An Examination of the Role of Socioeconomic Status in the Relationship Between Treatment Regret, Mental, Physical and Urological Health Indicators and Psychosocial Well-Being among Prostate Cancer Survivors

by

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Dedication

This thesis is dedicated to my best friend, Sarah Schwartz. Your kindness, support, enthusiasm and patience made this possible.

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Abstract

While prostate cancer (PCa) survival is high, the side effects that accompany its various treatments are significant. This exploratory cross-sectional study assessed if the combined contribution of treatment regret, mental and physical health indicators are associated with the well-being of PCa survivors, and if disparities exist by socioeconomic status. Multivariable logistic regression analyses modelled four well-being domains (social/family, emotional, functional, and spiritual) based on six predictors (urinary, sexual, and bowel function; mental and physical health; and treatment regret) and four covariates (age, household income, education, and survivorship time). Interactions between age, household income and education and each of the four outcomes were assessed. Stratified analyses by these covariates were evaluated where significant interactions were observed. Social/family well-being was associated with bowel function, sexual function, and age; emotional well-being with sexual function; and functional well-being with bowel function, and sexual function. Important differences also exist for different socioeconomic groups.

List of Abbreviations

QoL - Quality of life

HRQoL - Health-Related Quality of Life

CAD - Canadian Dollars

SGBA+ - Sex- and Gender-Based Analysis

FACT-P - Functional Assessment of Cancer Therapy-Prostate

UCLA-PCI - University College of Los Angeles Prostate Cancer Index

SF-12 - Short Form 12

OR - Odds Ratio

CI - Confidence Interval

Chapter 1. Introduction

1.1 Introduction to Prostate Cancer

With an increasing global burden of disease (Global Burden of Disease Cancer Collaboration et al., 2017), prostate cancer is the most commonly diagnosed cancer in Canadian males (Brenner et al., 2020). In 2021, prostate cancer was projected to account for one in five new cancer cases in Canadian males (Brenner et al., 2020; Canadian Cancer Society, 2021a). In a sample of 6,585 men from Atlantic Canada, the prevalence of lifetime history of prostate cancer diagnosis was found to be 3.9% (Ilie et al., 2020a), which was comparable (4%) to that found in a national population-based sample of 25,183 Canadian men (Moodie et al. 2020). However, despite the high prevalence for this disease, thanks to highly effective treatments, the net 5-year survival for Canadians diagnosed with prostate cancer is 91% (Canadian Cancer Society, 2022). The risk of prostate cancer increases with age, and about 99% of cases among Canadians are diagnosed among men over the age of 50 (Canadian Cancer Statistics Advisory Committee et al., 2021). However, younger men are not immune to this disease, with a nationally representative sample of Canadian adults reporting cases of prostate in individuals as young as 25 years old (Sritharan et al., 2018).

Given recent improvements in prostate cancer detection and increased survivorship following effective treatment modalities for this disease, it has become increasingly important to consider quality of life (QoL) outcomes associated with different psychosocial and physical characteristics of prostate cancer survivorship. Short-term QoL outcomes have been extensively documented, but only a few reports have evaluated long-term QoL and survival associated with different treatment side effects or psychosocial indicators

(Ávila et al., 2018; Lardas et al., 2017; Mazariego et al., 2020). The aim of this project was to determine if the combined contribution of treatment regret, and mental and physical health indicators is associated with the social/family, emotional, functional, and/or spiritual well-being of prostate cancer survivors in covariate-controlled analyses. Secondly, we examined whether disparities exist in these associations by socioeconomic status (SES) measures (household income, education, and age). Understanding these associations is valuable as they may be used to inform prostate cancer treatment and survivorship care, such that QoL can be maximized throughout prostate cancer patients' survivorship journeys.

1.2 Prostate Cancer Quality of Life

While prostate cancer-specific survival is high, the side effects that accompany its various active treatments have been shown to significantly impact the QoL of survivors (Gomella et al., 2009). Treatment options for patients with localized or locally advanced prostate cancer vary, but include hormone therapy, radiotherapy, and radical prostatectomy surgery (Keyes et al., 2013). Patients with advanced disease may also undergo chemotherapy (Gravis, 2019). Each treatment modality has a unique side effect profile; however, each is associated with changes in QoL in the urinary, sexual, bowel, and hormonal domains (Keyes et al., 2013; Namiki & Arai, 2010). In a study following 3,348 prostate cancer survivors post-treatment, 90% of participants reported having experienced at least one physical side effect, including urinary incontinence, erectile dysfunction, loss of libido, bowel problems, breast changes, hot flashes, and fatigue (Gavin et al., 2015). The most common side effects were erectile dysfunction (68%), loss of libido (58%), and fatigue (55%) (Gavin et al., 2015).

Moreover, there are also significant psychosocial side effects that can accompany prostate cancer treatment and survivorship. Steginga et al. (2004) found that up to 60% of prostate cancer survivors experience psychological distress after treatment, and symptoms of depression among prostate cancer survivors have been reported to range from 16-38% (Bennett & Badger, 2005; Fervaha et al., 2019; Ilie, 2018a; Ilie et al., 2021b, 2020b, 2020c; Sharpley & Christie, 2007). While the factors contributing to mental distress among prostate cancer patients are unique to each individual, it has been hypothesized that it is often due to physical symptoms and side effects, uncertainties associated with the diagnosis, unmet psychosocial needs, and changes in self-esteem and sense of masculinity (Fervaha et al., 2019; Ilie et al., 2020a; Massoeurs et al., 2021). Whereas Canadian men with a history of other cancer(s) have comparable odds of severe anxiety and depression symptoms to men without a cancer diagnosis, Canadian men diagnosed with prostate cancer have significantly higher odds for both severe anxiety and depression symptoms (Ilie et al., 2020a). This phenomenon of increased mental distress among prostate cancer survivors has recently been referred to as a “silent epidemic,” highlighting the importance of dedicating health research resources to its acknowledgement and prevention (Massoeurs et al., 2021).

The significance of these life-altering physical and mental side effects is apparent, as studies consistently report finding a reduction in the QoL of prostate cancer patients following the initiation of treatment (Eton et al., 2001; Lardas et al., 2017; Sanda et al., 2008). Among the sub-domains of QoL that are the focus of this work, there is a paucity of research quantifying the prevalence of poor social/family, emotional, functional, and spiritual well-being among prostate cancer survivors. However, in a sample of 367 people with any lifetime history of prostate cancer in the Maritime provinces of Canada, 54.4% screened positive for poor social/family well-being, 26.5% screened positive for poor emotional well-being, 49.9% screened positive for poor functional well-being, and 63.8% screened positive for poor spiritual well-being (Bradley et al., 2021). Compared to other cancers such as multiple myelomas, lung cancer, and lymphoma, prostate cancer survivors generally have lesser disability (Joshy et al., 2020). However, the rates of survival of prostate cancer patients are much higher than these other cancers, and thus the burden of this disease on patients and their communities is significant (Canadian Cancer Society, 2022). Given the high prevalence of prostate cancer survivors experiencing reduced QoL, it is important to examine what factors may be associated with this phenomenon, such that specific and directed efforts can be made in these areas to improve the well-being of survivors.

1.3 Socioeconomic status

SES can be defined as a measure of one's combined economic and social status, and tends to be positively associated with better health (Baker, 2014; Braveman, 2006; Lorant, 2003; Shavers, 2007; Ward et al., 2004). Measures of SES are varied, but commonly include education, income, occupation, and other composite measures which integrate individual-level proxies (Shavers, 2007). Previous studies have provided significant evidence of marked consistency in the morbidity and mortality of disease by social group (Blane, 1995; Elo, 2009; House et al., 1990; Mackenbach et al., 2008; Menvielle & Kunst, 2008). Indeed, SES is frequently a contributor to health disparities observed among racial/ethnic minorities, women and elderly populations (Shavers, 2007). This may be because of how those of higher SES may have greater access to health-promoting materials, services and information, as well as lesser discrimination, in certain cases (Fuller-Rowell et al., 2012; Gordon-Larsen et al., 2006; Price et al., 2013).

Understanding how SES may mediate or confound associations in health research is critical to delivering the most effective and appropriate and care.

1.4 Treatment Regret

While many people are familiar with feelings of regret, it can be broadly defined as a "comparison-based emotion of self-blame, experienced when people realize or imagine that their present situation would have been better had they decided differently in the past" (Zeelenberg & Pieters, 2007, pg 4). Decisional regret is an important topic to consider in a prostate cancer context as there are many different treatment options, each of which has a unique side effect profile (Keyes et al., 2013; Namiki & Arai, 2010). The different treatment options may impact patients' satisfaction with treatment based on physical and psychological side effects, and with more treatment options available, there may be an increased likelihood for regret (Chernev et al., 2015). Considering the impact of treatment regret in prostate cancer survivorship is important, as it has been evidenced to be associated with poorer QoL among prostate cancer survivors (Bradley et al., 2021; Clark et al., 2001; Diefenbach et al., 2008)

Chapter 2. Literature Review

2.1 Overview

While short-term QoL outcomes have been extensively documented, only a few reports have evaluated the QoL of prostate cancer survivors beyond 10 years of survivorship, and the rates of survival associated with different treatment options (Ávila et al., 2018; Lardas et al., 2017; Mazariego et al., 2020). QoL is a complex concept, which is defined by the World Health Organization (WHO) as “individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” (Whoqol Group, 1995, pg 11). In this thesis, we were concerned with a predetermined set of QoL domains or health related constructs of well-being such as emotional, functional, social/family, and spiritual well-being assessed through validated questionnaires where patients and survivors are presented with each domain and are asked to rate their perceived experience in each area (Hays & Reeve, 2008). Further, we were interested in analyzing whether disparities in QoL among prostate cancer patients exist by different socioeconomic factors.

While behavioural risk factors are often presented as main determinants of health, there is evidence that these account for only a small amount of difference in health between individuals. Evidence supports that there are social factors which may have a significant role in health determination (Raphael, 2003). The most important social determinants of health vary by population; however, a report from the Government of Canada on the Key Health Inequalities in Canada outlines that significant health inequalities were observed among Indigenous peoples, sexual and racial minorities, immigrants, and people living with functional limitations. A gradient of inequalities by socioeconomic status (income, education levels, employment, and occupation status) could be seen for many indicators (Public Health Agency of Canada & Pan-Canadian Public Health Network, 2018). In a prostate cancer context, the literature supports that social determinants such as poverty, lack of education, immigration status, lack of social support, and social isolation play an important role in prostate cancer stage at diagnosis and survival (Coughlin, 2020). Another important determinant of health to consider in a prostate cancer context, especially when considering life expectancy, is gender. Prostate cancer can occur in non cis-gender men who were assigned male at birth, such as transgender women and non-binary people, however, the vast majority of the prostate cancer patient population is cis-gender men (Deebel et al., 2017). For this reason, in a prostate cancer context, it is important to consider the unique health profiles of men, as compared to other genders. While Canadian women may spend a larger proportion of their lives in poor health, Canadian men have a shorter life expectancy, living about 4.5 years less (Public Health Agency of Canada & Pan-Canadian Public Health Network, 2018). Suicide mortality is also significantly higher among Canadian men than women, which is important in a prostate cancer context, given the significant psychosocial impacts that can accompany this disease and its treatments (Public Health Agency of Canada & Pan-Canadian Public Health Network, 2018). In fact, prostate cancer patients with locally advanced or metastatic disease have twice the suicide rate than men in the general population (Bill-Axelson et al., 2010).

2.2 Psychosocial well-being among survivors of prostate cancer

Social/Family Well-Being

There is evidence that survivors of breast cancer experience changes in their social/family well-being, secondary to their cancer, which can negatively impact QoL (Dow et al., 1996). However, there is very limited research into the social/family well-being of prostate cancer patients. There are many similarities between prostate and breast cancers, from physiologic similarities to comparable treatment strategies and similar survivorship needs (Gooden & Winefield, 2007; Risbridger et al., 2010). It is therefore possible that prostate cancer patients may experience similar reductions in their social/family well-being as a result their cancer. Further, perceived social support, an important proxy of social/family well-being, is an important predictor of well-being among cancer patient populations (Chien et al., 2021; Ganz et al., 2003; Helgeson & Cohen, 1996; Michael et al., 2000). Given the potential reduction in social/family well-being among prostate cancer survivors, it is critical to investigate factors that may be contributing to this association, such that patients' needs can be appropriately addressed throughout their cancer survivorship.

Dow et al. (1996) found that among their sample of breast cancer survivors, satisfaction with sex life was scored the lowest of the social/family well-being domain of the Functional Assessment of Cancer Therapy-General (FACT-G) (with lower scores indicating lower satisfaction). The aspects of this domain that were generally positive among the breast cancer patient sample were support from friends and family, family communication and acceptance, and feeling close to friends, family, and partners (Dow et al., 1996).

Bradley et al. (2021) found a significant association between low household income and poor social/family well-being among prostate cancer survivors, when physical and mental health, urinary, bowel and sexual function, as well as age and survivorship time were held constant. While the mechanisms behind this association are not clear, this work has informed the objectives of this thesis, which further examine the association between household income (as well as other SES measures) and social/family well-being among prostate cancer survivors and explore potential contributors to this association.

Emotional Well-Being

A study by Traeger et al. (2009) analyzed the cognitive representation of illness among prostate cancer survivors. They found that illness perception, including treatment control (effectiveness of treatment in controlling symptoms), illness coherence (comprehension of prostate cancer and its symptoms), negative consequences (negative life impacts of prostate cancer), and cause (perceived personality and behavioural causes of prostate cancer, such as eating habits) accounted for significant variance in the emotional well-being of prostate cancer survivors. It has been suggested that these associations may in part be due to a relationship between perceiving illness as controllable (e.g., being able to influence vitality, symptoms, psychological adjustment, and curability) and engaging in active coping and cognitive reappraisal (Hagger & Orbell, 2003). Moreover, Traeger et al. (2009) found that more years of education and higher income were both related to higher emotional well-being (Traeger et al., 2009). This may be associated with increased access to goods and services which could support a greater emotional well-being (e.g., housing, psychological therapy, recreation activities), as well as a greater sense of security and control which may in turn decrease stress and increase well-being (Short & Mallonee, 2006). These disparities in emotional well-being associated with SES proxies provides support for the importance of this proposed project, which aims to investigate the significance of such relationships.

Other studies have found that emotional functioning was better among prostate cancer patients who participated in their treatment decision than those who did not, and among those with localized disease as compared to metastatic (Davison & Goldenberg, 2003; Lintz et al., 2003). The decreased emotional well-being among men with advanced cancer may be due to increased burden of physical symptoms, as well as lesser hope for cure (Lintz et al., 2003). These previous studies point to the potentially important role of patient education, autonomy, and psychological support in prostate cancer survivors' emotional well-being, such that illness perception, treatment decision-making, positive coping, and positive thinking can be maximized (Davison & Goldenberg, 2003; Hagger & Orbell, 2003; Lintz et al., 2003; Traeger et al., 2009).

Functional Well-Being

Physical health and functional well-being have long been shown to affect one another (Eton & Lepore, 2002). In recent years, research has shown that cardiovascular events, fatigue and sexual, urinary, bowel, and sleep problems are some of the most significant functional and physical health-related side effects that impact the QoL of prostate cancer survivors (Chambers et al., 2017; Ilie, 2018b; Ilie et al., 2020b; Joly et al., 2006; Leong et al., 2020; Smith et al., 2009). Bradley et al. (2021) found that almost half (49%) of their sample of 367 men with a lifetime history of prostate cancer reported poor functional well-being. Further, poor functional well-being was associated with treatment regret (OR = 4.18, 95% CI: 1.76–9.93), and the presence of good mental and physical health, urinary, bowel, and sexual function were each negatively related to poor functional well-being (OR = 0.84, 95% CI: 0.79–0.88; OR = 0.88, 95% CI: 0.84–0.92; OR = 0.99, 95% CI: 0.97–0.99; OR = 0.97, 95% CI: 0.96–0.98; OR = 0.98 95% CI: 0.96–0.99, respectively). Evidence of these associations point to the need for patients to participate in activities that target physical function throughout prostate cancer survivorship, which may include pelvic floor physiotherapy and/or patient empowerment programs. The utility of multi-faceted patient empowerment programs that include such activities have been highlighted by prostate cancer patients (Ilie et al., 2020d).

