential participants were contacted following each respective registry's policies. In short, our first contact consisted of a mailed packet that included a recruitment letter, a consent form without requiring a signature, a short screening questionnaire, and a self-addressed stamped return envelope for the screening questionnaire. The recruitment letter explained the purpose of the study, provided information about the means to opt-out of the study, and announced that a member of the study team would call to conduct the screening survey by telephone after verbal consent had been obtained if they did not opt-out of the study or return the mailed screening questionnaire. A few weeks after sending the mailing, we initiated the first of a maximum of ten call attempts, including three voice mail messages, to complete the screening survey. Between October 2015 and June 2019, we mailed study packets to 17,849 individuals across the four registries. Of these 2,553 opted out or refused participation upon contact; 1286 were deemed ineligible after screening, and we were unable to make contact with 7,640 due to bad addresses or phone numbers, or having made the maximum number of call attempts. We obtained 6,370 completed screening surveys, which corresponds to a 35.7% response and 62.4% cooperation rate. Of 5,750 eligible survivors, we invited all sexual minority survivors and every 10th heterosexual survivor to participate in a 45-minute telephone survey, which resulted in 480 survivors who participated in the survey an average of 3 years post-diagnosis (127 sexual minority and 353 heterosexual survivors). For this analysis, which focuses on health care utilization, we removed 62 survivors who reported a recurrence and/or survivors who reported current treatments for colorectal cancer. Therefore, our final sample included 418 non-recurrent colorectal cancer survivors who had completed treatment.

## Measures

The study measures were derived from cancer registry data and self-reported measures, which we obtained during the survivor survey. *The dependent measure*, non-emergency health care visits to a health care provider in the past 3 months, was dichotomized into 0–1 visit vs. 2 or more visits. We reasoned that survivors who seek health care ≥2 times in 3 months experience difficulties that require follow-up visits. Self-reported health care visits in the previous 3 months is a commonly used measure of survivors' health care utilization.[5]

*The main independent measures* consisted of survivors' self-reported sexual orientation (heterosexual, lesbian, gay, bisexual or reporting a same-sex vs. opposite-sex partner), which we dichotomized into sexual minority vs heterosexual survivors. Self-reported Symptoms were measured with the European Organisation for Research and Treatment of Cancer (EORTC) module for colorectal cancer, the QLQ-CR29, which asks survivors about problems in the past week.[16] The QLQ-CR29 has 4 functional scales (body image, weight, health-related anxiety, and sexual interest) and 15 symptom scales (e.g., bloating) that were transformed into scales ranging from 0–100. Consistent with earlier research, we then dichotomized each scale to distinguish frequent symptoms, defined as 'quite a bit' or 'very much' (scores ≥ 51) versus symptoms 'not at all' or 'a little' present (scores ≤ 50).[14,17] To capture psychological distress, we used the Hospital Anxiety and Depression scale (HADS), which measures symptoms of anxiety and depression over the past week.[18] Consistent with earlier research, we defined presence of anxiety (or depression) as scores ≥8.[19]

As control variables, we considered survivors' demographic and clinical characteristics. Demographic characteristics consisted of age at diagnosis, binary sex (male or female) obtained from registry data. Race/ethnicity, marital status, employment, health insurance, education, and income were self-reported. From the registry's census tract at each survivor's diagnosis, we derived neighborhood-level descriptors of socioeconomic status. The first was the percent of the population below the poverty level. Two others captured spatial social and economic polarization, summarized as an index of concentration at the extremes (ICE) for income and race/ethnicity.[20,21] The ICE measures range from −1, which captures the most disadvantaged, to 1, which reflects the most advantaged, while a value of 0 indicates an equal number of persons are in the most disadvantaged and most advantaged categories.[21]

