Prevention Science
https://doi.org/10.1007/s11121-023-01494-5

Identifying Latent Patterns and Predictors of Health Behaviors and Healthcare Barriers Among LGBT Older Adults

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Accepted: 16 January 2023

Abstract
Heightened risk of adverse health behaviors is of major concern among lesbian, gay, bisexual, and transgender (LGBT) older adults. Yet, no previous research has investigated heterogeneity of LGBT older adults on a set of health behaviors in conjunction with healthcare barriers. We aim to identify latent classes of the behavior and barrier patterns and examine differences in physical and psychological health-related quality of life (HRQOL) by the specified latent classes while exploring predictors of the class membership. Three-step latent class analysis applying survey weights was conducted with 14 indicators of health-risk behavior, health-promoting behavior, preventive care use, and healthcare barriers from baseline data of the Aging with Pride: National Health, Aging, and Sexuality/Gender Study (NHAS, $N = 2450$). The best empirical and substantive fit was determined with four classes consisting of (1) *healthy behaviors and minimal barriers* (C1, 39%), (2) *less healthy behaviors and high barriers* (C2, 31%), (3) *healthy behaviors and healthcare system barriers* (C3, 19%), and (4) *optimal health behaviors with risks of limited healthcare access* (C4, 11%). Compared to C1, C2 and C3 had lower physical HRQOL and C2 also had lower psychological HRQOL. C4 did not differ in HRQOL from C1. C2 was associated with more day-to-day discrimination, lower mastery, and lower social support. Efforts to lower healthcare barriers are warranted in addition to interventions to strengthen social support and reduce marginalization. Positive relationships between LGBT older adults and healthcare need to be established via trust-building and cultural competency.

Keywords LGBTQ+ · Health behaviors · Barriers to care · Latent class analysis

Introduction

Health behaviors are one of the strongest predictors of health and quality of life among older adults (Sowa et al., 2016), and there is consensus that promoting healthy behaviors, such as exercise and preventive healthcare use, is key to the prevention of chronic conditions that are leading causes of mortality (Drewnowski & Evans, 2001) including cardiovascular disease and cancer (National Center for Health Statistics, 2019). Existing research has shown that LGBT older adults are at heightened risks of health-risk behaviors such as substance use and lack of physical activity (Fredriksen-Goldsen et al., 2013a, b), which are proximal predictors of their adverse health outcomes (Fredriksen-Goldsen et al., 2017a). LGBT older adults are also known to experience added barriers to healthcare due to their identity (Ayhan et al., 2020), and elevated risks in health behaviors and barriers to healthcare access are closely associated (Baum & Fisher, 2014; Schnittker & McLeod, 2005). Yet, little is known about how varied health behaviors and barriers to healthcare co-occur among LGBT older adults. Given that health behaviors are modifiable and can be addressed in interventions and practices in healthcare settings to alleviate health disparities (Martin et al., 2010), understanding patterns of health behaviors in conjunction with barriers to healthcare access among LGBT older adults will be an important step to this end.

Need for a Person-Centered Perspective

Researchers have examined how different types of health behaviors and healthcare access barriers correspond to health outcomes in later life. Individual risk factors

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Published online: 10 February 2023

including smoking, lack of physical activity, substance misuse, and suboptimal diet and sleep have shown to be positively associated with chronic conditions including cardiovascular disease and cancer (Loef & Walach, 2012; Veronese et al., 2016), and negatively with physical health and quality of life (Strine et al., 2008). Other studies examined preventive care use such as routine checkups (e.g., Fan et al., 2010), and their associations with health outcomes were inconsistent because preventive care use can be either protective of or resulting from adverse health conditions (Thompson et al., 2012). However, these studies focused on the independent role of each type of health behavior and healthcare barrier (Erskine et al., 2018; Loef & Walach, 2012), and their conjoined patterns between different behaviors as well as healthcare barriers have not been examined. The efforts to reduce barriers to healthcare and to promote healthy behaviors stem from the presumed benefits that healthcare and healthy behaviors may potentially bring to health outcomes and well-being of patients. However, individuals may display varying combinations of behaviors and healthcare access, some positive and some negative, and healthy behaviors may not be accompanied by access to healthcare. This is particularly relevant to LGBT individuals given their experiences of bias and oppression not only in general but also in interactions with healthcare (Waling et al., 2022). Nonetheless, no previous research has examined these potentially complex patterns of experiences from a person-centered perspective among LGBT older adults, which warrants such investigations to understand unique and diversified needs based on behaviors and barriers, and tailor interventions accordingly for a more targeted and effective approach towards health equity.