Spiritual Well-Being

Spiritual well-being is well-accepted in research to encompass four aspects of health: human connection with a higher existence, with oneself, with others, and with nature (Dhar et al., 2011; Ghaderi et al., 2018; Gomez & Fisher, 2003). Similar to social, emotional, functional, and physical wellbeing, spiritual well-being is an important psychosocial marker of QoL among prostate cancer survivors. However, more research is needed to understand its impact on physical and psychological health (Bai & Lazenby, 2015; De Sousa et al., 2012; Krupski et al., 2006). Low household income has previously been found to be associated with higher spiritual well-being (Bradley et al., 2021; Sithey et al., 2018; Wimberley, 1984). Zavala et al. (2009) examined how spirituality is associated with health-related quality of life (HRQoL) among low-income men with metastatic prostate cancer and found that greater spirituality was associated with better HRQoL and psychosocial function. Specifically, when controlling for demographic covariates including age, race, relationship status, and number of comorbidities, spirituality was independently associated with better scores in the physical and mental health domains of the Short-Form-12 survey (SF-12), as well as urinary bother, bowel function and bother, SF-12 pain assessment, self-efficacy, and anxiety (J. E. Ware et al., 1996; Zavala et al., 2009).

Similar results were found by Krupski et al. (2006), where greater spiritual well-being among low-income patients was associated with greater prostate cancer-specific outcomes, including better sexual function and lower urinary bother (Krupski et al., 2006). Brady et al. (1999) reported that greater spiritual well-being may allow cancer patients to experience higher QoL despite symptoms, including sense of self, and decrease the perceived importance of symptoms on one's overall well-being (Brady et al., 1999). In this case, prostate cancer survivors may experience less suffering and greater well-being throughout their survivorship, and consequently reduce the burden of this disease on the medical system. Further, exploring disparities in the spiritual well-being of prostate cancer patient populations may allow for even greater survivorship care by identifying what sub-populations may be in need of additional support and/or resources in this well-being domain.

2.3 Treatment Regret among men with a history of prostate cancer

Little is known about how the presence or absence of treatment regret impacts psychosocial well-being of prostate cancer patients, and whether disparities exist by SES. With many treatment modalities available in the current standard of care for the management of prostate cancer, the treatment decision-making process can be difficult, and regret about the choice of prostate cancer treatment is not uncommon (Albkri et al., 2018). A systematic review by Christie et al. (2015) found that the most common reasons for treatment regret were poor urinary and sexual function, the choice of surgery over other active forms of treatment, and toxicity of side effects associated with radiation therapy (Christie et al., 2015).

Bradley et al. (2021) found that men from the Maritimes (Nova Scotia, New Brunswick and Prince Edward Island), Canada who reported treatment regret had 3.62 (95% CI: 1.16-11.36), 5.58 (95% CI: 1.75-17.75), or 4.63 (95% CI: 1.40-15.36) higher odds of poor social, emotional, and functional well-being, respectively (Bradley et al., 2021). This is consistent with previous studies that have reported treatment regret being associated with lower QoL among prostate cancer populations (Clark et al., 2001; Diefenbach et al., 2008). This association may indicate that patients who experience greater side effects from their prostate cancer, and thus lower QoL, may have greater treatment regret. As treatment regret may play a significant role in the QoL of prostate cancer patients throughout survivorship, it is important to consider proactive approaches that may reduce its prevalence.

Communication that values patient autonomy in patient-centred care is strongly associated with satisfaction with care (Oliveira et al., 2012). A review by Shevach et al. (2019) highlights the impact that both systemic and local prostate cancer treatments can have on the QoL of patients, and the authors recommend that patients be involved in the decision-making process and afforded the opportunity to make voluntary choices based on what aspects of QoL they value most highly (Shevach et al., 2019). Moreover, Sanda et al. (2018) recommend that shared decision-making between clinician and patient be utilized with consideration of cancer severity, patient values and preferences, life expectancy, pre-treatment general and genitourinary function, expected post-treatment function, and potential for salvage treatment in the decision (Sanda et al., 2018). Moreover, they recommend that clinicians encourage patients to meet with different prostate cancer care specialists to promote informed decision-making, inform patients of both immediate and long-term side effects of their treatment options, and inform patients about clinical trials for which they may be eligible (Sanda et al., 2018). This patient-centred approach undoubtedly discourages top-down treatment decisions (doctor making decisions for the patient) and protects some patients from potentially unwanted interventions, by allowing the patient to, for example, decline surgery that they may consider more burdensome than beneficial (Bradley et al., 2021). Enabling patients to be autonomous in the treatment modality decision-making process, and make informed decisions emphasizes the importance of the individuals' understandings of health care interventions and supports the development and use of potentially autonomy-enhancing patient decision aids (Davies & Elwyn, 2008).

2.4 Mental and Physical health indicators and QoL

There is ample evidence in the literature that prostate cancer survivorship is often associated with sexual, urinary, and bowel dysfunction (Donovan et al., 2016; Downs et al., 2003; Litwin et al., 2000; Resnick et al., 2014; Stanford et al., 2000). In a study examining the prevalence of urinary, sexual, bowel, and hormonal dysfunction in men with prostate cancer, prior to treatment, 45% of the men reported erectile function insufficient for intercourse at the time of study enrollment, 7% of patients reported "frequent dribbling or no urinary control," and 17% reported urinary leakage "at least once per day or more." (Resnick et al., 2014). These results highlight the significant burden of pre-treatment dysfunction, and these dysfunctions are often worsened throughout and after treatment.

Results from Stanford et al. (2000) report that among their sample of 1,291 prostate cancer patients, 24 months after diagnosis, 40.2% of patients who underwent a prostatectomy reported occasional urinary leaking, 6.8% frequent urinary leaking, and

1.6% no urinary control (≥18 months after surgery). They also assessed sexual function among their radical prostatectomy sample and found that at 24 months (≥18 months after surgery), 59.9% of men reported that erections were not firm enough for sexual intercourse, and 44.2% were unable to have any erections (Stanford et al., 2000).

In a prostate cancer context, bowel function (or dysfunction) includes rectal urgency, loose stools, crampy pelvic pain, and occasional rectal bleeding (Litwin et al., 2004). In a sample of 1,584 prostate cancer patients, results showed that compared with radical prostatectomy, patients treated with radiation experience significantly greater impairment in bowel function following treatment (Litwin et al., 2004). Bowel bother and urinary irritation (distress over bowel and urinary symptoms) as compared to bowel and urinary function, are also more common among radiation patients than those who undergo surgery (Litwin et al., 2000, 2004).

Another aspect that may contribute significantly to prostate cancer patients' poor mental health outcomes may include a sense of loss of masculinity. Men's experiences of illness, especially prostate cancer, are increasingly being recognized as greatly influenced by how men and their communities define masculinity (Bowie et al., 2022; Charmaz, 1994; Oliffe, 2005). From the time they are young, many boys may be taught that having and using erections has something to do with masculinity (Zilbergeld, 1999). Therefore, when one's ability to do this is hindered by a circumstance such as prostate cancer treatment, it is reasonable that they may lose a sense of their masculinity. One patient described their experience of loss of potency after a prostatectomy as leading to "very black experiences", felt "like a 90 year old man", "worthless" and "kept himself invisible" (Oliffe, 2005, pg. 2254). This highlights the severe impact that prostate cancer treatments can have on survivors' mental health and sense of self.

Evidence suggests that HRQoL, measured as physical and mental health, decreases between pre- and post- prostate cancer treatment (Downs et al., 2003). This is likely associated with the extensive side-effects that were previously described, and the potential emotional impact. Ilie et al (2020a) revealed that men with a lifetime history of prostate cancer had 2.45 or 2.05 higher odds for screening positive for current mild, moderate, or severe anxiety or depression status, respectively, compared with those with no lifetime history of cancer (Ilie et al., 2020a). Moreover, another study found that men undergoing surgery for prostate cancer had a more than seven-fold risk of depression compared to men undergoing surgery for any other form of cancer (Ilie et al., 2021b). These findings emphasize the need for multidisciplinary survivorship care plans among prostate cancer patients that include therapies targeting both the physical and mental health issues of prostate cancer survivorship.

2.5 Socioeconomic status and QoL

As indicted by the Government of Canada's report on the Key Health Inequalities in Canada, a gradient of health inequalities exists by socioeconomic status for the Canadian population (Public Health Agency of Canada & Pan-Canadian Public Health Network, 2018). Socioeconomic factors that were important to many health domains from this report included income, education levels, employment, and occupation status. In this thesis, we were interested particularly in the role of income, age, and education level in the QoL of prostate cancer patients. While occupation can also be a helpful proxy for SES, it was not included as a variable in this thesis, due to the sample size, which would not provide adequate power for analyses with occupation included as a covariate/potentially moderating variable.

Income

The main strength that income has as a measure of SES is that it indicates one's access, or limited access, to material goods and services that may influence health (Kaplan & Keil, 1993; Lantz et al., 1998; Shavers, 2007; Ziebarth, 2010). Among low-income women who are breast or gynaecological cancer survivors, economic stress is associated with poorer functional, emotional and affective well-being (Ell et al., 2008). However, this area of research remains largely unexplored in other cancer populations (Bradley et al., 2021; Ell et al., 2008). In a prostate cancer context, prostate cancer patients with low income have been shown to have more than 10 times the odds of screening positive for depression than men with any other cancer (Ilie et al., 2021a). These income-related disparities in QoL may be due additional income allowing for the purchase of material resources to support cancer survivorship (e.g., supplements, housing, and transportation), as well as a greater sense of security and control which may in turn decrease stress and increase QoL (Short & Mallonee, 2006).

Age

Compared to older prostate cancer patients, younger patients often report worse prostate cancer-related functioning (Ilie et al., 2021b; Lintz et al., 2003; Moodie et al., 2020). In one study, prostate cancer patients under 65 years report decreased social functioning, greater physical pain, increased sleep disturbance, greater financial impact, greater anxiety, and more discomfort associated with being sexually intimate, compared to those 65 years and older (Lintz et al., 2003). This is not likely due to factors intrinsic to the cancer, but rather the meaning and value that patients place on their life, sexual function, and ability to cope (Lintz et al., 2003). Younger prostate cancer patients' increased anxiety and psychological discomfort, and decreased social functioning may be related to concerns about sexual function, and whether partners, friends, family and colleagues may treat or view them differently because of their diagnosis (Cliff & Macdonagh, 2001). Further, these higher levels of anxiety can also lead to exacerbated physical pain (Rhudy & Meagher, 2000), which can then increase risk of sleep disturbances (Savard et al., 2005).

In an Atlantic Canadian population, researchers found that younger men (49–59 years old) have odds 2.13 times higher for screening positive for current depression than older men (60-69 years) (Ilie et al., 2021a). These findings are consistent to those found elsewhere where older age has been found to be a protective factor against screening positive for mental distress (Ilie et al., 2020c; Moodie et al., 2020). This may again indicate that younger men are more impacted psychologically from the common physical side effects associated with prostate cancer and its treatment, such as incontinence and erectile dysfunction (Bill-Axelson et al., 2013; Eton & Lepore, 2002; Ilie et al., 2020c). Previous studies have highlighted the importance of considering the potentially moderating role of age with other measures of SES (House et al., 1990; Robert & Li, 2001). It is therefore important that we consider how statistical associations between variables may differ by age category.

Education

Education level is a well-established proxy of SES (Shavers, 2007) and has been shown to predict QoL among prostate cancer patients (Brar et al., 2005; Eton & Lepore, 2002; Knight et al., 2007). It has been suggested that men with prostate cancer with lower-level education may have a lesser understanding of their disease and its symptoms, as well as lower health literacy, leading to greater distress (Brar et al., 2005; Eton & Lepore, 2002; Seaton et al., 2020). The use of education as a measure of SES has many strengths. It allows for the inclusion of the majority of the population and is less likely to be influenced by disease than income and occupation. Moreover, education is a practical and convenient measure that tends to remain fairly stable beyond early adulthood (Shavers, 2007). In this study, we built upon the explanatory model of Bradley et al. (2021), by adding in education status as another indicator of SES.

2.6 Survivorship time and QoL

While there is limited research examining how QoL of prostate cancer patients may vary throughout long-term survivorship, one study reported that greater survivorship time has been shown to be associated with greater functional and spiritual well-being, which is an important proxy of QoL (Bradley et al., 2021). As survivors become adjusted to their new life circumstances and side effects post-treatment, and as they recover from some of the side effects, it is possible that the perception of their functional well-being and connection to spiritual beliefs also improves (Bradley et al., 2021; Zavala et al., 2009). Other studies examining the urinary, bowel and sexual function of prostate cancer patients throughout treatment and survivorship found significant variation in each of these domains throughout five- to fifteen- year survivorship (Mazariego et al., 2020; Parker et al., 2011). In one study, survivorship time did not contribute to differentiating between the presence of depression or anxiety among prostate cancer survivors (Ilie et al., 2020a). Other studies related to the QoL of prostate cancer patients have also included survivorship time as a covariate in their statistical models to ensure that findings were not influenced by any changes in sample attributes across months of survivorship (Bradley et al., 2021; Ilie et al., 2021b, 2020a, 2020b; Massoeurs et al., 2021).

Chapter 3. Objectives and Research Questions

The first objective of this study was to examine the contribution of treatment regret, urinary, bowel and sexual function, mental and physical health, to the social/family, emotional, functional, and spiritual well-being of prostate cancer survivors in covariate-controlled analyses. The second objective was an exploratory analysis aimed at examining household income, age and education level disparities in this population (as representing SES) by examining each of their interaction with the predictors on the outcomes indicated. These objectives were addressed through the following research questions:

Research question 1: Are treatment regret, urinary, bowel, and sexual function, mental and physical health associated with the social/family, emotional, functional and spiritual well-being of prostate cancer survivors?

Research question 2. Does the contribution of treatment regret, urinary, bowel and sexual function, mental and physical health to social/family, emotional, functional and spiritual well-being of prostate cancer survivors differ among age groups, levels of education, or household income?

Chapter 4. Methods

4.1 Study design

This was an exploratory cross-sectional study. The analytical sample was composed of 421 cisgender male prostate cancer survivors (mean age = 68.36 years, SD = 7.16, range 47 to 88 years old) who took an online survey assessing their QoL between May 2017 and January 2022. This was a convenience sample where participants were recruited through printed materials that were advertised in Urology and Radiation Oncology Clinical offices throughout the Maritimes, through physician and nurse referrals, as well as prostate cancer support groups in the region. This Maritime survey study was designed and led by Dr. Ilie through the Soillse Prostate Cancer Quality of Life Lab at Dalhousie University. Eligible participants included anyone diagnosed with prostate cancer, that spoke English, resided in the Maritime provinces, and had an active email address. Interested participants were asked to either contact the study's research coordinator and review the study or access the online informed consent link directly. The online link provided interested participants with an informed e-consent form, which could be completed on their own, or reviewed with the research coordinator. Once participant e-consent was obtained, which included providing an email address and health card number for the study, participants were taken to the online survey questions. Participants who were unable to complete the survey online were provided with an identical printed copy of the survey, and their data were entered manually by a research team member who was blinded to the participant's identity. The survey duration was approximately 45 minutes. Survey procedures were in accordance with the Helsinki Declaration of 1975, as revised in 2000. The survey data was stored in the REDCap (Research Electronic Data Capture) online database supported by Nova Scotia

Health (NSH) and according to the Patient Health Information Act (PHIA). Approval for this study was granted by the NSH, Horizon New Brunswick, and Prince Edward Island Research Ethics Boards (project # 1021455). Data for this project was generated by REDCap and resides on the private and secure NSH servers. The data was de-identified for the anonymity and confidentiality protection of the participants prior to being accessed for statistical analysis.