Clinical characteristics consisted of cancer site, stage at diagnosis, time since diagnosis, all of which were obtained from registry data as well as self-reported family history of colorectal cancer and cancer treatments. To capture survivors overall self-reported health, we used a single item to describe general health from poor to excellent (fair/poor vs. better health) and used a 9-item self-reported Charlson Co-morbidity Index with a range from 0–9, which we categorized into 0, 1, 2, or 3 or more comorbidities.[22] As has been done in prior colorectal cancer research,[23] we derived survivors' body mass index (BMI) from survivors' self-reported weight and height, which may be slightly lower than BMI derived from clinician-measured height and weight.[24]

## Statistical analysis

We examined sample characteristics using descriptive statistics, including proportions for categorical variables and means, standard deviations, medians, and interquartile ranges for continuous variables. To avoid bias associated with listwise deletion of observations during multivariable regression, we performed multiple imputations using SAS PROC MI. We generated five complete data sets with missing data replaced with imputed values. First, we assessed each symptom and survivors' demographic and clinical characteristics for significant bivariate associations with health care use, using all five imputed data sets and SAS PROC MIANALYZE to integrate parameter estimates with valid standard errors and significance levels. All significant variables ($p<0.05$) except for a summary symptom measure were considered as candidates for selection into the final model unless more than 95% of the sample was concentrated in a single categorical response (e.g. health insurance). We then computed a base model, consisting of sexual orientation (one of the main independent variables of interest) and commonly reported confounders of health care: sex, age, race/ethnicity, income, and comorbidities. We included registry to account for geographic differences. We then used logistic regression with forward selection on each of the five completed data sets, forcing entry of the base model variables. The forward selection of additional independent variables into the model was determined using an entry criterion of $p<0.05$, and the Akaike Information Criterion (AIC) was used to select a model for each imputed data set. We included variables in the final model using a 'majority rules' selection process. That is a variable was included if it was selected into the forward selection models generated with at least three of five imputed data sets. As a final step, we fit the final model specification to all five imputed data sets using SAS PROC MIANALYZE to obtain summarized parameter estimates and standard errors, as we did for the bivariate analyses. All analyses were performed using SAS version 9.4.

## Results

Table 1 shows survivors' characteristics by sexual orientation. Sexual minority survivors differed from their heterosexual peers on demographic characteristics, in that they were significantly younger, more likely male, less likely to be married, more educated, and more likely employed. Sexual minority survivors were more likely to live in areas with greater poverty, and more income and race disadvantage than heterosexual survivors. Sexual minority and heterosexual survivors shared similar clinical characteristics and had similar health care utilization, in that 45–53% of all survivors reported two or more physician visits in the past 3 months.

Table 2 summarizes the prevalence of physical and psychological symptoms and function about three years after diagnosis by sexual orientation. Low sexual interest was most common, reported by 70% of survivors, followed by 23% reporting weight concerns, 19% health-related anxiety, and 18% generalized anxiety. Except for sexual interest, these problems were significantly more common among sexual minority survivors. Flatulence was reported by 17% of survivors, depression and urinary frequency by 12%, bloating by 11%, and dry mouth by 10%; none of these differed significantly by sexual orientation. Embarrassment, low body image, frequent stool, urinary incontinence, sore skin, and abdominal pain were experienced by 5%–9% of survivors, and of these, low body image was significantly more often reported by sexual minority than heterosexual survivors. All other symptoms were reported by less than 5% of survivors and were similar irrespective of sexual orientation. Counting all symptoms showed that 12% of survivors reported zero, 39% one, 17% two, 20% three to five, and 12% reported six or more symptoms. There was a trend towards sexual minority survivors reporting six or more symptoms compared to heterosexual survivors (18% vs. 10%; p=0.06). Sexual minorities also reported more symptoms on average (2.8 vs. 2.3; p<0.09) (results not shown). To better understand the prevalence of low sexual interest, we also assessed sexual interest by sex and age (results not shown). Significantly more women reported low sexual interest than men (83% compared to 58%; p<0.001), and survivors diagnosed at age 65 or older reported low sexual interest significantly more often than survivors diagnosed between age 50–64 or age 21–49 (83% vs. 63% vs. 55%, respectively p<0.001)

Of the symptoms that were reported by more than 5% of survivors, only weight concerns, health-related anxiety, flatulence, and sore skin had a significant bivariate association with more health care use (Table 3). When stratified by sexual orientation, sexual minorities' health-related anxiety and sore skin were significantly associated with greater health care utilization. Among heterosexual survivors, weight concerns were significantly associated with greater health care utilization. We also performed interaction analyses of sexual orientation with health-related anxiety, sore skin, and weight concerns (results not shown). None of the interactions were significant. We also tested for differences in weight concerns by sex among sexual minority survivors and found no significant differences.