Health Equity Promotion Model (HEPM)

The Health Equity Promotion Model (HEPM) (Fredriksen-Goldsen & Kim, 2017) comprehensively considers multidimensional factors and complex processes unfolding over the life course of LGBT older adults. Health behaviors and healthcare barriers are interconnected with other life experiences of LGBT older adults. This model emphasizes structural and environmental influences related to one's social location as determining factors of health in addition to psychological, social, behavioral, and biological processes (Fredriksen-Goldsen & Kim, 2017). Highlighting both risk and protective factors and processes, it posits that LGBT older adults can reach their full health potential given their lifetime and contemporary environmental context including marginalization experiences by creating and navigating through resources and strengths. According to HEPM, health behaviors and healthcare barriers are influenced by diverse environmental, psychological, and social experiences, and in turn affect health and well-being as proximal predictors. An investigation of the cascading health effects over the life course revealed that health-risk and health-promoting behaviors were significantly associated with marginalization experiences among LGBT older adults as well as their social and psychological resources, and predicted their physical health (Fredriksen-Goldsen et al., 2017a). Yet, no empirical research has examined how patterns of health behaviors and healthcare barriers among LGBT older adults are shaped by these factors or whether any identified patterns are associated with elevated risks of poor health or quality of life.

Simultaneous Occurrence or Non-occurrence of Health Behaviors and Barriers to Healthcare

Health-risk and health-promoting behaviors co-exist (Södergren et al., 2014) and both affect health outcomes (Spring et al., 2012). Different behaviors occur simultaneously within an individual, and they influence each other (Short & Mollborn, 2015). Prior studies have examined this co-occurring pattern (e.g., Poortinga, 2007) and found that the co-occurrence created a synergistic effect (Södergren et al., 2014). For example, 70% of current smokers also engaged in at least one of three unhealthy behaviors including excessive drinking, lack of physical activity, or poor diet (Poortinga, 2007). Furthermore, studies on co-occurrence of health behaviors have observed integrative and dynamic properties of individual behaviors interacting with ecological systems (Cockerham, 2005). Health-promoting behaviors such as physical activity and healthy diet may or may not be accompanied by preventive care use depending on the availability of healthcare perceived to be trustworthy or culturally competent in one's environment (Musa et al., 2009). Distrust of healthcare and frustration with lack of LGBT-friendly services is commonly experienced in LGBT communities (Ayhan et al., 2020), which may affect occurrence and non-occurrence of different health behaviors.

Healthy People 2030 (n.d.) declared the national objectives to achieve full potential of health of American people and addressed social determinants of health (SDOH) as one of the five major topics (Healthy People 2030, n.d.). Health behaviors, one major pathway to health (Short & Mollborn, 2015), are also influenced by SDOH (Baum & Fisher, 2014) such as the lack of socioeconomic and environmental resources (e.g., financial barrier and unavailability of quality services) and other factors that can discourage access to healthcare system (e.g., distrust in healthcare, previous experiences of bias in care, low health literacy, postponed care, and unwillingness to receive care) (Schnittker

& McLeod, 2005). Therefore, investigating healthcare barriers along with health behaviors bear great importance in health and well-being of individuals.

Aims of the Study

The aims of this study are threefold. First, we aim to examine latent clusters of LGBT older adults based on their health behaviors and healthcare barriers using latent class analysis (LCA), which capture complex but homogeneous patterns within a cluster and show heterogeneity, i.e., diverse representation of behaviors and barriers, across different classifications of individuals. Latent characteristics that drive measurement of each behavior and barrier variable are examined by classifying individuals into subgroups that share similar characteristics. Second, we examine differences in physical and psychological health-related quality of life (HRQOL) by the specified latent groups. Third, we explore factors predicting latent class memberships based on HEPM including social locations, bias experiences, and psychological and social factors. Disability and depressive symptomatology were included as covariates given their association with physical and/or mental incapacity to engage in certain behaviors (e.g., Jones et al., 2009).

Methods

Data

The data comes from the Aging with Pride: National Health, Aging, and Sexuality/Gender Study (NHAS), the first national longitudinal study of LGBT older adults. This study began in 2014 with 2450 participants recruited through community aging agencies across all US Census divisions. Stratified sampling was used to ensure demographic diversity of the sample by cohort, gender, race/ethnicity, and geographic location. Social network clustering chain referral method, where recruited participants help spread the word to their connections, was used to increase the proportion from underrepresented, hard-to-reach populations and those not affiliated with aging agencies (Walters, 2011). The inclusion criteria included aged 50 and older in 2014 and self-identifying as sexual and/or gender minority encompassing lesbian, gay, bisexual, or transgender or gender diverse, or as someone who is attracted to or has engaged in sexual behavior or a romantic relationship with someone of the same sex or gender. Four waves of data have been collected biennially, and this study analyzed the baseline data collected in 2014. According to participant preference, paper and online surveys were completed. This study was approved by the Institutional Review Board of the University of Washington.