4.2 Measures

Intersectionality and SGBA+

Central to the methods of this thesis are the concepts of Sex- and Gender-Based Analysis (SGBA+), as well as intersectionality. SGBA+ operates on the understanding that both biological factors of sex, and socialization factors of gender, affect people's lives and their health. SGBA+ considers the biological and social differences between women and men and analyzes how they relate to a particular health issue (Clow & Atlantic Centre of Excellence for Women's Health, 2009). The four main concepts of SGBA+ are sex, gender, diversity and equity, each of which have provided important context to the development and interpretation of this thesis (Clow & Atlantic Centre of Excellence for Women's Health, 2009). While this dataset lacks the data that that would be needed to provide meaningful analyses regarding differences by sex, gender, race/ethnicity, sexuality, or other minority groups, consideration of how the results from this study may apply to these groups remains important. Further, SGBA+ will be utilized to consider differences among the participants in this sample, by socioeconomic factors. An intersectional paradigm has also informed this work. Intersectional paradigms provide a framework that aim to capture the complexity of lived experiences and concomitant interacting factors of social inequity, to aid in understanding health inequities (Hankivsky & Christoffersen, 2008). In this thesis, we are interested in how multiple different social inequities may impact the QoL of prostate cancer survivors. An intersectional lens has therefore been applied throughout the conceptual development of this project, as well as throughout the interpretation and implications of our conclusions.

Outcome Variables

Social/family, emotional and functional well-being were assessed using the Functional Assessment of Cancer Therapy-Prostate (FACT-P). This is a 39-item 5-point Likert- type scale validated to measure HRQoL in prostate cancer patients aged 18 years and older, over the past seven days (Esper et al., 1997). The FACT-P also includes physical well-being and prostate cancer subscales, which were not utilized in this study as their content was covered by other measures used. Responses on each of the three subscales of interest ranged from 0 ("Not at all"), 1 ("A little bit"), 2 ("Somewhat"), 3 ("Quite a bit"), to 4 ("Very much"). The items of each of these three subscales are presented in the table below.

Table 1. FACT-P Questions: Social/Family, Emotional and Functional Well-Being

	Social/Family	Emotional	Functional
1.	I feel close to my friends	I feel sad	I am able to work (include work at home)
2.	I get emotional support from my family	I am satisfied with how I am coping with my illness	My work (include work at home) is fulfilling
3.	I get support from my friends	I am losing hope in the fight against my illness	I am able to enjoy life

4.	My family has accepted my illness	I feel nervous	I have accepted my illness
5.	I am satisfied with family communication about my illness	I worry about dying	I am sleeping well
6.	I feel close to my partner (or the person who is my main support)	I worry that my condition will get worse	I am enjoying the things I usually do for fun
7.	I am satisfied with my sex life		I am content with the quality of my life right now

Scores were calculated by summing the scores from each question of the subscale, with reverse coding for negatively worded questions. A binary variable based on mean scores for each subscale was created to indicate good well-being if the mean score for each subscale was 3 or below (coded 0), or poor well-being if the mean score for each subscale was above 3 (coded 1). This is consistent with evidence from Jae Jong (2016) that 5-point Likert scales dichotomized into 1–3 and 4–5 performed well compared to their original 5-point scale (similar p-values for significance with each predictor when correlated using both dichotomous and continuous coding) (Jae Jeong, 2016). The Pearson Correlation coefficients between the binary variable created and the continuous variable for each of the subscales are as follows: Social/Family (−0.750), Emotional (−0.807) and Functional (−0.795). This indicates good overall correlations between the binary variables (which were reversely coded such that a 0 indicates good well-being and a 1 indicates poor well-being) and continuous variables (for which a higher score indicates increased well-being). The Cronbach’s alpha value for the social/family, emotional and functionals well-being domains in this sample were found to be 0.848, 0.777 and 0.891, respectively, which overall indicates good internal reliability. The

FACT-P has good concurrent validity and has been found to discriminate cancer patients by stage of the disease and prostate-specific antigen (PSA) levels (Esper et al., 1997). Moreover, the FACT-P has been validated in several languages making it widely accessible (the EMPRO Group et al., 2014).

Spiritual well-being was measured using the Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being (FACIT-Sp-12) which is a 12-item 5-point Likert-type scale designed for patients with a chronic illness aged 18 years and older (Bredle et al., 2011). Questions assessed participants on three subscales of spirituality: meaning, peace, and faith, over the past seven days. Responses on each of the three subscales ranged from 0 ("Not at all"), 1 ("A little bit"), 2 ("Somewhat"), 3 ("Quite a bit") to 4 ("Very much"). The items for each of the three subscales are presented in Table 2. The Cronbach's alpha for spiritual well-being in this sample was found to be 0.808, indicating good internal reliability.

Table 2. Subscale Items for the FACIT-Sp-12

	Meaning	Peace	Faith
1.	I have a reason for living	I feel peaceful	I find comfort in my spiritual beliefs
2.	My life has been productive	I have trouble feeling peace of mind	I find strength in my faith or spiritual beliefs
3.	I feel a sense of purpose in my life	I am able to reach down deep into myself for comfort	My illness has strengthened my faith or spiritual beliefs
4.	My life lacks meaning and purpose	I feel a sense of harmony within myself	I know that whatever happens with my illness, things will be okay.

An overall score for spiritual well-being was obtained by summing the mean scores from each subscale. Participants were classed as "good" if their overall score is 3 or below, and "poor" if their mean score is above 3. As with the FACT-P, this categorization is in keeping with evidence from Jae Jeong (2016) that 5-point Likert scales dichotomized into 1–3 and 4–5 performed well compared to their original 5-point scale (Jae Jeong, 2016). The Pearson correlation coefficient correlating the binary and continuous variables form Spiritual Well-Being is −0.792. This indicates a good correlation between the binary variable (which was reversely coded such that a 0 indicates good well-being and a 1 indicates poor well-being) and continuous variable (for which a higher score indicates higher well-being). FACIT-Sp-12 is established as a reliable and valid measurement of spiritual well-being that may be particularly useful in assessing the role of both religious and non-religious spiritual well-being in health-related QoL (Brady et al., 1999; Bredle et al., 2011; Peterman et al., 2014).

Predictor Variables

Sexual, bowel and urinary functioning were assessed using the UCLA Prostate Cancer Index (function) which is a 17-item scale used to measure HRQoL among men with localized prostate cancer (Litwin et al., 1998). The recall period assessing each domain was 4 weeks. The items for the sexual, bowel, and urinary functioning domain are outlined in Table 3.

Table 3. UCLA-PCI Sexual, Bowel and Urinary Function Items

<table>
<tr><th></th><th colspan="2">Sexual Function</th><th>Bowel Function</th><th colspan="2">Urinary Function</th></tr>
<tr><td>1.</td><td rowspan="3">How would you rate each of the following during the last 4 weeks:</td><td>a) your level of sexual desire?</td><td>How often have you had rectal urgency during the last 4 weeks?</td><td colspan="2">Over the last 4 weeks, how often have you leaked urine?</td></tr>
<tr><td>2.</td><td>b) your ability to have an erection?</td><td>How often have you had stools that were loose or liquid during the last 4 weeks?</td><td colspan="2">Which of the following best describes your urinary control during the last 4 weeks?</td></tr>
<tr><td>3.</td><td>c) your ability to reach orgasm (climax)?</td><td>How much distress have your bowel movements caused you during the last 4 weeks?</td><td colspan="2">Which of the following best describes your urinary control during the last 4 weeks?</td></tr>
<tr><td>4.</td><td colspan="2">How would you describe the usual quality of your erections?</td><td>How often have you had crampy pain in your abdomen or pelvis during the last 4 weeks?</td><td colspan="2">How many pads or adult diapers did you usually use to control leakage during the last 4 weeks?</td></tr>
<tr><td>5.</td><td colspan="2">How would you describe the frequency of your erections?</td><td></td><td rowspan="2">How big a problem, if any, has each of the following been for you:</td><td>a) Dripping urine or wetting your pants?</td></tr>
<tr><td>6.</td><td colspan="2">How often have you awakened in the morning or night with an erection?</td><td></td><td>b) Urine leakage interfering with your sexual activity?</td></tr>
<tr><td>7.</td><td colspan="2">During the last 4 weeks did you have vaginal or anal intercourse?</td><td></td><td colspan="2"></td></tr>
<tr><td>8.</td><td colspan="2">Overall, how would you rate your ability to function sexually during the last 4 weeks?</td><td></td><td colspan="2"></td></tr>
</table>

Items for urinary, bowel, and sexual function had responses with associated numeric scores of on a 3-, 4-, 5-, or 6-point scale. These scores were then recoded to an associated value between 0–100 as per the scoring instructions, and mean scores for each subset were calculated (Litwin, 1994). The UCLA-PCI is a reliable and valid measure in males with and without prostate cancer, with test-retest reliability ranging from 0.66 to 0.93, and internal consistency ranging from 0.65 to 0.93 (Litwin et al., 1998). In this sample, the Cronbach's alphas for urinary, bowel and sexual function were 0.800, 0.735 and 0.877, respectively.

Physical- and mental-health-related QoL was assessed using the SF-12v2 which consists of 12 questions that assess physical and mental health, intended for adults of the general population (J. Ware et al., 1998; J. E. Ware et al., 1996). The 12 items assess eight health concepts including physical functioning, role limitations due to physical health problems, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health. The instrument has been validated across a number of chronic diseases and conditions (Cernin et al., 2010; Chariyalertsak et al., 2011; Cheak-Zamora et al., 2009; Salyers et al., 2000). The response options for each item are specific to the question, and include responses such as description of health, degree of limitation of specific symptoms, yes/no options, degree of interference, and amount of time spent with specific symptoms. Two summary scores were calculated: a Physical Component Summary Score (PCS) and a Mental Component Summary Score (MCS). In order to obtain these scores, indicator variables for item response choices needed to be created (scored 1 for selected and 0 for not selected) for a total of 35 indicator variables. Reverse coding was necessary for items with negative wording, and indicator variables were created for each item's response. Finally, MCS and PCS scores were computed by multiplying each indicator variable by its respective mental/physical regression weight provided by the authors in the scoring criteria guideline (J. Ware et al., 1998) and summing the 35 products. Scores range from 0–100, with higher scores indicating better health. The SF-12 has been shown to have high internal consistency, with Cronbach's alpha scores consistently above 0.80 (Cheak-Zamora et al., 2009; Kathe et al., 2018). The Cronbach's alpha scores in this sample were 0.682 for physical health and 0.569 for mental health, which, though lower than some coefficients in the literature, remain in a generally acceptable range of above 0.50. With the inclusion of these variables that represent a multitude of uro-oncological and general health outcomes, it is likely that any differences in symptoms and side effect profiles due to treatment type and/or cancer stage would be adjusted for.

Treatment regret: To assess for the presence or absence of treatment regrets, participants were asked "Do you have any regrets with regards to the treatment you received for your prostate cancer diagnosis?" Responses were coded as "No" = 1 and "Yes" = 2.

Covariates and potentially moderating variables

The variables that were included as covariates in this study include age, household income, education, and time elapsed between diagnosis (the date the patient was told they had prostate cancer) and survey (date of completion of the survey) measured in months. These covariates have previously been established in the literature as significant prognostic and QoL factors among prostate cancer survivors (Ilie et al., 2021a, 2020c; Knight et al., 2007; Moodie et al., 2020). SES proxies consisting of age, household income, and education were considered as potential moderators and/or stratifying variables. Self-reported household income in the past 12 months was coded 1 for less than $50,000 CAD, 2 for $50,000 CAD to $100,000 CAD, and 3 for over $100,000 CAD. Age was coded 1 for

47-65 years, 2 for 66-75 years and 3 for 76-88 years. Highest level of education completed was coded 1 for high school or less, 2 for university or college, and 3 for graduate training or more. The reference groups for these variables when assessing all outcomes were the oldest age group (coded 3 for 76-88 years), the highest household income group (coded 3 for over $100,000 CAD) and the highest education level (coded 3 for graduate training or more). Treatment type was not included as a predictor or covariate in this study as preliminary analyses with and without this variable showed no meaningful differences. Therefore, in order to not further reduce the power of the models, an informed decision was made to not include this variable. Moreover, with the inclusion of variables that represent a multitude of uro-oncological and general health outcomes, it is likely that any differences in symptoms and side effect profiles due to treatment type would be adjusted for through these measures.

4.3 Statistical analyses

Statistical analyses were performed using SPSS V27. Before beginning the analyses, the assumptions of logistic regression were checked and found to be tenable. Cross tabulations were used to assess the association between each of the four binary outcomes (social/family, emotional, functional, and spiritual well-being) and each of the six predictors (urinary, bowel, and sexual function, physical and mental health, and treatment regret) as well as each individual covariate (age, household income, education, and survivorship time).

Objective 1. Multivariable logistic regression analyses were used to model each of the well-being domains (social/family, emotional, functional, and spiritual) based on the six predictors (urinary, sexual, and bowel function; mental and physical health; and treatment regret) and the four covariates (age, household income, education, and survivorship time). Subgroup analyses for each of the spiritual well-being sub-domains (meaning, peace, and faith) were executed to assess whether differences exist by sub-domain. Figure 1 depicts the multivariable model used to assess Objective 1.

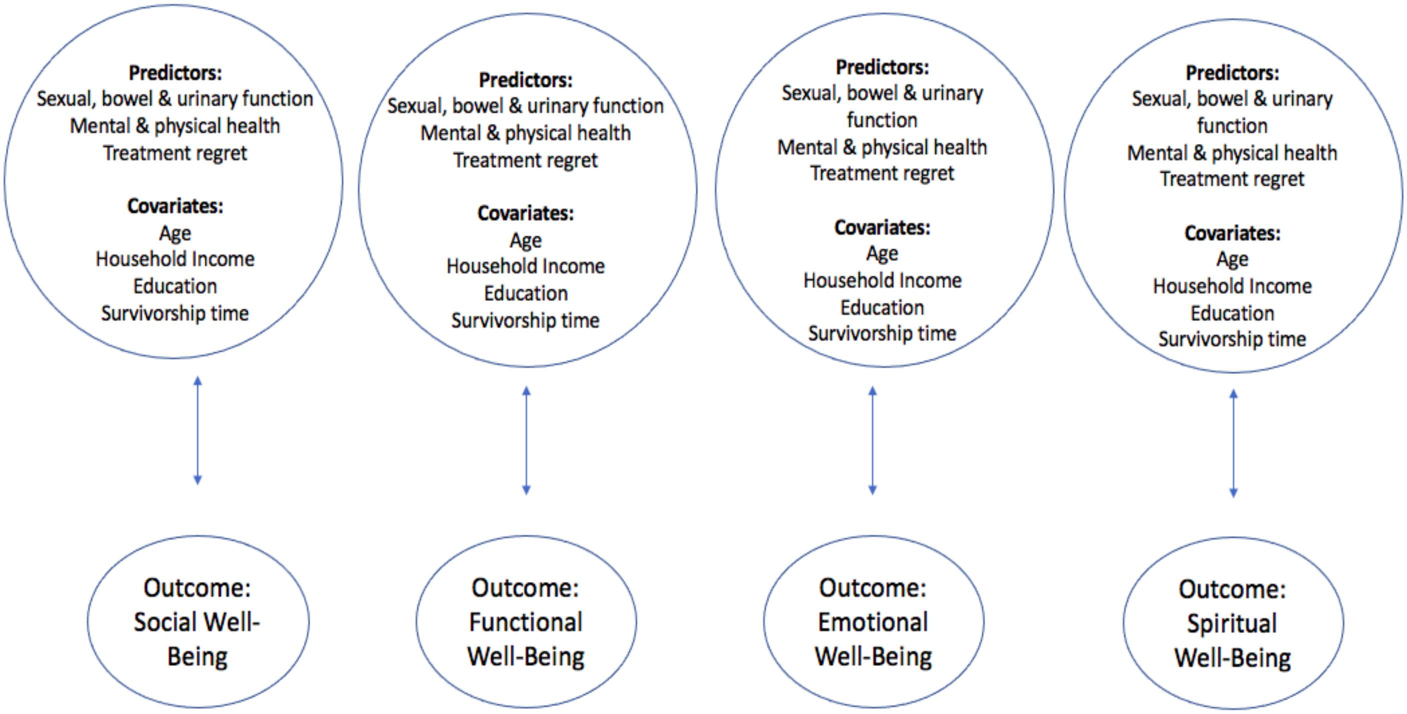

Figure 1. Multivariable Model Graphical Representation

Objective 2. Age, household income and education interactions with each of the predictors on each of the four outcomes were assessed. If any interactions were observed to be statistically significant, predictor-stratified analyses by age, education, and/or household income was evaluated for the multivariable model.