The final explanatory model that explained greater use of health care is presented in Table 4. Of the pre-determined confounders, only comorbidities significantly increased the odds of more health care utilization, with survivors reporting more comorbidities using more health care. Of the symptoms considered, survivors with sore skin had 2.7 times the odds, and survivors with weight concerns had 1.7 times the odds of more health care visits. We also performed interaction analysis of sexual orientation with sex (results not shown), which was not significantly associated with health care utilization. To further understand weight concerns, we examined the association between the self-reported measure of body mass index and weight concerns (results not shown). This association was significant with 17% of healthy weight, 32% overweight, and 51% of obese survivors reporting weight concerns ($p < .0001$).

## Discussion

This study contributes to the literature by identifying the relationship between symptoms and health care utilization among sexual minority and heterosexual survivors in remission for an average of three years post-diagnosis of colorectal cancer. Among these mostly insured survivors, symptoms varied greatly, with equal proportions of survivors reporting no symptoms and co-occurrence of six or more symptoms. Some findings were consistent with prior studies. For example, in one study of colorectal cancer survivors about 6 months after diagnosis, 89% reported any symptom and 13% reported depression, which is comparable to our findings of 88% and 12%, respectively.[25] Contrary to the finding that depression is a barrier to health care utilization,[6] in the current study, depression was unrelated to health care utilization. Rather, weight concerns reported by 23% of survivors, health-related anxiety (19%), flatulence (17%), and sore skin (7%), were significantly associated with greater health care utilization in bivariate analyses. The most common symptom, reported by 70% of survivors, low sexual interest, was unrelated to health care utilization. Sexual interest did not differ by sexual orientation. However, differences in sexual interest by sex and age at diagnosis identified in our study are consistent with reviews of sexual function that have noted considerable variation in the prevalence of sexual problems after colorectal cancer.[26,27]

In the final model, sexual orientation was not associated with health care utilization. After we controlled for survivors' other demographic factors and other comorbidities, two problems significantly contributed towards explaining survivors' greater health care utilization: worrying about weight, and sore skin around the anal area or stoma. Survivors' weight concerns may be related to weight gain, possibly after physicians encouraged survivors to maintain their weight during cancer treatments. This hypothesis is supported by the significant association between the self-reported measure of body mass index and weight concerns in this study as well as prior studies that reported post-diagnosis weight gain among survivors.[23] Skin problems after treatment for colorectal cancer are known long-term complications, especially among survivors with a stoma.[28,29] In this study, skin problems in the anal area or at the stoma were linked to increased health care utilization.

Although the observed differences are not statistically significant, our data are consistent with earlier findings that sexual minority survivors report more symptoms and use more health care than heterosexual survivors.[10–12] Weight concerns, health-related anxiety, anxiety, and low body image were more likely to be endorsed by sexual minority than heterosexual survivors. Moreover, sexual minorities have more co-occurring symptoms. These findings are consistent with breast cancer studies showing that after undergoing mastectomy, radiation therapy, or hormone therapy sexual minority women reported worse arm symptoms and systemic side effects than heterosexual women[11–12] We also identified a significant association between sexual orientation and some symptoms, showing that among sexual minorities, health-related anxiety and sore skin are linked to greater health care utilization. Because having a stoma may cause symptoms that increase health care utilization, future studies need to examine whether sexual minorities' health care utilization can be explained by having a stoma, which was twice as common among sexual minorities compared to heterosexual survivors. In total, this study further expands our understanding of sexual minority survivors' perception of symptoms as well as the need for more studies and larger sample sizes of sexual minority colorectal cancer survivors.