Measures

Health Behavior and Healthcare Barrier Indicators to Generate Latent Classes (Aim 1)

Fourteen dichotomous indicators were used to generate the latent classes from the following four dimensions: health-risk behavior, health-promoting behavior, preventive care use, and healthcare barrier.

Health-risk behaviors consist of three variables. *Current smoking*: Yes or No to "Do you smoke cigarettes now?" *Excessive drinking*: Yes or No to whether drinking either more than 30 drinks in total or four or more drinks on one occasion during the past 30 days (Centers for Disease Control and Prevention (CDC), n.d.-a). *Nonmedical drug use*: Yes or No to whether participants used an illegal drug or used a prescription medication for nonmedical reasons in the past 12 months.

Health-promoting behaviors also consist of three variables. *Physical activity*: Yes or No to whether participants engage in the CDC-recommended level of physical activity (CDC, n.d.-b). *Sufficient food intake* dichotomized responses on how frequently they were experiencing insufficient food intake into "never or seldom" (=1) versus "quite often, very often, or always" (=0). *Optimal sleep hours* indicate average hours of sleep between 6 and 9 hours in a 24-hour period (Liu et al., 2013).

Preventive care use consists of two variables, i.e., *regular checkup* and *flu vaccination*. Participants responded (Yes or No) to whether they had visited a doctor for a routine checkup during the past 12 months and to whether they had a flu vaccination within the past year.

Healthcare barriers consist of six variables. *Financial barrier* was coded yes if any of the two items were experienced in the past 12 months: "I needed medical care but did not get it because I couldn't afford it" and "I ended up taking less medication than was prescribed for me because of the cost." *Unavailability of LGBT-friendly services* and *distrust in healthcare* indicated whether participants affirmed having experienced unavailability of LGBT-friendly service in their areas and distrust or disbelief in healthcare providers (Yes or No). *Low health literacy* was a dichotomized measure of the mean of eight items assessing health literacy, i.e., accessing, understanding, evaluating, and applying health information (1 = *very difficult* to 4 = *very easy*; $M = 3.1$; $SD = 0.5$; $\alpha = .89$). Mean scores lower than three were coded 1 to indicate low health literacy and three or higher was coded 0. *Postponement of care* assesses experiences of any circumstantial and/or attitudinal barrier conducive to postponed care and was measured dichotomously (Yes or No) indicating whether participants had ever postponed getting care even though they were sick or needed advice about health during the past 12 months. *Unwillingness to receive*

care was measured by whether participants would be willing to get professional help for a personal problem. Responses of *probably would not* and *definitely would not* were coded 1 to indicate unwillingness as opposed to responses of *probably* and *definitely would* (=0).

Outcomes of Class Membership (Aim 2)

We measured physical and psychological HRQOL using the World Health Organization (WHO) Quality of Life – BREF (Bonomi et al., 2000) to examine differences by the latent classes generated in Aim 1. Participants rated seven items for physical HRQOL, including vitality, mobility, and dependence on medical treatment, and six items for psychological HRQOL, including positive and negative affect, self-esteem, and personal beliefs. Summary scores were calculated following the guidelines (WHO, 2004) and ranged from 0 to 100 with higher scores indicating better quality of life. The means were 66.4 (SD = 20.3; α = .86) and 67.3 (SD = 18.6; α = .87) for physical and psychological HRQOL, respectively.

Predictors and Covariates of Class Membership (Aim 3)

The following measures drawn from HEPM were used to predict the latent class memberships that were generated in Aim 1. Two variables of bias experiences were measured. *Lifetime discrimination and victimization* is a summed score of five types of discrimination (e.g., employment, housing, and healthcare) and nine types of victimization (e.g., verbal, physical, and sexual assault, and property damage). Participants were asked how many times they had experienced each (0 = *never* to 3 = *three or more times*) because they were or were perceived to be LGBT (Fredriksen-Goldsen & Kim, 2017). The ranges were 0 to 42 (M = 6.2; SD = 7.3; α = .88). *Day-to-day discrimination* was a mean of six items describing experiences of unfair treatment that might occur daily (0 = *never* to 5 = *almost every day*). It ranged 0 to 5 (M = 0.9; SD = 0.9; α = .91).