Social/family, emotional and functional well-being outcomes had 1.2% missing data, and the spiritual well-being outcome had 0.54% missing. As the missing data did not exceed 5%, the patterns of missing data were not analyzed and complete case analysis was used. After listwise deletion, the analytical sample for the multivariate logistic regressions was 416 for social/family, emotional and functional well-being and 365 for spiritual well-being.

Chapter 5. Results

5.1 Descriptive analyses

Tables 4-7 present the associations between the six predictors and the four covariates and the outcome variables. A total of 54.6% of participants from the sample screened positive for poor social/family well-being. Poor social/family well-being was negatively associated with bowel function (OR: 0.962, 95% CI: 0.948-0.977) and sexual function (OR: 0.983, 95% CI: 0.974-0.991). Poor emotional well-being was present among 28.7% of participants in the sample. Poor emotional well-being was negatively associated with each of bowel function (OR: 0.977, 95% CI 0.965-0.989), sexual function (OR: 0.984, 95% CI: 0.973-0.994), and mental health (OR: 0.964 95% CI: 0.940-0.988). A total of 51.8% of participants from the sample screened positive for poor functional well-being. Poor functional well-being was negatively associated with each of urinary function (OR: 0.987, 95% CI: 0.977-0.996), bowel function (OR: 0.966, 95% CI: 0.953-0.979), sexual function (OR: 0.980, 95% CI: 0.971-0.989), and physical health (OR: 0.971, 95% CI: 0.949-0.993). Poor spiritual well-being was found among 58.0% of participants in the sample. No variables from this model were individually associated with poor spiritual well-being.

Table 4. Univariate logistic regression analyses assessing the relationship between social/family well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors

	Good social/family well-being (n=186) OR (95% CI)	**Poor social/family well-being** (n=230) OR (95% CI)	**Wald Chi-square**
Urinary function[1] (severity of lower urinary tract symptoms), UCLA, Mean (SD)	79.193 (20.953) 1.0 Reference	59.44 (54.538) 0.995 (0.986, 1.004)	$X^2(1) = 1.189$
Bowel function[1] (severity of bowel symptoms), UCLA, Mean (SD)	89.163 (13.484) 1.0 Reference	79.879 (18.680) **0.962 (0.948, 0.977)*****	$X^2(1) = 26.473$
Sexual function[1] (severity of dysfunction), UCLA, Mean (SD)	31.539 (26.727) 1.0 Reference	21.165 (21.687) **0.983 (0.974, 0.991)*****	$X^2(1) = 14.722$
Physical health[1], SF-12, Mean (SD)	48.995 (9.191) 1.0 Reference	47.536 (9.287) 0.983 (0.961, 1.005)	$X^2(1)=2.242$
Mental health[1], SF-12, Mean	53.320 (8.718) 1.0 Reference	52.631 (8.784) 0.991 (0.968, 1.015)	$X^2(1)=0.560$
Treatment regret			$X^2(1)=1.518$
Presence	13.5% 1.0 Reference	18.8% 1.478 (0.794, 2.750)	
Absence	86.5% 1.0 Reference	81.2% 1.0 Reference	
Age			$X^2(2) = 3.319$
47-64	29.4% 1.0 Reference	37.2% 1.763 (0.927, 3.354)	$X^2(1) = 2.988$
65-74	53.5% 1.0 Reference	50.5% 1.313 (0.717, 2.404)	$X^2(1) = 0.779$
75+	17.1% 1.0 Reference	12.3% 1.0 Reference	
Survivorship time (months) from diagnosis, Mean (SD)	68.050 (61.162) 1.0 Reference	59.44 (54.538) 0.997 (0.994, 1.001)	$X^2(1) = 1.742$
Household Income			$X^2(2) =2.634$
<$50,000 CAD	21.8% 1.0 Reference	24.6% 0.922 (0.508, 1.673)	$X^2(1) = 0.072$
$50,000-$100,000 CAD	51.0% 1.0 Reference	42.2% 0.678 (0.410, 1.123)	$X^2(1) =2.274$
>$100,000 CAD	27.2% 1.0 Reference	33.2% 1.0 Reference	
Education			$X^2(2) = 0.120$
High school or less	15.3% 1.0 Reference	14.4% 0.892 (0.461, 1.729)	$X^2(1) = 0.114$
University or college	58.8% 1.0 Reference	58.4% 0.944 (0.586, 1.522)	$X^2(1) = 0.056$
Graduate training or more	25.9% 1.0 Reference	27.2% 1.0 Reference	

* $p<0.05$, ** $p<0.01$; *** $p<0.001$

[1] Lower scores indicate worse function or health related quality of life

Table 5. Univariate logistic regression analyses assessing the relationship between emotional well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors

	Good emotional well-being (n=295) 1.0 Reference	**Poor emotional well-being** (n=121) OR (95% CI)	**Wald Chi-square**
Urinary function[1] (severity of lower urinary tract symptoms), UCLA, Mean (SD)	78.908 (20.906) 1.0 Reference	75.497 (22.655) 0.993 (0.983, 1.002)	$X^2(1) = 2.159$
Bowel function[1] (severity of bowel symptoms), UCLA, Mean (SD)	86.156 (15.405) 1.0 Reference	78.842 (20.010) **0.977 (0.965, 0.989)*****	$X^2(1) = 14.401$
Sexual function[1] (severity of dysfunction), UCLA, Mean (SD)	28.207 (25.961) 1.0 Reference	19.365 (19.171) **0.984 (0.973, 0.994)****	$X^2(1) = 8.881$
Physical health[1], SF-12, Mean (SD)	48.203 (9.283) 1.0 Reference	48.156 (9.248) 0.999 (0.975, 1.024)	$X^2(1)=0.002$
Mental health[1], SF-12, Mean	53.799 (8.55) 1.0 Reference	50.831 (8.913) **0.964 (0.940, 0.988)****	$X^2(1)=8.304$
Treatment regret			$X^2(1)=0.846$
Presence	15.3% 1.0 Reference	19.6% 1.345 (0.715, 2.529)	
Absence	84.7% 1.0 Reference	80.4% 1.0 Reference	
Age			$X^2(2) = 1.257$
47-64	31.9% 1.0 Reference	38.0% 1.254 (0.621, 2.532)	$X^2(1)= 0.399$
65-74	53.4% 1.0 Reference	48.1% 0.952 (0.485, 1.870)	$X^2(1)= 0.020$
75+	14.7% 1.0 Reference	13.9% 1.0 Reference	
Survivorship time (months) from diagnosis, Mean (SD)	62.020 (55.252) 1.0 Reference	66.210 (63.265) 1.001 (0.997, 1.005)	$X^2(1) = 0.346$
Household Income			$X^2(2) =1.300$
<$50,000 CAD	24.7% 1.0 Reference	20.2% 0.688 (0.358, 1.321)	$X^2(1)= 1.262$
$50,000-$100,000 CAD	46.4% 1.0 Reference	45.5% 0.823 (0.481, 1.408)	$X^2(1)= 0.507$
>$100,000 CAD	28.9% 1.0 Reference	34.3% 1.0 Reference	
Education			$X^2(2) = 1.501$
High school or less	13.6% 1.0 Reference	17.6% 1.562 (0.763, 3.201)	$X^2(1)= 1.486$
University or college	58.4% 1.0 Reference	59.3% 1.230 (0.718, 2.109)	$X^2(1)= 0.567$
Graduate training or more	28.0% 1.0 Reference	23.1% 1.0 Reference	

* $p<0.05$, ** $p<0.01$; *** $p<0.001$

[1] Lower scores indicate worse function or health related quality of life

Table 6. Univariate logistic regression analyses lations assessing the relationship between functional well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors

	Good functional well-being (n=198) 1.0 Reference	**Poor functional well-being** (n=218) OR (95% CI)	**Wald Chi-square**
Urinary function[1] (severity of lower urinary tract symptoms), UCLA, Mean (SD)	81.089 (20.191) 1.0 Reference	75.035 (18.313) **0.987 (0.977, 0.996)****	$X^2(1) = 8.104$
Bowel function[1] (severity of bowel symptoms), UCLA, Mean (SD)	88.663 (14.513) 1.0 Reference	79.858 (18.313) **0.966 (0.953, 0.979)*****	$X^2(1) = 24.271$
Sexual function[1] (severity of dysfunction), UCLA, Mean (SD)	31.836 (27.615) 1.0 Reference	20.091 (19.793) **0.980 (0.971, 0.989)*****	$X^2(1) = 18.909$
Physical health[1], SF-12, Mean (SD)	49.453 (8.581) 1.0 Reference	46.966 (9.741) **0.971 (0.949, 0.993)***	$X^2(1)=6.504$
Mental health[1], SF-12, %	53.685 (8.440) 1.0 Reference	52.218 (9.002) 0.981 (0.957, 1.004)	$X^2(1)= 2.547$
Treatment regret			$X^2(1)=0.838$
Presence	14.5% 1.0 Reference	18.3% 1.326 (0.725, 2.428)	
Absence	85.5% 1.0 Reference	81.7% 1.0 Reference	
Age, Mean, SD			$X^2(1) = 5.149$
47-64	29.2% 1.0 Reference	38.1% **2.095 (1.093, 4.018)***	$X^2(1)= 4.959$
65-74	53.0% 1.0 Reference	50.8% 1.539 (0.832, 2.848)	$X^2(1)= 1.888$
75+	17.8% 1.0 Reference	11.1% 1.0 Reference	
Survivorship time (months) from diagnosis, Mean (SD)	67.840 (62.500) 1.0 Reference	58.800 (52.293) 0.997 (0.993, 1.001)	$X^2(1) = 1.950$
Household Income			$X^2(2)=0.437$
<$50,000 CAD	22.1% 1.0 Reference	24.5% 1.084 (0.602, 1.951)	$X^2(1)= 0.072$
$50,000-$100,000 CAD	47.8% 1.0 Reference	44.6% 0.907 (0.551, 1.493)	$X^2(1)= 0.146$
>$100,000 CAD	30.1% 1.0 Reference	30.9% 1.0 Reference	
Education			$X^2(2) = 1.672$
Completed high school	12.5% 1.0 Reference	17.0% 1.539 (0.791, 2.994)	$X^2(1)= 1.615$
University or college	59.2% 1.0 Reference	58.0% 1.106 (0.688, 1.780)	$X^2(1)= 0.174$
Graduate training or more	28.3% 1.0 Reference	25.0% 1.0 Reference	

* $p<0.05$, ** $p<0.01$; *** $p<0.001$

[1] Lower scores indicate worse function or health related quality of life

Table 7. Univariate logistic regression analyses assessing the relationship between spiritual well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors

	Good spiritual well-being (n=121) 1.0 Reference	**Poor spiritual well-being** (n=244) OR (95% CI)	**Wald Chi-square**
Urinary function[1] (severity of lower urinary tract symptoms), UCLA, Mean (SD)	77.521 (21.043) 1.0 Reference	77.130 (22.517) 0.999 (0.989, 1.009)	$X^2(1) = 0.026$
Bowel function[1] (severity of bowel symptoms), UCLA, Mean (SD)	85.952 (17.882) 1.0 Reference	82.337 (17.297) 0.987 (0.974, 1.001)	$X^2(1) = 0.067$
Sexual function[1] (severity of dysfunction), UCLA, Mean (SD)	27.861 (26.485) 1.0 Reference	24.615 (23.467) 0.995 (0.986, 1.004)	$X^2(1) = 1.356$
Physical health[1], SF-12, Mean (SD)	48.040 (9.596) 1.0 Reference	47.921 (9.226) 0.999 (0.974, 1.024)	$X^2(1) = 0.012$
Mental health[1], SF-12, %	54.111 (7.408) 1.0 Reference	52.572 (9.505) 0.979 (0.952, 1.007)	$X^2(1) = 2.146$
Treatment regret			$X^2(1) = 0.588$
Presence	87.2% 1.0 Reference	16.2% 1.324 (0.646, 2.713)	
Absence	12.8% 1.0 Reference	83.8% 1.0 Reference	
Age, Mean, SD			$X^2(2) = 4.282$
47-64	25.2% 1.0 Reference	36.6% 1.717 (0.836, 3.526)	$X^2(1) = 2.169$
65-74	58.3% 1.0 Reference	49.5% 1.007 (0.523, 1.939)	$X^2(1) = 0.000$
75+	16.5% 1.0 Reference	13.9% 1.0 Reference	
Survivorship time (months) from diagnosis, Mean (SD)	70.970 (63.448) 1.0 Reference	59.020 (53.876) 0.996 (0.993, 1.000)	$X^2(1) = 3.098$
Household Income			$X^2(2) = 1.920$
<$50,000 CAD	29.6% 1.0 Reference	23.6% 0.629 (0.327, 1.213)	$X^2(1) = 1.912$
$50,000-$100,000 CAD	44.9% 1.0 Reference	44.1% 0.776 (0.430, 1.397)	$X^2(1) = 0.716$
>$100,000 CAD	25.5% 1.0 Reference	32.3% 1.0 Reference	
Education			$X^2(2) = 0.322$
Completed high school or less	13.9% 1.0 Reference	16.0% 1.237 (0.592, 2.585)	$X^2(1) = 0.321$
University or college	57.4% 1.0 Reference	57.3% 1.073 (0.634, 1.816)	$X^2(1) = 0.068$
Graduate training or more	28.7% 1.0 Reference	26.7% 1.0 Reference	

* $p<0.05$, ** $p<0.01$; *** $p<0.001$

[1] Lower scores indicate worse function or health related quality of life

5.2 Multivariate regression analyses

A total of 54.6% (n=230) participants screened positive for poor social/family well-being. The results from the multivariable regressions are presented in Table 8-9 below. The multivariate logistic regression model assessing the presence of poor social/family well-being based on the six predictors and four covariates was statistically significant $X^2(13) = 42.404$, $p<0.001$. Nagelkerke's R^2 indicated that 30.8% of the variance in the model was accounted for by its set of predictors and covariates. The Hosmer and Lemeshow test showed model stability $X^2(8) = 0.125$, $p>0.05$. When all other predictors and covariates were held constant, three significant associations emerged. Good bowel and sexual function, and older age emerged as protective factors against poor social/family well-being when the other variables in the model were held constant. Specifically, as scores on bowel function and sexual function subscale went up, the odds of poor social/family well-being decreased by 4.7% (0.953, 95% CI: 0.932-0.975) or 1.3% (OR: 0.987, 95% CI: 0.975-1.000), respectively. Participants in the younger age categories, 47-64 years old and 65-74 years old, had 2.929 (95% CI: 1.118-7.671) and 2.573 (95% CI: 1.071-6.183) times higher odds of poor social/family well-being than participants in the older age category (75-88 years old).

A total of 28.7% (n=121) of participants screened positive for poor emotional well-being. The multivariate logistic regression model assessing the presence of poor emotional well-being based on the six predictors and four covariates was statistically significant $X^2(13) = 22.577$, $p=0.047$. Nagelkerke's R^2 indicated that 13.8% of the variance in the model was accounted for by this set of predictors and covariates. Model stability was indicated by a Hosmer and Lemeshow test of $X^2(8) = 12.516$, $p>0.05$.