This study has several limitations worth noting. While this study was carefully designed to recruit colorectal cancer survivors representing various geographic regions, the study sample may still include geographic biases. Our definition of sexual minority status did not distinguish sexual minority identities, nor did we have a measure of gender identity. Future studies with larger samples of sexual minority survivors need to evaluate whether sexual minority subgroups, as well as sexual minority men and women, differ in symptomatology and health care utilization. Further, additional studies are needed with regard to gender identity and health care utilization among colorectal cancer survivors. Next, some may argue that the past three months is too short a time frame for determining health care utilization and a limitation of this study. However, others have used the same time frame,[5] and we suggest that a shorter time frame is advantageous when linking symptoms occurring over the past week to health care utilization. Further limitations were the use of self-reported BMI and that the symptom measure assessed the presence of symptoms in the past week, without determining the onset of symptoms, including the possibility that symptoms existed before the cancer diagnosis. While the EORTC-CR29 is designed to capture colorectal cancer survivors' symptoms, which are distinct from symptoms of other cancer sites, only the intensity of the symptom presentation is captured (e.g., “not at all” vs. “quite a bit”) without assessing survivors' subjective experience or bother of the symptom. Some of these limitations are particularly important in the context of low sexual interest, which was present in three out of four survivors but had no association with health care utilization. It was beyond the scope of this study to determine whether survivors accepted low sexual interest or would have liked to address concerns with their providers. Both, survivors' reluctance to ask providers about sexual function and providers' avoidance to include sexual health into their discussion with survivors have previously been documented.[30,31]

Among the strengths of this study are identifying symptoms that led to increased health care use. The identified symptoms can inform clinical care, suggesting that providers should engage survivors in conversations about their symptoms and extent of bother by the symptoms to determine treatment or referral to support services. In this context and during cancer care more generally, survivors' sexual orientation should be assessed as recommended by leading organizations.[32] Our finding that sexual minority survivors' experiences of symptoms differed and related differently to health care utilization further supports the need to ascertain sexual orientation to ensure providers offer tailored referral to educational or behavioral support services and counseling to facilitate coping with bothersome symptoms. The findings of this study add to a growing body of research that examines equity by sexual orientation in cancer survivorship.

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### Table 1.

Characteristics of sexual minority and heterosexual cancer survivors in remission (N=418)

| | **Sexual minority N=116** | **Heterosexual N=302** | **p value** |
|---|---|---|---|
| Registry | | | |
| CA | 75 (64.7%) | 123 (40.7%) | 0.0001 |
| FL | 24 (20.7%) | 85 (28.1%) | |
| GA | 6 (5.2%) | 44 (14.6%) | |
| WA | 11 (9.5%) | 50 (16.6%) | |
| Age at diagnosis | | | |
| 21–49 years old | 19 (16.4%) | 43 (14.2%) | 0.02 |
| 50–64 years old | 60 (51.7%) | 117 (38.7%) | |
| 65 years and older | 37 (31.9%) | 142 (47.0%) | |
| Sex | | | |
| Male | 68 (58.6%) | 141 (46.7%) | 0.03 |
| Female | 48 (41.4%) | 161 (53.3%) | |
| Race | | | |
| Non-Hispanic (NH) White | 97 (83.6%) | 237 (78.5%) | 0.49 |
| NH Black | 8 (6.9%) | 29 (9.6%) | |
| Other/Unknown | 11 (9.5%) | 36 (11.9%) | |
| Household income | | | |
| < $40k | 24 (22.6%) | 81 (28.3%) | 0.53 |
| $40k to < $80k | 33 (31.1%) | 83 (29.0%) | |
| $80k to < $120k | 21 (19.8%) | 62 (21.7%) | |
| $120k or more | 28 (26.4%) | 60 (21.0%) | |
| ICE for income Mean (Std Dev) | 0.0 (0.3) | 0.1 (0.3) | 0.002 |
| ICE for race/ethnicity Mean (Std Dev) | 0.2 (0.2) | 0.2 (0.2) | 0.047 |
| Percent below poverty level Mean (Std Dev) | 14.4 (9.3) | 10.8 (7.5) | 0.0002 |
| Marital status | | | |
| Married | 25 (21.6%) | 180 (59.8%) | <.0001 |
| Not married | 91 (78.4%) | 121 (40.2%) | |
| Highest level of education | | | |
| < college grad | 40 (36.0%) | 152 (50.8%) | 0.008 |
| college grad or higher | 71 (64.0%) | 147 (49.2%) | |
| Employment | | | |
| Not employed | 53 (45.7%) | 184 (61.5%) | 0.003 |
| Employed (self/fulltime/parttime) | 63 (54.3%) | 115 (38.5%) | |
| Health Insurance | | | |
| Yes | 111 (97.4%) | 296 (98.7%) | 0.36 |
| No | 3 (2.6%) | 4 (1.3%) | |
| **Clinical Characteristics** | | | |
| Primary Site | | | 0.39 |