Psychological factors include identity stigma and mastery. *Identity stigma* was measured by a mean of eight items assessing the extent to which participants hold negative attitudes and feelings towards their sexual or gender identity (Fredriksen-Goldsen & Kim, 2017; Herek et al., 2009). Items include "I feel ashamed of myself for being LGBT" (1 = *strongly disagree* to 6 = *strongly agree*). It ranged 1 to 6 with the mean of 1.6 (SD = 0.8) and the α of 0.91. *Mastery* was measured by a mean of four items assessing the extent to which participants view themselves as having control of what significantly impacts their lives (Lachman & Weaver, 1998). Items include "I can do just about anything I really set my mind to" (1 = *strongly disagree* to 6 = *strongly agree*). It ranged 1 to 6 with the mean of 4.4 (SD = 1.0) and the α of .84.

Social factors include social support and community engagement. *Social support* was assessed with a mean of the abbreviated 4-item MOS-Social Support Scale (Gjesfjeld et al., 2008). Participants indicated how often each kind of support was available if needed, including "someone to do something enjoyable with" (0 = *never* to 4 = *very often*). It ranged 0 to 4 with the mean of 2.7 (SD = 1.1) and the α of .86. *Community engagement* was assessed with a mean of the 4-item Community Engagement Scale (Fredriksen-Goldsen & Kim, 2017) measuring the degree of engagement in and a sense of belonging to LGBT communities. Items include "I am active or socialize in the community" (1 = *strongly disagree* to 6 = *strongly agree*). It ranged 1 to 6 with the mean of 4.0 (SD = 1.3) and the α of .86.

Sociodemographic characteristics include *age* in years ranging from 50 to 98, *income* (at or below vs. above 200% of federal poverty level), *education* (high school or less vs. some college or more), *relationship status* (partnered/married vs. not), *race/ethnicity* (people of color vs. non-Hispanic Whites), *gender* (women, men, and gender diverse), *gender identity* (transgender vs. cisgender), and *sexual identity* (lesbian or gay, bisexual, or sexually diverse). The covariates include disability and depressive symptomatology. *Disability* was a dichotomous measure indicating whether participants had any of the following conditions (US Department of Health and Human Services, 2011): (1) serious difficulty in seeing, (2) hearing, (3) walking or climbing stairs, (4) concentrating, remembering, or making decisions, and (5) difficulty in dressing or bathing, or (6) running errands alone. *Depressive symptomatology* was also a dichotomous measure based on summed scores of the 10-item Center for Epidemiologic Studies-Depression Scale (CESD-10) (Andresen et al., 1994). Participants' ratings of how often they had felt as each item described during the past week (0 = less than 1 day to 3 = 5 to 7 days) were summed (M = 8.3; SD = 6.8; α = .87) and dichotomized into scores higher than 10 vs. 10 or below. Scores greater than 10 indicate clinically significant depressive symptomatology.

Analysis

The notion of diverse manifestation of health behaviors and healthcare barriers aligns with the need for and the advantage of adopting a person-centered analytic approach as opposed to a variable-centered counterpart. A person-centered approach creates "empirically derived typologies" and groups "similar people together" whereas a variable-centered approach "groups items" and uses "arbitrary cutoffs" to group individuals (Nylund-Gibson & Choi, 2018, p. 442). Latent class analysis (LCA) is a model-based technique that can empirically classify individuals based on the potentially diverse manifestations of behaviors and barriers. Previous knowledge on the effects of health behaviors or healthcare barriers as individual

variables is to be expanded by LCA because individuals showing conflicting patterns, for example, health-promoting behaviors and high healthcare barriers, can be disclosed as a uniquely defined cluster only with person-centric analyses.

We conducted LCA in two phases using Mplus 8.6 and applied survey weights. Latent classes of health behaviors and healthcare barriers were generated in phase 1. In phase 2, we examined mean differences in HRQOL (distal outcome) across the latent classes and explored the predictors (covariates) of class membership. There have been active discussions on the best approaches to conducting LCA with covariates and distal outcomes in the past decade (Nylund-Gibson & Choi, 2018), and it is generally recommended to separate the class enumeration step (phase 1) from the estimation of covariates and outcomes (phase 2) (Grimm et al., 2018). Accordingly, we used the three-step method (Nylund-Gibson et al., 2014) where the final LCA solution is determined and fixed using logits for the classification probabilities, and then the covariates and outcomes are estimated for associations with the latent classes.

We compared across one- to six-class models based on substantive properties and model fit statistics including Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) (Nylund et al., 2007). We also consulted Lo-Mendell-Rubin (LMR) likelihood ratio test. Entropy and average posterior probabilities were examined to gauge separation of the classes. Entropy higher than .8 and average posterior probabilities higher than .7 are considered markers of good separation (Nylund-Gibson & Choi, 2018).