Sexual function was the only predictor that was statistically significantly associated with emotional well-being, when all other predictors and covariates were held constant. As scores on sexual function subscale increased, the odds of poor emotional well-being decreased by 1.6% (OR: 0.984 (95% CI: 0.970-0.999).

A total of 51.8% (n=218) of participants screened positive for poor functional well-being. The multivariate logistic regression model assessing the presence of poor functional well-being based on the six predictors and four covariates was statistically significant $X^2(13) = 37.001$, $p<0.001$. Nagelkerke's R^2 indicated that 20.5% of the variance in this model was accounted for by the predictors and covariates included. The model was stable, as indicated by the Hosmer and Lemeshow test, $X^2(8) = 15.388$, $p>0.05$. When all other predictors and covariates were held constant, two significant associations emerged. As scores on the bowel or the sexual function subscale increased, the odds of poor functional well-being decreased by 2.5% (0.975, 95%CI: 0.957-0.993) or 1.6% (OR: 0.984, 95% CI: 0.972-0.996), respectively.

A total of 58.0% (n=244) of participants screened positive for poor spiritual well-being. The multivariate logistic regression model assessing the presence of poor spiritual well-being based on the six predictors and four covariates was not statistically significant $X^2(13) = 12.288$, $p=0.509$. The Nagelkerke's R^2 indicated that 7.5% of the variance in this model was accounted for by its predictors and covariates. The model showed stability, with a Hosmer and Lemeshow test of $X^2(8) = 3.729$, $p>0.05$. No significant associations with spiritual well-being measure were found for this multivariate model.

Analyses for this multivariate model were also evaluated for the three sub-domains of spiritual well-being. The Wald-chi square value for the multivariate model with meaning as the outcome was significant ($X^2(13) = 22.360$, $p=0.050$). The model was stable, as indicated by the Hosmer and Lemeshow test, $X^2(8)$ =7.716, p>0.05, and 15.5% of the variance in the model was accounted for by the predictors and covariates. When all variables were held constant in the model, an increase in the bowel function domain, and survivorship time were associated with 0.976 (95% CI: 0.959, 0994) times lower odds and 1.365 times (95% CI: 1.006, 1.852) higher odds for poor meaning in the spiritual well- being subscale. The multivariate logistic regression model assessing the presence of poor spiritual well-being in the peace sub-domain based on the six predictors and four covariates was not statistically significant $X^2(13)$ =17.173. The model was stable, as indicated by the Hosmer and Lemeshow test, $X^2(8)$ =9.976, p>0.05, and 11.6% of the variance was explained by the predictors and covariates in the model, as indicated by the Nagelkerke R^2. Increased survivorship was a protective factor against experiencing lack of peace (0.755 (95% CI: 0.574, 0.993). No significant associations emerged with the evaluation of the "faith" sub-domain.

Table 8. Multivariable logistic regression analyses assessing the relationship between social, emotional, functional and spiritual well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors in a sample of men with a history of prostate cancer diagnosis from the baseline cycle of a Quality of Life Maritimes Survey administered to 421 of men between, 2017–2022

	Poor social/family well-being vs. Good social/family well-being (Reference) (n=230) OR (95% CI)	**Wald Chi-square**
		$X^2(13)$ = 42.404
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	1.001 (0.987, 1.015)	$X^2(1)$ = 0.019
Bowel function[1] (severity of bowel symptoms), UCLA	**0.953 (0.932, 0.975)*****	$X^2(1)$ = 17.295
Sexual function[1] (severity of dysfunction), UCLA, Mean (SD)	**0.987 (0.975, 1.000)***	$X^2(1)$ = 4.088
Physical health[1], SF-12	0.967 (0.934, 1.001)	$X^2(1)$=3.539
Mental health[1], SF-12	1.003 (0.968, 1.039)	$X^2(1)$=0.031
Treatment regret		$X^2(1)$=0.150
Presence	0.844 (0.357, 1.996)	
Absence	1.0 Reference	
Age		$X^2(2)$ =5.383
47-64	**2.929 (1.118, 7.671)***	$X^2(1)$= 4.787

65-74	**2.573 (1.071, 6.183)***	X^2(1)=4.462
75+	1.0 Reference	
Survivorship time (months) from diagnosis	0.932 (0.709, 1.225)	X^2(1) =0.258
Household Income		X^2(2) =3.401
<$50,000 CAD	0.471 (0.191, 1.160)	X^2(1) =2.677
$50,000-$100,000 CAD	0.530 (0.250, 1.124)	X^2(1) =2.742
>$100,000 CAD	1.0 Reference	
Education		X^2(2) =0.022
Completed high school or less	0.972 (0.352, 2.685)	X^2(1) =0.003
Completed university or college	1.032 (0.508, 2.100)	X^2(1) =0.008
Graduate training or more	1.0 Reference	
	Poor Emotional Well-Being vs. Good Emotional Well-Being (Reference) (n=121) OR (95% CI)	**Wald Chi-square**
		X^2(13) = 22.577
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	1.000 (0.986, 1.014)	X^2(1) = 0.001
Bowel function[1] (severity of bowel symptoms), UCLA	0.985 (0.970, 1.001)	X^2(1) =3.291
Sexual function[1] (severity of dysfunction), UCLA	**0.984 (0.970, 0.999)***	X^2(1)=4.418
Physical health[1], SF-12	1.001 (0.966, 1.036)	X^2(1)=0.001
Mental health[1], SF-12	0.973 (0.940, 1.007)	X^2(1)=2.413
Treatment regret		X^2(1)=0.614
Presence	1.402 (0.602, 3.262)	
Absence	1.0 Reference	
Age		X^2(2) =0.077
47-64	1.081 (0.398, 2.939)	X^2(1)=0.023
65-74	1.135 (0.452, 2.855)	X^2(1)=0.073
75+	1.0 Reference	
Survivorship time (months) from diagnosis	1.032 (0.772, 1.379)	X^2(1) =0.044
Household Income		X^2(2) =2.810
<$50,000 CAD	0.447 (0.170, 1.177)	X^2(1) =2.657
$50,000-$100,000 CAD	0.818 (0.388, 1.723)	X^2(1) =0.280
>$100,000 CAD	1.0 Reference	
Education		X^2(2) =5.754
Completed high school or less	3.116 (1.107, 8.765)	X^2(1) =4.637
Completed university or college	1.156 (0.535, 2.499)	X^2(1) =0.136
Graduate training or more	1.0	
	Poor Functional Well-Being vs. Good Functional Well-Being (Reference) (n=218) OR (95% CI)	**Wald Chi-square**
		X^2(13) = 37.001
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	0.987 (0.974, 1.001)	X^2(1) =3.83
Bowel function[1] (severity of bowel symptoms), UCLA	**0.975 (0.957, 0.993)****	X^2(1) =7.497

Sexual function[1] (severity of dysfunction), UCLA	**0.984 (0.972, 0.996)***	$X^2(1)=6.394$
Physical health[1], SF-12	0.976 (0.944, 1.010)	$X^2(1)=1.978$
Mental health[1], SF-12	0.984 (0.950, 1.019)	$X^2(1)=0.853$
Treatment regret		$X^2(1)=0.001$
Presence	0.988 (0.424, 2.302)	
Absence	1.0 Reference	
Age		$X^2(2)=1.949$
47-64	1.920 (0.768, 4.801)	$X^2(1)=0.948$
65-74	1.531 (0.665, 3.525)	$X^2(1)=1.000$
75+	1.0 Reference	
Survivorship time (months) from diagnosis	1.198 (0.916, 1.569)	$X^2(1)=1.736$
Household Income		$X^2(2)=2.476$
<$50,000 CAD	0.749 (0.311, 1.804)	$X^2(1)=0.415$
$50,000-$100,000 CAD	0.567 (0.277, 1.162)	$X^2(1)=2.399$
>$100,000 CAD	1.0 Reference	
Education		$X^2(2)=2.155$
Completed high school or less	2.102 (0.767, 5.763)	$X^2(1)=2.085$
Completed university or college	1.201 (0.600, 2.402)	$X^2(1)=0.268$
Graduate training or more	1.0	
	Poor Spiritual Well-Being vs. Good Spiritual Well-Being (Reference) OR (95% CI) n=244	**Wald Chi-square**
		$X^2(13)=12.228$
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	0.997 (0.983, 1.011)	$X^2(1)=0.156$
Bowel function[1] (severity of bowel symptoms), UCLA	0.995 (0.978, 1.012)	$X^2(1)=0.359$
Sexual function[1] (severity of dysfunction), UCLA	0.993 (0.981, 1.005)	$X^2(1)=1.176$
Physical health[1], SF-12	0.989 (0.956, 1.023)	$X^2(1)=0.431$
Mental health[1], SF-12	0.966 (0.929, 1.005)	$X^2(1)=2.957$
Treatment regret		$X^2(1)=0.053$
Presence	1.104 (0.476, 2.562)	
Absence	1.0 Reference	
Age		$X^2(2)=0.261$
47-64	1.224 (0.487, 3.076)	$X^2(1)=0.184$
65-74	1.040 (0.457, 2.367)	$X^2(1)=0.009$
75+	1.0 Reference	
Survivorship time (months) from diagnosis	1.059 (0.811, 1.383)	$X^2(1)=0.176$
Household Income		$X^2(2)=3.033$
<$50,000 CAD	0.453 (0.186, 1.104)	$X^2(1)=3.033$
$50,000-$100,000 CAD	0.672 (0.318, 1.419)	$X^2(1)=1.087$
>$100,000 CAD	1.0 Reference	
Education		$X^2(2)=1.032$
Completed high school or less	1.239 (0.467, 3.288)	$X^2(1)=0.185$
Completed university or college	1.430 (0.714, 2.865)	$X^2(1)=1.016$
Graduate training or more	1.0 Reference	

* $p<0.05$, ** $p<0.01$; *** $p<0.001$

[1] Lower scores indicate worse function or health related quality of life

Table 9. Multivariable logistic regression assessing the relationship the sub-domains of spiritual well-being and uro-oncological function, physical and mental health indicators, and socioeconomic factors

	Poor Meaning vs. Good Meaning (Reference) (n=115) OR (95% CI)	**Wald Chi-square**
		$X^2(13)$ =22.360
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	0.988 (0.973, 1.003)	$X^2(1)$ =2.524
Bowel function[1] (severity of bowel symptoms), UCLA	**0.976 (0.959, 0.994)***	$X^2(1)$ =6.146
Sexual function[1] (severity of dysfunction), UCLA	0.990 (0.976, 1.005)	$X^2(1)$=1.700
Physical health[1], SF-12	0.975 (0.940, 1.012)	$X^2(1)$=1.810
Mental health[1], SF-12	0.977 (0.942, 1.014)	$X^2(1)$=1.505
Treatment regret		$X^2(1)$ =0.0.572
Presence	0.695 (0.271, 1.784)	
Absence	1.0 Reference	
Age		$X^2(2)$ =0.695
47-64	1.486 (0.545, 4.057)	$X^2(1)$ =0.599
65-74	1.176 (0.465, 2.977)	$X^2(1)$ =0.117
75+	1.0 Reference	
Survivorship time (months) from diagnosis	**1.365 (1.006, 1.852)***	$X^2(1)$ =3.998
Household Income		$X^2(2)$ =0.151
<$50,000 CAD	1.152 (0.452, 2.940)	$X^2(1)$ =0.088
$50,000-$100,000 CAD	1.161 (0.531, 2.534)	$X^2(1)$ =0.140
>$100,000 CAD	1.0 Reference	
Education		$X^2(2)$ =0.695
Completed high school or less	2.189 (0.714, 6.711)	$X^2(1)$ =0.599
Completed university or college	1.270 (0.593, 2.721)	$X^2(1)$ =0.117
Graduate training or more	1.0 Reference	
	Poor Peace vs. Good Peace (Reference) (n=132) OR (95% CI)	**Wald Chi-square**
		$X^2(13)$ = 17.173
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	1.012 (0.997, 1.027)	$X^2(1)$ =2.571
Bowel function[1] (severity of bowel symptoms), UCLA	1.016 (0.997, 1.035)	$X^2(1)$ =2.675
Sexual function[1] (severity of dysfunction), UCLA	1.010 (0.996, 1.023)	$X^2(1)$=2.063
Physical health[1], SF-12	1.023 (0.987, 1.060)	$X^2(1)$=1.533
Mental health[1], SF-12	1.007 (0.970, 1.044)	$X^2(1)$=0.125
Treatment regret		$X^2(1)$ =0.824
Presence	1.514 (0.618, 3.710)	
Absence	1.0 Reference	
Age		$X^2(2)$ =0.748
47-64	0.895 (0.338, 2.365)	$X^2(1)$ =0.050
65-74	0.711 (0.290, 1.738)	$X^2(1)$ =0.560
75+	1.0 Reference	
Survivorship time (months) from diagnosis	**0.755 (0.574, 0.993)***	$X^2(1)$ =4.040
Household Income		$X^2(2)$ =2.388

<$50,000 CAD	2.007 (0.805, 5.002)	$X^2(1)$ =2.234
$50,000-$100,000 CAD	1.582 (0.737, 3.395)	$X^2(1)$ =1.124
>$100,000 CAD	1.0 Reference	
Education		$X^2(2)$ =0.410
Completed high school or less	0.715 (0.239, 2.137)	$X^2(1)$ =0.361
Completed university or college	0.958 (0.464, 1.978)	$X^2(1)$ =0.013
Graduate training or more	1.0 Reference	
	Poor Faith vs. Good Faith (Reference) (n=241) OR (95% CI)	**Wald Chi-square**
		$X^2(13)$ =3.896
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	1.010 (0.993, 1.026)	$X^2(1)$ =1.350
Bowel function[1] (severity) of bowel symptoms, UCLA	1.007 (0.987, 1.026)	$X^2(1)$ =0.450
Sexual function[1] (severity of disfunction), UCLA	1.000 (0.984, 1.016)	$X^2(1)$=0.000
Physical health[1], SF-12	1.011 (0.971, 1.054)	$X^2(1)$=0.288
Mental health[1], SF-12	0.997 (0.955, 1.041)	$X^2(1)$=0.015
Treatment regret		$X^2(1)$ =0.129
Presence	0.835 (0.313, 2.231)	
Absence	1.0 Reference	
Age		$X^2(2)$ =0.306
47-64	0.951 (0.295, 3.072)	$X^2(1)$ =0.007
65-74	0.787 (0.272, 2.274)	$X^2(1)$ =0.196
75+	1.0 Reference	
Survivorship time (months) from diagnosis	0.910 (0.652, 1.270)	$X^2(1)$ =0.309
Household Income		$X^2(2)$ =0.574
<$50,000 CAD	0.669 (0.226, 1.977)	$X^2(1)$ =0.530
$50,000-$100,000 CAD	0.751 (0.298, 1.891)	$X^2(1)$ =0.370
>$100,000 CAD	1.0 Reference	
Education		$X^2(2)$ =0.024
Completed high school or less	1.019 (0.273, 3.807)	$X^2(1)$ =0.001
Completed university or college	0.949 (0.402, 2.241)	$X^2(1)$ =0.014
Graduate training or more	1.0 Reference	

* $p<0.05$, ** $p<0.01$; *** $p<0.001$

[1] Lower scores indicate worse function or health related quality of life

5.3 Stratified Model Analyses

Assessment of the interaction between each individual socioeconomic factor (education, household income and age category), and multivariable model predictors of the well-being domains revealed several significant ($p<0.05$) interactions. Household income interacted with bowel function, and treatment regret, and these interactions were statistically significantly associated with social/family well-being. The interaction between household income and treatment regret was also statistically significantly associated with emotional well-being. Lastly, the interactions between age and sexual function, as well as age and survivorship time, were significantly associated with spiritual well-being. No statistically significant interactions emerged with functional well-being as the outcome. The stratified models for these analyses are presented in Figures 2 through 4.