| | **Sexual minority N=116** | **Heterosexual N=302** | **p value** |
|---|---|---|---|
| Colon | 74 (63.8%) | 206 (68.2%) | |
| Rectum | 42 (36.2%) | 96 (31.8%) | |
| Stage at diagnosis | | | 0.88 |
| Stage I | 37 (31.9%) | 99 (32.8%) | |
| Stage II | 41 (35.3%) | 99 (32.8%) | |
| Stage III | 38 (32.8%) | 104 (34.4%) | |
| Surgery | | | |
| Yes | 112 (96.6%) | 281 (94.3%) | 0.35 |
| No | 4 (3.4%) | 17 (5.7%) | |
| Radiation therapy | | | |
| Yes | 28 (24.1%) | 60 (19.9%) | 0.34 |
| No | 88 (75.9%) | 242 (80.1%) | |
| Chemotherapy | | | |
| Yes | 62 (53.4%) | 143 (47.4%) | 0.26 |
| No | 54 (46.6%) | 159 (52.6%) | |
| Any other treatments | | | |
| Yes | 8 (7.0%) | 23 (7.6%) | 0.84 |
| No | 106 (93.0%) | 279 (92.4%) | |
| Stoma | | | |
| Yes | 13 (11.2%) | 19 (6.3%) | 0.0906 |
| No | 103 (88.8%) | 283 (93.7%) | |
| Family History of CCR | | | |
| Yes | 18 (16.7%) | 49 (17.0%) | 0.93 |
| No | 90 (83.3%) | 239 (83.0%) | |
| Comorbidities | | | |
| 0 | 45 (38.8%) | 134 (44.4%) | |
| 1 | 44 (37.9%) | 92 (30.5%) | 0.54 |
| 2 | 17 (14.7%) | 47 (15.6%) | |
| 3+ | 10 (8.6%) | 29 (9.6%) | |
| BMI | | | |
| Healthy Weight | 49 (42.2%) | 98 (32.5%) | |
| Overweight | 34 (29.3%) | 113 (37.4%) | 0.14 |
| Obese | 33 (28.4%) | 91 (30.1%) | |
| Fair/Poor Health | 22 (19.0%) | 38 (12.6%) | 0.0956 |
| Good/Very good/Excellent Health | 94 (81.0%) | 264 (87.4%) | |
| **Outcome** | | | |
| Nonemergency health care utilization | | | |
| 0–1 | 51 (45.1%) | 159 (53.0%) | 0.1539 |
| 2+ | 62 (54.9%) | 141 (47.0%) | |