Given the low variability of the health behavior indicators, sensitivity analyses were conducted. Health-risk behavior variables were combined to indicate any vs. none of the behaviors. Health-promoting behaviors (i.e., sufficient food intake and optimal sleep) and preventive care variables (i.e., regular checkup and flu vaccination) were combined to indicate satisfaction of both. Other recoding schemes were also employed to increase variability of indicators in a series of analyses. The classification and overall characteristics of the classes, as reported in this study, were confirmed with slight changes in item-response probabilities of indicators and the distribution of classes by the most likely class membership in the sample.

Findings

Latent Classes of Health Behavior and Healthcare Barriers

While comparing the one- to six-class LCA model, we determined that the four-class model was the best fit empirically and substantively. As shown in Table 1, The BIC is the lowest with four classes while AIC with six classes. On the other hand, LMR-LRT indicates the two-class model is preferable to the three-class model ($p = 0.6$) and suggests that an additional class does not improve the model fit from the three-class model and on. Considerations were placed in substantive interpretability based on known experiences of LGBT older adults and the fact that AIC tends to overestimate models with more classes. The two-class model was determined to be too simplistic. Although the entropy of the 4-class model is less optimal (= 0.7), the average diagonal posterior probabilities are 0.82 which is higher than 0.80, a cutoff for acceptable diagonal probabilities (Weller et al., 2020) and indicates good separation of the classes. Each class was interpreted in relative terms to the other classes, ensuring that the identified classes reflect plausible patterns derived from the experiences or perceptions of LGBT older adults regarding their relationships with health behavior and healthcare access.

Figure 1 presents the class conditional probabilities of the 14 indicators for each class. *Class* 1, *healthy behaviors and minimal barriers*, consists of 39% and is characterized with average probabilities of health-risk behaviors (smoking 9%, excessive drinking 30%, and nonmedical drug use 12%), high probabilities of health-promoting behaviors (physical activity 76%, sufficient food intake 92%, and optimal sleep hours 83%), high probabilities of preventive care use (regular checkup 89% and flu vaccination 77%), and minimal healthcare barriers (financial barrier 8%, unavailability of LGBT-friendly services 0%, distrust in healthcare 0%, low health literacy 13%, postponement of care 13%, and unwillingness to receive care 8%).

Class 2, *less healthy behaviors and high barriers*, consist of 31% and has higher-than-average probabilities of risk-taking behaviors (smoking 14%, excessive drinking 30%, and nonmedical drug use 21%), lower-than-average probabilities of health-promoting behaviors (physical activity 63%, sufficient food intake 74%, optimal sleep hours 72%) and preventive care use (regular checkup 77% and flu vaccination 56%), high probabilities of healthcare barriers (financial barrier 73%, unavailability of LGBT-friendly services 47%, distrust in healthcare 70%, low health literacy 78%, postponement of care 83%, and unwillingness 29%).

Table 1 Fit statistics of LCA models

Model	AIC	BIC	Entropy	LMR-LRT
1 Class	34246.403	34326.948	-	-
2 Classes	32463.640	32630.482	0.711	$\boldsymbol{p < 0.001}$
3 Classes	32347.990	32601.131	0.667	$p = 0.577$
4 Classes	32248.302	32587.74	0.681	$p = 0.707$
5 Classes	32170.818	32596.555	0.679	$p = 0.817$
6 Classes	32102.803	32614.837	0.640	$p = 0.736$

AIC Akaike Information Criterion, *BIC* Bayesian Information Criterion, *LMR-LRT* Lo-Mendell-Rubin likelihood ratio test