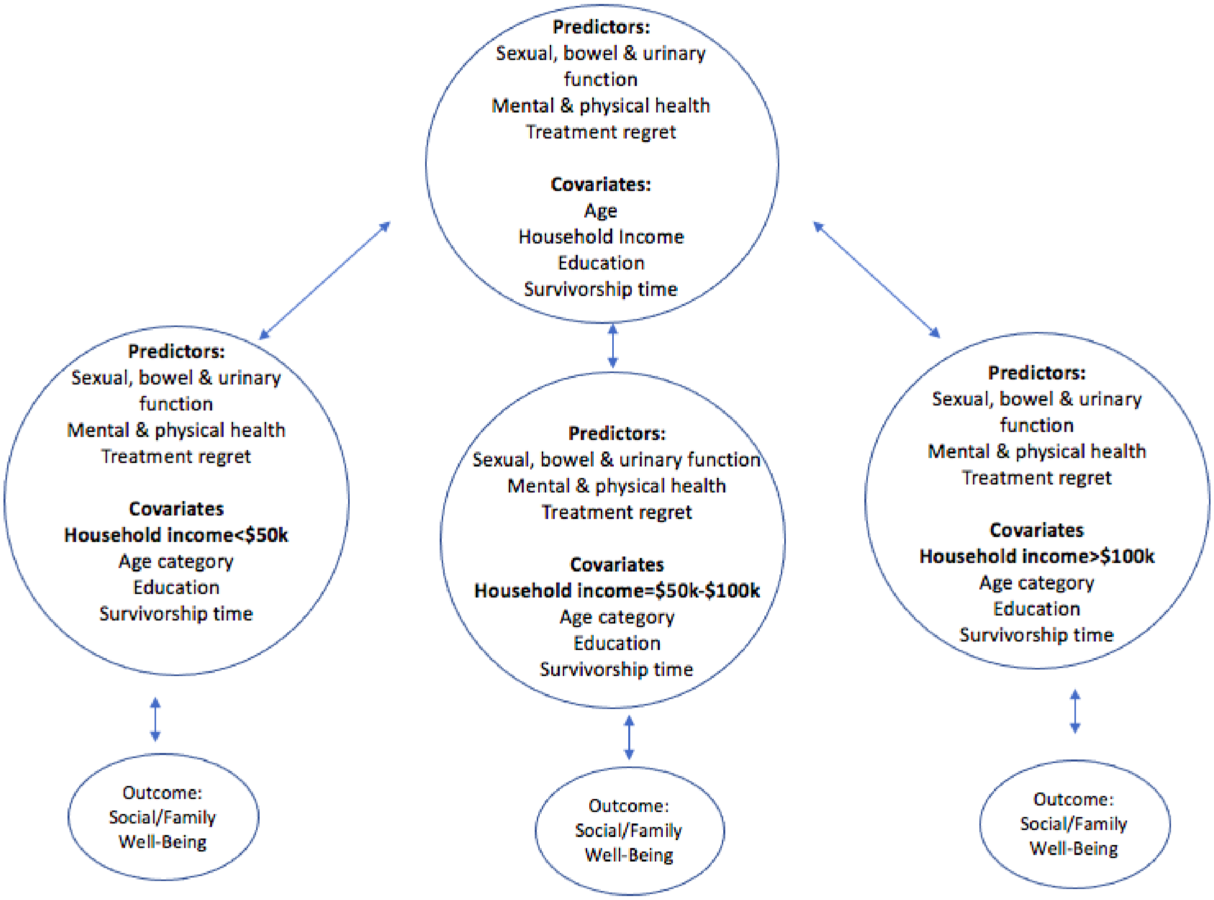

Figure 2. Stratified analysis of the multivariable model by household income for social/family well-being

Stratified analyses for social/family well-being were examined for each level of household income for the multivariable model. Results from these analyses are presented in Tables 7 through 9. Stratified analysis of the multivariable model when household income was less than $50,000 CAD showed that the model was not statistically significant $X^2(11)=17.566$, $p=0.092$. Nagelkerke's R^2 indicated that 36.0% of the variance in the model was accounted for by the predictors and covariates in the model . The Hosmer and Lemeshow test showed model stability $X^2(7) = 3.142$, $p>0.05$. For this lowest income group, the odds of poor social/family well-being were 0.103 (95% CI: 0.016-0.739) times, or 89.7% lower, when participants had treatment regret.

Stratified analysis of the multivariable model when household income was $50,000-$100,000 CAD showed that the model was statistically significant $X^2(11)=41.340$, $p<0.001$, and Nagelkerke's R^2 indicated that 43.5% of the variance in the model was accounted for by the predictors and covariates. The model was stable, as indicated by a Hosmer and Lemeshow of $X^2(8) = 5.371$, $p>0.05$. Three statistically significant associations emerged when holding all other predictors and covariates constant. As scores on the bowel function or the sexual function subscales increased, indicating better overall function, the odds of poor social/family well-being decreased by 6.3% (OR: 0.937, 95% CI: 0.901-0.973), and 2.9% (OR: 0.971, 95% CI: 0.949-0.993), respectively. Lastly, participants in the 47- to 64-year-old age category had 9.440 (95% CI: 2.058-43.287) times higher odds of poor social/family well-being, as compared to the oldest age category (75-88 years old).

Stratified analysis of the multivariable model when household income was greater than $100,00 CAD showed that the only predictor significantly associated with social/family well-being was physical health. As physical health increased, the odds of poor social/family well-being decreased by 0.884 (95% CI: 0.796-0.982) times, or 11.6%. This model was non-significant $X^2(11)=18.440$, $p=0.072$. The predictors and covariates in the model accounted for 36.7% of the variance, as indicated by the Nagelkerke's R^2. The Hosmer and Lemeshow test showed model stability $X^2(8) = 7.712$ $p>0.05$.

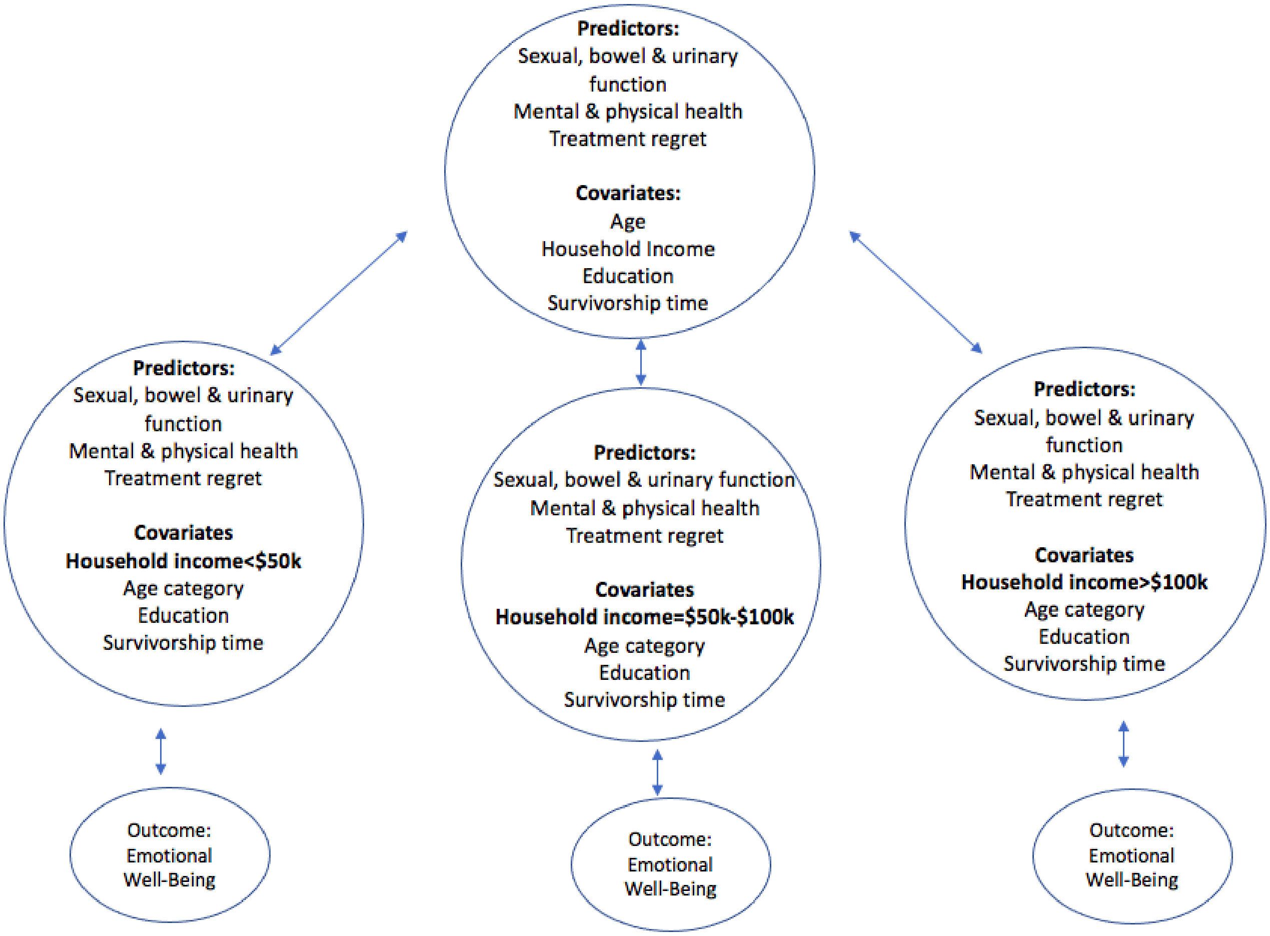

Figure 3. Stratified analysis of the multivariable model by household income for emotional well-being.

Stratified analyses of the multivariable model were evaluated by household income with emotional well-being as the outcome. Results from these analyses are presented in Tables 10 through 12. With household income as less than $50,000 CAD, the model was not statistically significant, $X^2(11)=18.172$, $p=0.078$. The Nagelkerke's R^2 indicated that 41.9% of the variance in the model was accounted for by the predictors and covariates. The Hosmer and Lemeshow test showed model stability $X^2(7) = 5.340$, $p>0.05$. When adjusting for all predictors and covariates, two significant associations emerged. As scores on the SF-12 mental health subscale increased, indicating better mental health, the odds of poor emotional well-being decreased by 11.2% (OR 0.888, 95% CI: 0.805, 0.980). As survivorship time increased, the odds of poor emotional well-being were 3.184 times higher (95% CI: 1.083, 9.362).

Stratified analysis of the multivariable model with household income group as \$50,000-\$100,000 CAD showed that the model was not statistically significant $X^2(11)=10.309$, $p=0.503$. The predictors and covariates in the model accounted for 13.3% of the variance, as indicated by the Nagelkerke's R^2. The Hosmer and Lemeshow test showed model stability $X^2(8) = 12.489$, $p>0.05$. No variables from the model were observed to be associated with poor emotional well-being for this group. Stratified analysis of the multivariable model where household income was greater than \$100,000 CAD showed that the model was statistically significant $X^2(11)=26.011$, $p=0.006$. The Nagelkerke's R^2 test showed that 4.79% of the variance in the model was accounted for by the predictors and covariates. The Hosmer and Lemeshow test showed model stability, $X^2(8) = 7.391$, $p>0.05$. No variables from the model were observed to be associated with poor emotional well-being for this group. No statistically significant interactions were found among any predictors or covariates and functional well-being, and thus no stratified analyses were indicated.

Age-stratified analyses for the spiritual well-being multivariable model were evaluated. Results from these analyses are presented in Tables 16 through 18. The stratified analysis of the multivariable model for the youngest age group (47-65 years) showed that the model was not statistically significant $X^2(11)=8.983$, $p=0.623$. The

Nagelkerke's R^2 test showed that 16.3% of the variance in the model was accounted for by its predictors and covariates. The Hosmer and Lemeshow test showed model stability $X^2(8) = 6.965$, $p>0.05$. No significant associations were found with poor spiritual well-being and any of the predictors or covariates for this youngest group. Stratified analysis of the multivariable model for the middle age group (66-75 years) showed that the model was not statistically significant $X^2(11)=14.161$, $p=0.224$, with a Nagelkerke's R^2 indicating that 16.5% of the variance in the model was accounted for by the predictors and covariates. The Hosmer and Lemeshow test showed model stability $X^2(8) = 12.377$, $p>0.05$. No significant associations were found with poor spiritual well-being and any of the predictors or covariates for this middle age group. The stratified analysis of the multivariable model for the oldest age group (75-88 years) showed that the model was not statistically significant $X^2(11)=17.881$, $p=0.084$. Nagelkerke's R^2 indicated that 53.6% of the variance was accounted for by the predictors and covariates in the model. A Hosmer and Lemeshow test showed model stability $X^2(8) = 8.895$ $p>0.05$. Sexual function was associated with poor spiritual well-being for this oldest age group. As scores on the sexual function subscale increased, indicating better function, the odds for poor spiritual well-being increased by 1.066 (95% CI: 1.001-1.135) times.

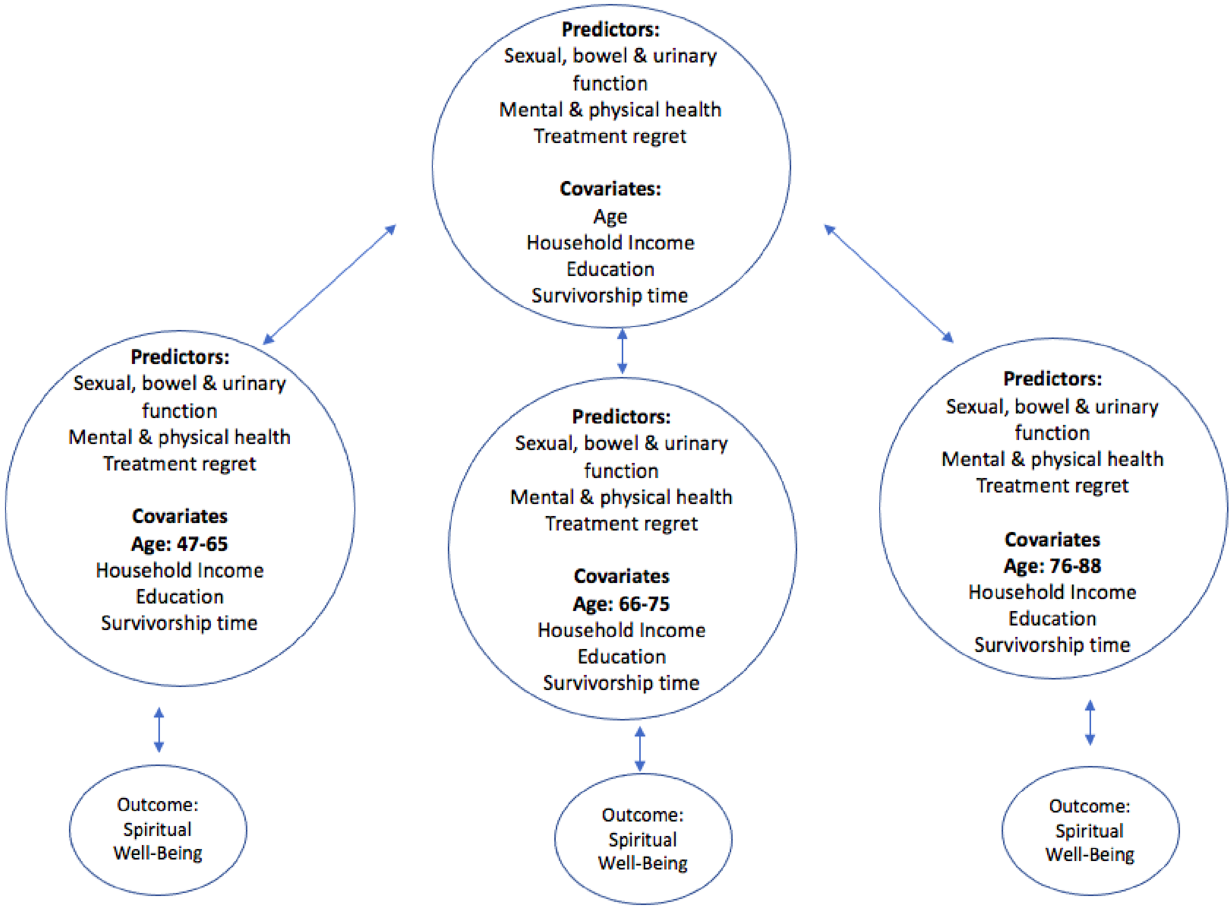

Figure 4. Stratified analysis of the multivariable model by age category for spiritual well-being