## Table 2.

Physical and Psychological Symptoms and Function

| | **Entire Sample (N=418) Scale Scores Mean (SD)** | **Entire Sample (N=418) Frequent Problem N (%)** | **Sexual Minorities (N=116) Frequent Problem N (%)** | **Heterosexuals (N=302) Frequent Problem N (%)** | **p value[*]** |
|---|---|---|---|---|---|
| Sexual Interest | 35.7 (32.3) | 285 (70.2) | 75 (65.8) | 210 (71.9) | 0.23 |
| Weight Function | 70.9 (32.6) | 96 (23.0) | 38 (32.8) | 58 (19.2) | **<0.01** |
| Health-related Anxiety | 71.0 (29.3) | 81 (19.4) | 32 (27.8) | 49 (16.2) | **<0.01** |
| Anxiety | 4.4 (3.7) | 72 (17.5) | 30 (26.8) | 42 (14.0) | **<0.01** |
| Flatulence | 26.5 (27.3) | 71 (17.1) | 23 (20.0) | 48 (16.0) | 0.33 |
| Depression | 3.5 (3.4) | 51 (12.4) | 13 (11.6) | 38 (12.7) | 0.77 |
| Urinary Frequency | 23.3 (25.7) | 49 (11.8) | 18 (15.5) | 31 (10.3) | 0.14 |
| Bloating | 15.3 (25.5) | 44 (10.6) | 14 (12.1) | 30 (10.0) | 0.53 |
| Dry Mouth | 17.6 (25.1) | 42 (10.1) | 13 (11.3) | 29 (9.6) | 0.61 |
| Embarrassment | 12.0 (25.2) | 39 (9.4) | 13 (11.3) | 26 (8.6) | 0.40 |
| Body Image | 86.3 (22.1) | 32 (7.7) | 14 (12.1) | 18 (6.0) | **0.04** |
| Stool Frequency | 14.7 (22.2) | 28 (6.7) | 10 (8.7) | 18 (6.0) | 0.32 |
| Urinary Incontinence | 12.6 (22.1) | 28 (6.7) | 7 (6.1) | 21 (7.0) | 0.74 |
| Sore Skin | 9.5 (22.6) | 27 (6.5) | 7 (6.1) | 20 (6.6) | 0.84 |
| Abdominal Pain | 8.7 (20.3) | 21 (5.0) | 6 (5.2) | 15 (5.0) | 0.93 |
| Buttock Pain | 8.1 (20.2) | 18 (4.3) | 3 (2.6) | 15 (5.0) | 0.28 |
| Fecal Incontinence | 7.5 (18.1) | 15 (3.6) | 5 (4.3) | 10 (3.3) | 0.62 |
| Taste | 4.1 (15.2) | 11 (2.6) | 2 (1.7) | 9 (3.0) | 0.47 |
| Hair Loss | 3.4 (12.7) | 7 (1.7) | 1 (0.9) | 6 (2.0) | 0.42 |
| Dysuria | 1.4 (7.0) | 1 (0.2) | 1 (0.9) | 0 (0) | 0.11 |
| Blood and Mucus in Stool | 2.2 (7.9) | 0 (0) | 0 (0) | 0 (0) | - |
| *Sum of Problems* | -- | | | | 0.06 |
| 0 | | 48 (12.2) | 14 (12.8) | 34 (11.9) | |
| 1 | | 155 (39.3) | 34 (31.2) | 121 (42.5) | |
| 2 | | 65 (17.0) | 22 (20.2) | 43 (15.1) | |
| 3–5 | | 78 (20.0) | 19 (17.4) | 59 (20.7) | |
| 6 or more | | 48 (12.2) | 20 (18.4) | 28 (9.8) | |