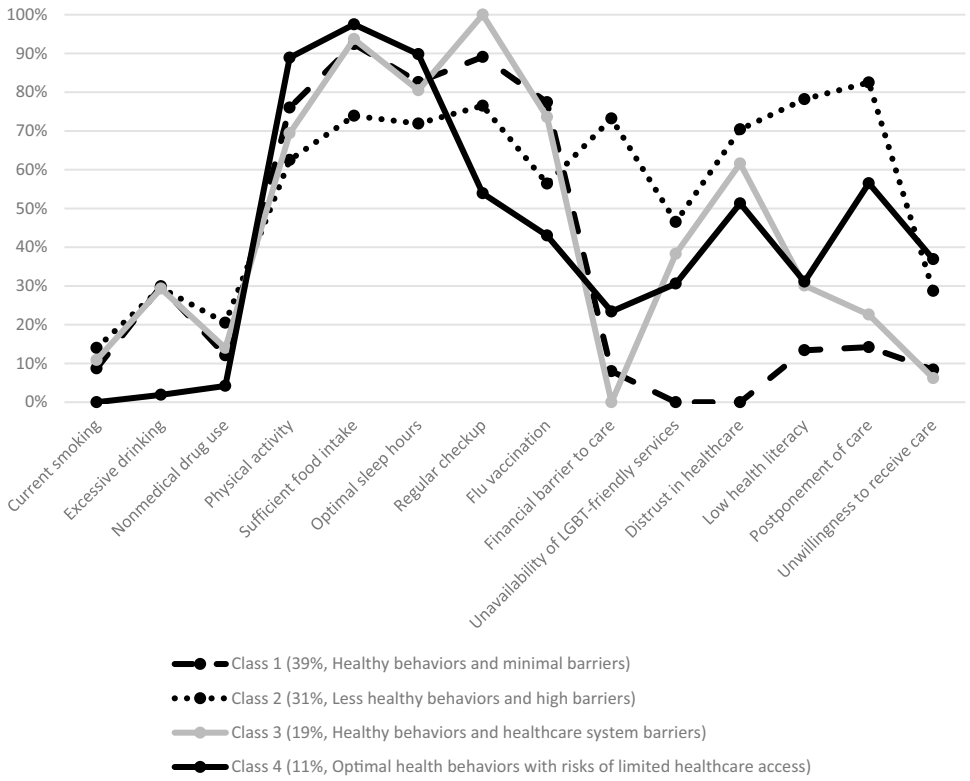

Fig. 1 Class conditional posterior probabilities of health behaviors and healthcare barriers

Class 3, *healthy behaviors and healthcare system barriers*, consists of 19% and is similar to Class 1 in that they have average probabilities of health-risk behaviors (smoking 11%, excessive drinking 29%, and nonmedical drug use 14%) and high probabilities of health-promoting behaviors (physical activity 69%, sufficient food intake 94%, and optimal sleep hours 81%) and preventive care use (regular checkup 100% and flu vaccination 74%). This class, however, has higher probabilities of healthcare system barriers, i.e., unavailability of LGBT-friendly services (38%), distrust in healthcare (62%), and low health literacy (30%) while their probabilities of the other barriers were low (financial barrier 0%, postponement of care 23%, and unwillingness to receive care 6%).

Class 4, *optimal health behaviors with risks of limited healthcare access*, is the least prevalent (11%) and characterized with minimal probabilities of health-risk behaviors (smoking 0%, excessive drinking 2%, and nonmedical drug use 4%), high probabilities of health-promoting behaviors (physical activity 89%, sufficient food intake 98%, and optimal sleep hours 90%), low probabilities of preventive care use (regular checkup 54% and flu shot 43%), and moderate probabilities of healthcare barriers (financial barrier 23%, unavailability of LGBT-friendly services 31%, distrust in healthcare 51%, low health literacy 31%, postponement of care 57%, and unwillingness to receive care 37%).

Physical and Psychological HRQOL by Class Membership

Table 2 presents mean differences in physical and psychological HRQOL by the latent classes. *Class 1* (*healthy behaviors and minimal barriers*) had significantly higher physical (mean difference [MD] = 8.3) and psychological HRQOL (MD = 10.0) than *Class 2* (*less healthy behaviors and high barriers*) and higher physical HRQOL (MD = 5.8) than *Class 3* (*healthy behaviors and healthcare system barriers*). However, no differences were found when comparing with *Class 4* (*optimal health behaviors with risks of limited healthcare access*). *Class 4* also had higher physical and psychological HRQOLs than *Class 2* (MD = 16.0 and 10.7) and higher physical HRQOL (MD = 13.5) than *Class 3*. *Class 2* had lower psychological HRQOL (MD = −5.7) than *Class 3*.

Predictors of Class Membership

Table 3 presents the multinomial regression findings that predict class membership by predictors and covariates with *Class 1* set as the reference. The probability of *Class 2* membership was associated with several predictors while *Classes 3* and *4* did not have statistically significant predictors compared with *Class 1*.