Table 10. Multivariable logistic regression assessing the relationship between social/family well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors, where household income is less than $50,000 CAD, n=79

Household income<$50,000 CAD	**Poor social/family well-being vs. Good social/family well-being (Reference)** OR (95% CI)	**Wald Chi-square**
		$X^2(11) = 17.566$
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	0.994 (0.959, 1.030)	$X^2(1) = 0.111$
Bowel function[1] (severity of bowel symptoms), UCLA	0.940 (0.893, 0.989)	$X^2(1) = 5.718$
Sexual function[1] (severity of dysfunction), UCLA, Mean (SD)	0.990 (0.961, 1.021)	$X^2(1) = 0.377$
Physical health[1], SF-12	0.967 (0.902, 1.036)	$X^2(1)=0.910$
Mental health[1], SF-12	1.008 (0.930, 1.093)	$X^2(1)=0.039$
Treatment regret		$X^2(1)=5.159$
Presence	**0.103 (0.016, 0.739)***	
Absence	1.0 Reference	
Age		$X^2(2) =1.950$
47-64	4.788 (0.492, 46.643)	$X^2(1)= 1.819$
65-74	1.924 (0.290, 12.782)	$X^2(1)=0.459$
75+	1.0 Reference	
Survivorship time (months) from diagnosis	1.313 (0.728, 2.369)	$X^2(1) =0.817$
Education		$X^2(2) =2.463$
Completed high school or less	1.285 (0.118, 14.009)	$X^2(1) =0.042$
Completed university or college	3.904 (0.409, 37.220)	$X^2(1) =1.401$
Graduate training or more	1.0 Reference	

* p<0.05, ** p<0.01; *** p<0.001

[1] Lower scores indicate worse function or health related quality of life

Table 11. Multivariable logistic regression assessing the relationship between social/family well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors, where household income is between \$50,000-\$100,000 CA

Household income = \$50,000-\$100,000 CAD	**Poor social/family well-being vs. Good social/family well-being (Reference)** OR (95% CI)	**Wald Chi-square**
		$X^2(11)$ =40.679
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	0.996 (0.974, 1.019)	$X^2(1)$ = 0.102
Bowel function[1] (severity of bowel symptoms), UCLA	**0.937 (0.902, 0.973)****	$X^2(1)$ = 11.283
Sexual function[1] (severity of dysfunction), UCLA, Mean (SD)	**0.971 (0.949, 0.993)****	$X^2(1)$ = 6.657
Physical health[1], SF-12	0.991 (0.932, 1.054)	$X^2(1)$=0.084
Mental health[1], SF-12	1.023 (0.968, 1.080)	$X^2(1)$=0.647
Treatment regret		$X^2(1)$=2.723
Presence	3.753 (0.780, 43.287)	
Absence	1.0 Reference	
Age		$X^2(2)$ =8.442
47-64	**9.440 (2.058, 43.287)****	$X^2(1)$= 2.347
65-74	3.343 (0.848, 13.187)	$X^2(1)$=2.593
75+	1.0 Reference	
Survivorship time (months) from diagnosis	0.654 (0.391, 1.096)	$X^2(1)$ =2.593
Education		$X^2(2)$ =0.615
Completed high school or less	0.975 (0.192, 4.944)	$X^2(1)$ =0.001
Completed university or college	1.492 (0.480, 4.634)	$X^2(1)$ =0.479
Graduate training or more	1.0 Reference	

* p<0.05, ** p<0.01; *** p<0.001

[1] Lower scores indicate worse function or health related quality of life

Table 12. Multivariable logistic regression assessing the relationship between social/family well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors, where household income is greater than $100,000 CAD

Household income >$100,000 CAD	**Poor social/family well-being vs. Good social/family well-being (Reference)** OR (95% CI)	**Wald Chi-square**
		$X^2(11) = 13.755$
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	1.002 (0.965, 1.040)	$X^2(1) = 0.009$
Bowel function[1] (severity of bowel symptoms), UCLA	0.962 (0.918, 1.009)	$X^2(1) = 2.570$
Sexual function[1] (severity of dysfunction), UCLA, Mean (SD)	1.014 (0.983, 1.045)	$X^2(1) = 0.752$
Physical health[1], SF-12	**0.884 (0.796, 0.982)***	$X^2(1)=5.325$
Mental health[1], SF-12	0.962 (0.872, 1.061)	$X^2(1)=0.597$
Treatment regret		$X^2(1)=0.013$
Presence	1.140 (0.121, 10.710)	
Absence	1.0 Reference	
Age		$X^2(2) =2.060$
47-64	0.422 (0.029, 6.080)	$X^2(1)= 0.402$
65-74	1.193 (0.088, 16.260)	$X^2(1)=0.018$
75+	1.0 Reference	
Survivorship time (months) from diagnosis	1.361 (0.740, 2.501)	$X^2(1) =0.985$
Education		$X^2(2) =0.260$
Completed high school or less	0.00	$X^2(1) =0.000$
Completed university or college	0.682 (0.156, 2.977)	$X^2(1) =0.260$
Graduate training or more	1.0 Reference	

* $p<0.05$, ** $p<0.01$; *** $p<0.001$

[1] Lower scores indicate worse function or health related quality of life

Table 13. Multivariable logistic regression assessing the relationship between emotional well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors where household income is less than \$50,000 CAD, n=79

Household income <\$50,000 CAD	**Poor Emotional Well-Being vs. Good Emotional Well-Being (Reference)** OR (95% CI)	**Wald Chi-square**
		$X^2(11)$ = 18.172
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	1.039 (0.993, 1.086)	$X^2(1)$ = 2.782
Bowel function[1] (severity of bowel symptoms), UCLA	0.999 (0.954, 1.045)	$X^2(1)$ =0.003
Sexual function[1] (severity of dysfunction), UCLA	0.980 (0.937, 1.025)	$X^2(1)$=0.769
Physical health[1], SF-12	0.941 (0.855, 1.037)	$X^2(1)$=1.513
Mental health[1], SF-12	**0.888 (0.805, 0.980)***	$X^2(1)$=5.609
Treatment regret		$X^2(1)$=0.276
Presence	0.566 (0.068, 4.719)	
Absence	1.0 Reference	
Age		$X^2(2)$ =0.943
47-64	4.079 (0.199, 83.599)	$X^2(1)$= 0.832
65-74	3.252 (0.248, 42.572)	$X^2(1)$= 0.808
75+	1.0 Reference	
Survivorship time (months) from diagnosis	**3.184 (1.083, 9.362)***	$X^2(1)$ =4.432
Education		$X^2(2)$ =1.496
Completed high school or less	3.367 (0.126, 80.8--)	$X^2(1)$ =0.525
Completed university or college	1.006 (0.043, 23.290)	$X^2(1)$ =0.000
Graduate training or more	1.0	

* p<0.05, ** p<0.01; *** p<0.001

[1] Lower scores indicate worse function or health related quality of life

Table 14. Multivariable logistic regression assessing the relationship between emotional well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors where household income is less than $50,000 CAD, n=157

Household income = $50,000-$100,000 CAD	**Poor Emotional Well-Being vs. Good Emotional Well-Being (Reference)** OR (95% CI)	**Wald Chi-square**
		$X^2(11) = 10.309$
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	0.994 (0.974, 1.013)	$X^2(1) = 0.426$
Bowel function[1] (severity of bowel symptoms), UCLA	0.982 (0.959, 1.005)	$X^2(1) = 2.359$
Sexual function[1] (severity of dysfunction), UCLA	0.983 (0.963, 1.004)	$X^2(1)=2.632$
Physical health[1], SF-12	0.999 (0.946, 1.054)	$X^2(1)=0.003$
Mental health[1], SF-12	0.988 (0.942, 1.037)	$X^2(1)=0.233$
Treatment regret		$X^2(1)=0.012$
Presence	1.080 (0.275, 4.238)	
Absence	1.0 Reference	
Age		$X^2(2) = 0.478$
47-64	1.327 (0.329, 5.353)	$X^2(1)=0.159$
65-74	1.562 (0.434, 5.619)	$X^2(1)=0.465$
75+	1.0 Reference	
Survivorship time (months) from diagnosis	0.861 (0.553, 1.341)	$X^2(1) = 0.438$
Education		$X^2(2) = 1.880$
Completed high school or less	2.822 (0.603, 13.206)	$X^2(1) = 1.737$
Completed university or college	1.887 (0.578, 6.160)	$X^2(1)$ 1.106
Graduate training or more	1.0	

* p<0.05, ** p<0.01; *** p<0.001

[1] Lower scores indicate worse function or health related quality of life

Table 15. Multivariable logistic regression assessing the relationship between emotional well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors where household income is greater than \$100,000 CAD, n=103

Household income > \$100,000 CAD	**Poor Emotional Well-Being vs. Good Emotional Well-Being (Reference)** OR (95% CI)	**Wald Chi-square**
		$X^2(11) = 26.011$
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	0.968 (0.926, 1.012)	$X^2(1) = 2.043$
Bowel function[1] (severity of bowel symptoms), UCLA	1.001 (0.965, 1.039)	$X^2(1) = 0.005$
Sexual function[1] (severity of dysfunction), UCLA	0.994 (0.961, 1.028)	$X^2(1)=0.122$
Physical health[1], SF-12	1.085 (0.978, 1.204)	$X^2(1)= 2.388$
Mental health[1], SF-12	1.109 (0.964, 1.276)	$X^2(1)= 2.101$
Treatment regret		$X^2(1)= 7.493$
Presence	44.543 (2.939, 675.067)	
Absence	1.0 Reference	
Age		$X^2(2) = 0.045$
47-64	0.812 (0.72, 9.206)	$X^2(1)=0.028$
65-74	0.787 (0.087, 7.124)	$X^2(1)=0.045$
75+	1.0 Reference	
Survivorship time (months) from diagnosis	1.010 (0.996, 1.025)	$X^2(1) =0.230$
Education		$X^2(2) =3.031$
Completed high school or less	0.00	$X^2(1) =0.000$
Completed university or college	0.230 (0.044, 1.203)	$X^2(1) =3.031$
Graduate training or more	1.0	

* p<0.05, ** p<0.01; *** p<0.001

[1] Lower scores indicate worse function or health related quality of life

Table 16. Multivariable logistic regression assessing the relationship between spiritual well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors, where age is 47-65 years, n=126

Age= 47-65 years	**Poor Spiritual Well-Being vs. Good Spiritual Well-Being (Reference)** OR (95% CI)	**Wald Chi-square**
		$X^2(11)$ =8.983
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	1.004 (0.977, 1.031)	$X^2(1)$ = 0.075
Bowel function[1] (severity of bowel symptoms), UCLA	0.993 (0.961, 1.027)	$X^2(1)$ =0.155
Sexual function[1] (severity of dysfunction), UCLA	0.984 (0.961, 1.008)	$X^2(1)$= 1.631
Physical health[1], SF-12	1.023 (0.959, 1.092)	$X^2(1)$= 0.483
Mental health[1], SF-12	0.983 (0.924, 1.045)	$X^2(1)$=0.295
Treatment regret		$X^2(1)$ =0.005
Presence	1.059 (0.203, 5.529)	
Absence	1.0 Reference	
Survivorship time (months) from diagnosis	0.826 (0.498, 1.369)	$X^2(1)$ =0.551
Household Income		$X^2(2)$ =3.779
<$50,000 CAD	0.328 (0.061, 1.759)	$X^2(1)$ =1.692
$50,000-$100,000 CAD	1.767 (0.447, 6.990)	$X^2(1)$ =0.659
>$100,000 CAD	1.0 Reference	
Education		$X^2(2)$ = 1.228
Completed high school or less	3.290 (0.399, 27.105)	$X^2(1)$ = 1.225
Completed university or college	1.645 (0.392, 6.897)	$X^2(1)$ = 0.463
Graduate training or more	1.0 Reference	

* p<0.05, ** p<0.01; *** p<0.001

[1] Lower scores indicate worse function or health related quality of life

Table 17. Multivariable logistic regression assessing the relationship between spiritual well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors, where age is 66-75 years, n=195

Age = 66-75 years	**Poor Spiritual Well-Being vs. Good Spiritual Well-Being (Reference)** OR (95% CI)	**Wald Chi-square**
		$X^2(11)$ =12.419
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	0.999 (0.979, 1.021)	$X^2(1)$ = 0.003
Bowel function[1] (severity of bowel symptoms), UCLA	0.989 (0.965, 1.013)	$X^2(1)$ =0.864
Sexual function[1] (severity of dysfunction), UCLA	0.991 (0.974, 1.007)	$X^2(1)$= 1.222
Physical health[1], SF-12	0.991 (0.940, 1.045)	$X^2(1)$= 0.106
Mental health[1], SF-12	0.931 (0.865, 1.011)	$X^2(1)$=3.731
Treatment regret		$X^2(1)$ =0.100
Presence	1.200 (0.387, 3.716)	
Absence	1.0 Reference	
Survivorship time (months) from diagnosis	1.318 (0.892, 1.945)	$X^2(1)$ =0.1925
Household Income		$X^2(2)$ =0.928
<$50,000CAN	0.530 (0.145, 1.941)	$X^2(1)$ =0.919
$50,000-$100,000 CAN	0.682 (0.224, 2.078)	$X^2(1)$ =0.454
>$100,000 CAN	1.0 Reference	
Education		$X^2(2)$ = 1.010
Completed high school or less	0.486 (0.113, 2.091)	$X^2(1)$ = 9.40
Completed university or college	0.876 (0.319, 2.404)	$X^2(1)$ = 0.066`
Graduate training or more	1.0 Reference	

* p<0.05, ** p<0.01; *** p<0.001

[1] Lower scores indicate worse function or health related quality of life

Table 18. Multivariable logistic regression assessing the relationship between spiritual well-being outcomes and uro-oncological function, physical and mental health indicators, and socioeconomic factors where age is 76-88 years, n=55

Age=76-88 years	**Poor Spiritual Well-Being vs. Good Spiritual Well-Being (Reference)** OR (95% CI)	**Wald Chi-square**
		$X^2(11)$ =17.881
Urinary function[1] (severity of lower urinary tract symptoms), UCLA	0.990 (0.928, 1.056)	$X^2(1)$ = 0.095
Bowel function[1] (severity of bowel symptoms), UCLA	1.039 (0.980, 1.102)	$X^2(1)$ =1.639
Sexual function[1] (severity of dysfunction), UCLA	**1.066 (1.001, 1.135)***	$X^2(1)$= 4.012
Physical health[1], SF-12	0.965 (0.871, 1.070)	$X^2(1)$= 0.451
Mental health[1], SF-12	1.227 (0.983, 1.530)	$X^2(1)$=3.279
Treatment regret		$X^2(1)$ =1014
Presence	0.116 (0.002, 7.700)	
Absence	1.0 Reference	
Survivorship time (months) from diagnosis	0.313 (0.055, 1.765)	$X^2(1)$ =1.733
Household Income		$X^2(2)$ =3.128
<$50,000 CAD	0.191 (0.003, 11.559)	$X^2(1)$ 0.625
$50,000-$100,000 CAD	0.023 (0.000, 1.889)	$X^2(1)$ =2.815
>$100,000 CAD	1.0 Reference	
Education		$X^2(2)$ = 2.337
Completed high school or less	0.756 (0.022, 25.573)	$X^2(1)$ = 0.024
Completed university or college	6.702 (0.436, 103.025)	$X^2(1)$ = 1.862
Graduate training or more	1.0 Reference	

* p<0.05, ** p<0.01; *** p<0.001

[1] Lower scores indicate worse function or health related quality of life

Chapter 6. Discussion

The purpose of this exploratory analysis was to examine the contribution of treatment regret, and mental and physical health indicators to the social/family, emotional, functional, and spiritual well-being of prostate cancer survivors in covariate-controlled analyses. The second objective was an exploratory analysis aimed at examining household income, age and education level disparities in this population (as representing SES) by examining each of their interactions with the predictors on the outcomes indicated.