[*] Chi square test comparing dichotomized symptoms by sexual orientation

## Table 3.

Bivariate Associations between symptoms and outcome

| | **All Survivors (N=418) 2+ Health care Visits Odds Ratio (95% CI)** | **Sexual Minority (N=116) 2+ Health care Visits Odds Ratio (95% CI)** | **Heterosexual (N=302) 2+ Health care Visits Odds Ratio (95% CI)** |
|---|---|---|---|
| Low Sexual Interest | 1.30 (0.85, 1.99) | 0.77 (0.35, 1.69) | 1.69 (1.00, 2.85) |
| Weight Concerns | 2.01 (1.26, 3.21) [***] | 1.66 (0.75, 3.69) | 2.12 (1.18, 3.81) [**] |
| Health-related Anxiety | 1.68 (1.02, 2.75) [**] | 2.85 (1.14, 7.11) [**] | 1.20 (0.65, 2.22) |
| Anxiety | 1.10 (0.66, 1.83) | 1.54 (0.64, 3.68) | 0.82 (0.42, 1.58) |
| Flatulence | 1.71 (1.01, 2.89) [**] | 1.92 (0.71, 5.16) | 1.60 (0.86, 2.97) |
| Depression | 1.16 (0.64, 2.10) | 1.25 (0.37, 4.25) | 1.14 (0.58, 2.25) |
| Urinary Frequency | 1.43 (0.77, 2.65) | 0.64 (0.23, 1.82) | 2.14 (0.98, 4.69) |
| Bloating | 0.96 (0.51, 1.81) | 1.19 (0.37, 3.87) | 0.86 (0.40, 1.84) |
| Dry Mouth | 1.61 (0.83, 3.10) | 1.41 (0.40, 5.00) | 1.68 (0.77, 3.68) |
| Embarrassment | 1.09 (0.56, 2.11) | 1.35 (0.41, 4.46) | 0.96 (0.43, 2.14) |
| Body Image | 1.39 (0.67, 2.91) | 1.19 (0.37, 3.87) | 1.43 (0.55, 3.73) |
| Stool Frequency | 2.21 (0.97, 5.08) | 2.04 (0.50, 8.30) | 2.24 (0.80, 6.27) |
| Urinary Incontinence | 1.38 (0.64, 2.99) | 0.57 (0.12, 2.68) | 1.90 (0.77, 4.74) |
| Sore Skin | 2.59 (1.11, 6.06) [**] | Ω | 1.74 (0.69, 4.40) |
| Abdominal Pain | 1.72 (0.70, 4.24) | 4.39 (0.50, 38.8) | 1.30 (0.46, 3.68) |
| *Sum of Problems* | | | |
| 0 | Ref | Ref | Ref |
| 1 | 1.44 (0.73, 2.84) | 0.90 (0.26, 3.17) | 1.72 (0.76, 3.89) |
| 2 | 2.10 (0.98, 4.52) | 2.51 (0.63, 10.0) | 1.89 (0.75, 4.75) |
| 3–5 | 2.48 (1.18, 5.19) [**] | 2.04 (0.50, 8.30) | 2.72 (1.13, 6.54) [**] |
| 6 or more | 3.21 (1.40, 7.38) [***] | 2.98 (0.73, 12.2) | 3.07 (1.09, 8.63) [**] |

[***] p<0.01;

[**] p<0.05;

[*] p<0.10

Ω All sexual minorities with sore skin problems reported two or more health care visits.

### Table 4.

Explanatory model of survivors' health care utilization (N=418)

| | **Two or more visits AOR (95% CI)** |
|---|---|
| Sexual minority vs. Heterosexual | 1.27(0.79,2.06) |
| Registry FL vs. CA | 1.06(0.64,1.76) |
| GA vs. CA | 0.88(0.43,1.78) |
| WA vs. CA | 0.59(0.31,1.12) |
| Age<br>21–49 years vs. ≥65 | 1.08(0.53,2.17) |
| 50–64 years vs. ≥65 | 0.9(0.56,1.43) |
| Sex<br>Female vs. Male | 1.18(0.78,1.79) |
| Race/Ethnicity<br>NH Black vs. NH White | 1.26(0.57,2.78) |
| Other vs. NH White | 0.99(0.52,1.91) |
| Income<br>40k-80k vs. <40k | 1.52(0.86,2.7) |
| 80–120k vs. <40k | 1.12(0.57,2.19) |
| 120 k or more vs. <40k | 1.04(0.55,1.96) |
| Comorbidities<br>1 vs. None | 1.46(0.89,2.38) |
| 2 vs. None | **2.00(1.05,3.8)** ** |
| 3+ vs. None | **4.06(1.79,9.22)** *** |
| Frequent sore skin | **2.67(1.06,6.69)** ** |
| Weight Concerns | **1.73(1.04,2.90)** ** |

*** p<0.01;

** p <0.05

AOR =Adjusted Odds Ratio NH= Non-Hispanic