Table 2 Mean differences in physical and psychological HRQOL by healthcare behavior and barrier classes, B (SE)

	[Class 2] *Less healthy behaviors and high barriers*	[Class 3] *Healthy behaviors and healthcare system barriers*	[Class 4] *Optimal health behaviors with risks of limited healthcare access*
[Class 1] *Healthy behaviors and minimal barriers*			
Physical	−8.3 (2.3)***	−5.8 (2.9)*	7.7 (6.3)
Psychological	−10.0 (2.1)***	−4.3 (2.2)	0.7 (3.0)
[Class 2] *Less healthy behaviors and high barriers*			
Physical	-	2.5 (3.1)	16.0 (5.7)**
Psychological	-	5.7 (2.6)*	10.7 (2.8)***
[Class 3] *Healthy behaviors and healthcare system barriers*			
Physical	-	-	13.5 (6.1)*
Psychological	-	-	4.9 (3.2)

Rows serve as reference category

HRQOL health-related quality of life

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

One year increase in age, having lower education (i.e., high school or less), and self-identified as men (vs. women) were associated with reduction in the odds of belonging to *Class* 2 as compared with *Class 1* by 10% (AOR = 0.9), 70% (AOR = 0.3), and 60% (AOR = 0.4), respectively. People of color had higher odds of belonging to *Class 2* (AOR = 2.5) and *Class 3* (AOR = 3.7) as compared to *Class 1*. The significant association of younger age and membership in *Class 2* was also found when *Class 3* was set as reference.

Regarding the HEPM factors, day-to-day discrimination was positively associated with membership in *Class 2* (AOR = 2.0) when compared with *Class 1* and *Class 3*. Mastery and social support were negatively associated with *Class 2* membership (vs. *Class 1*), with one point increase in mastery (AOR = 0.6) or social support (AOR = 0.6) associated with 40% reduction in the odds of *Class 2* membership comparing to *Class 1*.

Discussion

Significance of the Study

This is the first study to examine heterogeneous clusters of LGBT older adults according to distinct patterns of health behaviors and healthcare barriers and identify at-risk groups in terms of disadvantages in HRQOL. Of the four latent classes that have emerged in this study, one class (C2) was found at-risk with characteristics of less healthy behaviors and higher barriers and had lower HRQOL both physically and psychologically. The other at-risk class (C3) had healthy behaviors, but the healthcare system barriers were high. They had lower physical HRQOL than the class (C1) with healthy behaviors and minimal healthcare barriers. The class, C4, showed healthy behaviors at the highest levels and nearly no health-risk behaviors despite relatively high healthcare barriers, and their HRQOL was similar to the healthiest class (C1). The results demonstrate the importance of improving both health behaviors and healthcare access for LGBT older adults, and the need to examine them simultaneously from a person-centered perspective to understand their complex interconnectedness and to identify clusters at risk of poor health and predictors of those clusters. This reflects the recent development of health behavior research, applied to an underrepresented population, LGBT older adults, with more emphasis placed on environmental and interpersonal factors beyond intrapersonal considerations (Baum & Fisher, 2014; Healthy People 2030, n.d.). It is important to note that three out of the four classes, except for the healthiest class (C1), had elevated levels of healthcare barriers, which may be associated with their life experiences of bias and discrimination.

Resilience of LGBT Older Adults

We found that the most prevalent was the healthiest cluster with many protective behaviors and minimal healthcare barriers (Class 1). They represent a desirable pattern of health-promoting behaviors and preventive care use with average health-risk behaviors. The most distinguishable characteristics were their extremely low likelihoods of healthcare barriers. Many LGBT older adults experience limited availability of LGBT affirmative providers (Romanelli et al., 2018) and a heightened risk of financial barriers to healthcare (Fredriksen-Golden et al., 2017b) with increased reliance on informal care from friends and family of choice due to experiences of healthcare discrimination (Waling et al., 2022). LGBT older adults in this cluster might reside in a supportive environment where LGBT affirmative health services are available, accessible, and affordable. In addition,

Table 3 Multinomial logistic regression of the latent classes of health behaviors and healthcare barriers based on Health Equity Promotion Model (HEPM) predictors