The results from the univariate unadjusted analyses showed significant associations between bowel function, sexual function and three of the four outcomes (social/family, emotional, and functional well-being). Urinary function was significantly associated with emotional and functional well-being. Mental health was significantly associated with emotional well-being, and physical health was significantly associated with functional well-being. The youngest age category (47-64 years) was significantly associated with functional well-being. Once adjusting for all predictors and covariates in the multivariate model, sexual function remained significantly associated with social/family, emotional and functional well-being, while bowel function remained significantly associated with social/family and functional well-being, but not emotional well-being. Further, age category emerged as being significantly associated with social/family well-being. While no predictors or covariates in the model were significantly associated with spiritual well-being, when assessing the sub-domains of spiritual well-being, survivorship time was significantly associated with meaning and peace, while bowel function was significantly associated with meaning.

Sexual function emerged as the predictor significantly associated with the most well-being domains, with significant associations with social/family well-being, emotional well-being, and functional well-being. The contribution of sexual function to QoL has previously been documented (Agaba et al., 2017). Findings from this study add specificity to this previously documented association between sexual function and QoL, identifying the QoL domains for which the associations are significant. Better sexual function emerged as a risk factor for poor spiritual well-being for individuals aged 76-88, which is in contrast to previous literature that has supported positive impacts of better sexual function on QoL among prostate cancer patients (Sanda et al., 2008). However, this is the first study to examine this association in different age categories. Further research with larger sample sizes is necessary to examine potential mechanisms or confounding factors contributing to this association.

When stratified by household income group, sexual function remained significantly associated with social/family well-being only when household income was between $50,000 CAD and $100,000 CAD. This is largely equivalent to what was found with bowel function, suggesting that specific uro-oncological QoL factors, such as bowel and sexual function, are more important to the QoL of middle-income patients. This highlights the importance of having one's basic needs met prior to having more specific needs. This is in keeping with Maslow's hierarchy of needs, in which physiological needs must first be met, followed by safety and security, love and belonging, self-esteem, and self-actualization (Maslow, 1943). As the QoL determinants among patients with a household income of less than $50,000 CAD may be more related to basic needs rather than specific uro-oncological function, these patients may benefit from referrals to different social supports available to them that could aid in meeting their basic physiologic needs (food and water, shelter, clothing, etc.) throughout their prostate cancer survivorship.

These findings may also suggest that lesser material deprivation, which is more likely experienced by patients with a household income greater than $100,000 CAD than those of a lesser household income, may allow for increased access to effective uro-oncological supports and therapies such a pelvic floor physiotherapy and thus reduce the significance of bowel and sexual function on their QoL (Dorey, 2013; Filocamo et al., 2005; Urvaylıoğlu et al., 2021). As physiotherapy services are largely privatized in Canada, and those that are public can have excessive wait-times (Passalent et al., 2009), this may present a cost barrier to patients. Prostate cancer patients may benefit greatly from additional publicly funded and/or widely accessible survivorship care programs, which could include pelvic floor exercises. One example of such a program is the Prostate Cancer Patient Empowerment Program, which is free of cost for prostate cancer patients across Canada. This program includes physical exercise, relaxation training, social support, dietary recommendations, sleep recommendations, and pelvic floor exercises. The feasibility trial for this program resulted in significant improvements in both mental and physical health of participants (Ilie et al., 2020d).

Bowel dysfunction is an important aspect of prostate cancer survivorship that can occur with various treatments (Litwin et al., 2004). Findings from this thesis reveal that bowel function is significantly associated with both social/family well-being and functional well-being. This is in contrast to results from a previous sample of Maritime prostate cancer patients, which showed that bowel function was not significantly associated with any of the well-being domains of the FACT-P, when controlling for the same set of predictors and covariates as this model, with the exception of education. It is possible that the difference in results between these two studies may be partially attributable to the larger sample size in this study (Bradley et al., 2021).

When stratified by household income category, bowel function remained significantly associated with social/family well-being only when household income was between $50,000 CAD and $100,000 CAD. This novel finding may be of particular clinical relevance, as if this association is supported throughout future research, additional clinical attention to the bowel function of patients in this household income category may allow for greater QoL for these patients.

Results from a previous study showed that **physical and mental health** were commonly associated with the FACT-P well-being domains, when adjusting for the same predictors and covariates as included in this study, with the exception of education (Bradley et al., 2021). However, mental health only emerged as significantly associated with emotional well-being when household income was less than $50,000 CAD, and physical health only emerged as significantly associated with social/family well-being when household income was greater than $100,000 CAD. It is possible that the larger sample size used in this current study may have contributed to these differences, producing more representative results of the true prostate cancer patient population.

While overall physical and mental health were not often significant predictors in the models of this thesis, they remain important concepts in prostate cancer survivorship. The literature has robust evidence supporting the physical and mental health tolls that can be associated with prostate cancer (Donovan et al., 2016; Downs et al., 2003; Ilie et al., 2021a, 2020a, 2020c, 2020b; Litwin et al., 2000; Moodie et al., 2020; Resnick et al., 2014; Stanford et al., 2000). Considering this literature, along with the novel findings from this study, one potential avenue for improving the mental and physical health of prostate cancer survivors may be through financially accessible group exercise programs for prostate cancer patients. Exercise, particularly when done in a group, has been shown to improve both physical and mental health among prostate cancer patients, providing a comfortable environment to facilitate sensitive conversations regarding prostate cancer; practical, emotional and social support; and positive linkages to masculine values (Cormie et al., 2015, 2016; Hamilton et al., 2015). Activities such as this, which may channel a sense of masculinity, are important to prostate cancer survivorship as many men report negative feelings about their masculinity because of their prostate cancer experiences, which have even led some patients to feel worthless (Cormie et al., 2015, 2016; Hamilton et al., 2015). This again points to the importance of accessible health promotion programs for prostate cancer patients, such as PC-PEP, which include an exercise component. Given the difference in QoL predictors for prostate cancer patients of different socioeconomic groups, these patient programs should be developed with accessibility and adaptability at their forefront. Examples of this could include being free of cost, being able to be delivered through different mediums (e.g., in person and virtually), having social connection aspects be optional, and adapting the physical exercises to different ages and abilities.

Interestingly, the presence of **treatment regret** was protective against poor social/family well-being when household income was less than $50,000 CAD. This is in contrast to previous literature, which has reported treatment regret being associated with poorer QoL (Clark et al., 2001; M. Diefenbach et al., 2008). However, to our knowledge, this is the first study to investigate this association in analyses stratified by household income, which may help explain this disparity in results. This finding also supports the need for standardized, validated questionnaires assessing for treatment regret for research purposes, which currently do not exist. This may lead to more consistent findings regarding its contribution to QoL among prostate cancer survivors. Further research assessing this association with a larger sample size is necessary, especially given that the multivariate model in which this significant association was present was not statistically significant.

Despite the potential measurement bias impacting this association, the OR suggests a quite protective impact of treatment regret, reducing the odds of poor social/family well-being for the lowest income group by 89.7%, compared to participants without treatment regret. With this potentially large protective impact of treatment regret, consideration of the mechanisms explaining this relationship, as well as sources of confounding is warranted. One potential reason that treatment regret is seemingly protective against poor social/family well-being is that participants experiencing treatment regret may be more likely to lean on their social supports to help them with this challenge. This is supported by the fact that social support, an important proxy of social/family well-being, is an important predictor of well-being among cancer patient populations (Chien et al., 2021; Ganz et al., 2003; Helgeson & Cohen, 1996; Michael et al., 2000).

The spiritual well-being sub-domain model analyses revealed that **survivorship time** was significantly associated with meaning and peace, however longer survivorship time was a risk factor for poor meaning, while longer survivorship time was protective against poor peace. Further, survivorship time was significantly associated with emotional well-being when household income was less than $50,000k, with additional months of survivorship increasing the odds of poor emotional well-being by over three times. These findings are an important contribution to the literature, which has a paucity of research describing how the duration of prostate cancer survivorship may impact QoL. Previous studies have identified longer survivorship time being a protective factor against poor functional and spiritual well-being, but that it did not contribute to differentiating between levels of anxiety or depression among prostate cancer survivors (Bradley et al., 2021; Ilie et al., 2020a). Further research is necessary in order to establish more substantial evidence for the role of survivorship time on the QoL of prostate cancer patients.

While previous studies have reported significant associations between **education** and QoL among prostate cancer populations, results from this study did not show any associations between education level and QoL domains (Brar et al., 2005; Eton & Lepore, 2002; Knight et al., 2007). However, the addition of education to this model may have contributed to some of the previously outlined differences in results between this study and that of Bradley et al. (2021) (Bradley et al., 2021).

Household income did not emerge as a significant covariate in any of the multivariable models. Significant interactions were observed between household income and bowel function with social/family well-being as the outcome, and between household income and treatment regret with social/family well-being and emotional well-being as outcomes. Stratifying by household income group for the multivariate models with social/family and emotional well-being revealed that the predictors significantly associated with these well-being outcomes do vary by household income level. These findings point to the potential importance of prostate cancer survivorship care that considers patients' financial status.

A significant association between **age category** and social/family well-being emerged once adjusting for the variables in the multivariate model. These results are in keeping with previous studies which have highlighted that younger prostate cancer populations often experience lower QoL than older prostate cancer populations (Ilie et al., 2021b; Lintz et al., 2003; Moodie et al., 2020). The stratified analyses by household income revealed that age remained significantly associated with social/family well-being when household income was $50,000 CAD to $100,000 CAD, and only for the youngest age group. In fact, this youngest age group (47-65 years) of this household income had over nine times the odds for poor social/family well-being compared to those in the oldest age group (76-88) of this household income. This highlights an important disparity, whereby the intersectionality of younger age and moderate household income in prostate cancer patients result in significantly higher odds of poor well-being.

The stratified analyses by age category for spiritual well-being showed that sexual function was the only variable in this model that was significantly associated with this outcome, and only for the oldest age group (76-88 years). This adds important information to the current literature, which has previously evidenced the association between sexual function and spiritual well-being, but not revealed the differences by age group (Krupski et al., 2006). These differences by age category point to the potential importance of individualizing patient care to the patients' demographic, such that the care they receive is the most equitable and patient centred as possible.

6.1 Implications for survivorship care

Our results suggest the need for prostate cancer survivorship care that prioritizes both physical and mental health, along with the patient's individual needs. Results from the multivariable regression suggest that specific uro-oncological outcomes such as bowel and sexual function remain significantly associated with the QoL of prostate cancer patients even when adjusting for other health and socioeconomic factors. Therefore, therapies specifically targeting the improvement of these functions should be included throughout survivorship care as this may aid in improving QoL. Such therapies may include pelvic floor exercises, such as Kegels, which can significantly improve continence, bowel symptoms, as well as erectile dysfunction in prostate cancer patients undergoing different treatment types (Dorey, 2013; Filocamo et al., 2005; Urvaylıoğlu et al., 2021).

One potentially important approach for improving QoL throughout prostate cancer survivorship could be accessible, multi-disciplinary health promotion programs, such as Prostate Cancer Patient Empowerment Program (PC-PEP) in Atlantic Canada (Ilie, 2018a; Ilie et al., 2020d). Survivorship programs such as this, which aim to improve QoL through many different avenues, could also be tailored for specific age or social groups, such that the programming is informed on the specific needs of these unique groups. For example, a program similar to PC-PEP could be developed specifically for younger individuals with prostate cancer, which places additional focus on the social well-being of this group. Another QoL-promoting strategy that could be coupled with or separate from these health-promotion programs is the implementation of educational campaigns regarding prostate cancer and its various treatments. Educational campaigns providing specific cancer-related information for cancer patients have been largely found to have positive outcomes for patients (Chelf et al., 2001). Such initiatives can help to normalize the experiences of cancer patients, help provide accurate expectations for cancer survivorship, improve symptoms, and increase overall satisfaction with care (Butow et al., 1998; Chelf et al., 2001; Jahraus et al., 2002; Koh et al., 2018).

As the predictors and covariates significantly associated with patient well-being can vary by both age group and household income, it is important that clinicians are cognisant of their patient’s unique circumstances and characteristics. One such avenue to facilitate this could be the completion of sociodemographic screening surveys by patients prior to beginning their prostate cancer care. While there is limited literature surrounding the topic of the feasibility and significance of utilizing such screening tools prior to initiating cancer care, one scoping review found that the majority of clinicians expressed generally positive attitudes regarding addressing their patients’ socioeconomic needs (Quiñones-Rivera et al., 2021). Further, clinicians should actively incorporate the principles of shared decision-making, as well as facilitating informed decision-making with their patients, such as to maximize satisfaction with care (Sanda et al., 2008).

6.2 Critique and limitations

Limitations of this study include that the survey data are retrospective and thus subject to recall bias, as well as volunteer bias due to the voluntary nature of participation. Moreover, the data is self-reported and may be subject to social-desirability bias. Sample size for the exploratory stratified analyses was small and warrants an attempt to replicate the results with a larger sample size. Due to the cross-sectional design of this study, the temporality of the associations found cannot be assumed. Causality cannot be inferred, as results indicate only associations.

It would be interesting and relevant to study how the predictors assessed affect the outcomes of the study over time as patients progress through treatment and the various stages of the survivorship period, however, no pre-treatment data is available. Residual confounding may also play a role in the analyses. For example, rural versus urban settings, or province where the treatment was provided may influence results, although the type of treatment is similar across all provinces. Studies of larger sample size should consider controlling for these possible residual influences. The sample size of this study also presented some limitations with the stratified analyses, as there were certain strata in which there lacked adequate power to provide meaningful odds ratios for the categorical education variable. Moreover, certain stratified models had a non-significant Wald chi-square value. Future studies of larger sample size examining the associations found in this study would be beneficial.

While the exclusion of treatment type as a variable in this study may appear to be a limitation, this decision was made purposefully. A variable indicating the prostate cancer treatment type(s) undergone was available for use in these models, however, preliminary analyses with and without the inclusion of this treatment type variable showed no meaningful differences. Therefore, in order to not further reduce the power of the models, an informed decision was made to not include this variable. Moreover, with the inclusion of variables that represent a multitude of uro-oncological and general health outcomes, it is likely that any differences in symptoms and side effect profiles due to treatment type would be adjusted for through these measures.

6.3 Significance and Conclusions

This study contributes to the current knowledge surrounding the predictors of QoL and well-being among prostate cancer patients and survivors. Results from this study will be used to generate hypotheses for future studies, which may in turn inform improved survivorship care for prostate cancer patients and survivors across Canada. To our knowledge, this is the first study to examine the potentially moderating roles of socioeconomic factors in the associations between physical and psychosocial predictors of social/family, emotional, functional, and spiritual well-being among a prostate cancer population. This study has highlighted the role of household income in prostate cancer patients' QoL. Given the high prevalence and survival rates of prostate cancer among Canadian men, studies such as this are critical to examine how QoL may be maximized throughout prostate cancer survivorship. Understanding the socioeconomic disparities that exist in prostate cancer survivorship is important to providing the most equitable, patient-centred care possible. This is especially relevant in the current context of the COVID-19 pandemic, as this pandemic led to deterioration of social determinants of health, worsening broader health inequities (World Health Organization, 2021).

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