	Sample characteristics	[Class 2] *Less healthy behaviors and high barriers*	[Class 3] *Healthy behaviors and healthcare system barriers*	[Class 4] *Optimal health behaviors with risks of limited healthcare access*
	% (*n*)	AOR (SE)	AOR (SE)	AOR (SE)
Background				
Age, *m* (*se*)	61.3 (0.2)	0.9 (0.0)*	1.0 (0.0)	1.0 (0.1)
Income ≤ 200% FPL	35.5 (818)	1.7 (0.5)	0.9 (0.4)	0.6 (0.5)
High school or less	24.6 (199)	0.3 (0.1)*	0.8 (0.3)	0.4 (0.5)
Partnered/married	51.1 (1037)	0.9 (0.3)	0.7 (0.3)	0.8 (1.3)
People of color	22.8 (517)	2.5 (1.1)*	3.7 (2.2)*	2.9 (2.1)
Gender (Ref: women)	43.0 (944)			
Men	51.0 (1316)	0.4 (0.1)**	0.7 (0.3)	0.2 (0.2)
Gender diverse	6.0 (60)	1.3 (1.2)	14.4 (23.9)	8.1 (16.6)
Transgender	17.0 (197)	0.8 (0.4)	0.1 (0.1)	0.3 (0.3)
Sexual identity (Ref: LG)	72.3 (1995)			
Bisexual	17.3 (202)	1.1 (0.6)	0.9 (0.5)	3.2 (3.4)
Sexually diverse	10.4 (120)	0.9 (0.6)	1.3 (0.9)	0.6 (0.9)
Disability	47.3 (1074)	2.3 (0.7)**	1.2 (0.5)	1.0 (0.7)
Depressive symptomatology	37.5 (727)	3.6 (1.1)***	0.9 (0.4)	0.6 (0.4)
Environmental				
Lifetime discrimination and victimization, *m* (*se*)	6.6 (0.3)	1.0 (0.0)	1.0 (0.0)	1.0 (0.1)
Day-to-day discrimination, *m* (*se*)	1.0 (0.0)	2.0 (0.4)**	1.1 (0.3)	1.3 (0.7)
Psychological				
Identity stigma, *m* (*se*)	1.7 (0.0)	1.0 (0.2)	1.3 (0.3)	1.6 (0.8)
Mastery, *m* (*se*)	4.5 (0.0)	0.6 (0.1)*	1.0 (0.2)	0.9 (0.3)
Social				
Social support, *m* (*se*)	2.7 (0.0)	0.6 (0.1)**	0.9 (0.2)	1.0 (0.4)
Community engagement, *m* (*se*)	3.9 (0.0)	0.9 (0.1)	0.8 (0.1)	0.8 (0.2)

The first column presents the weighted distribution of the sample characteristics with unweighted *n*. Multinomial logistic regression were performed with Class 1 (*healthy behaviors and minimal barriers*) as the reference class

HEPM Health Equity Promotion Model, *AOR* adjusted odds ratio, *FPL* federal poverty line, *Ref.* reference group, *LG* lesbian or gay

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

they seem actively engaged in seeking and receiving needed care including preventive health services from the healthcare system with high health literacy. As a resilient group, they exemplify the importance of highlighting resources and strengths of LGBT older adults beyond challenges and risks associated with their minority stress (Meyer, 2003).

A Need to Build Trust and Mitigate Barriers to Healthcare System

On the other hand, there was a group of LGBT older adults with similar healthy behaviors and preventive care use, but with higher probabilities of healthcare system barriers such as unavailability of LGBT-friendly services, distrust in healthcare, and low health literacy. It is important to note that their positive health behavioral characteristics co-exist with significant perceived barriers to healthcare. Their perceived unavailability of LGBT-friendly services may be associated with the cultural and clinical competency gap of the US healthcare system (Bonvicini, 2017). Low health literacy and distrust in healthcare are major obstacles to health communication and health access, specified areas of focus for the HealthyPeople 2030 (n.d.). Importantly, these elevated healthcare barriers seem to be a contributing factor to their decreased physical HRQOL compared with Class

1 while the psychological HRQOLs are comparable possibly due to psychological and emotional benefits of their health-promoting behaviors (Cairney et al., 2009). It is implied that the prevalent use of preventive care accompanied with healthy behaviors may not translate to better physical HRQOL because the preventive care they are receiving may not reflect quality care nor lead to obtaining further care possibly due to the perceived healthcare barriers observed in this class. Quality and patient-centered care is a focus of improvement in the US healthcare system for its direct linkage to health outcomes (Pantaleon, 2019), but this is particularly important given the discrimination and insensitive treatment often experienced by LGBT people in healthcare (Ayhan et al., 2020). Efforts to build culturally competent and inclusive healthcare systems are critical to build trust and equity in the care system.

Compensating for Not Obtaining Healthcare with Proactive Health Behaviors

Although this cluster of LGBT older adults demonstrated similar probabilities of unavailability of LGBT-friendly services, distrust in healthcare, and low health literacy to Class 3, it was unique from other classes with nearly nonexistent risk behaviors and very high probabilities of health-promoting behaviors. Surprisingly, however, as opposed to Class 3, their use of preventive care was low and their postponement and unwillingness to receive care were highly probable, but HRQOLs were comparable with the healthiest cluster. This small group of LGBT older adults may not yet have significant healthcare needs and thus forgo getting health services. They may be compensating for not obtaining healthcare with their proactive health behaviors, and their HRQOLs show this strategy may have been effective so far. However, it is yet unknown if this HRQOL invariance would continue as their healthcare needs emerge. If they persist, these elevated healthcare barriers of all types examined in this study may accelerate deterioration of physical and psychological health of LGBT older adults in this cluster. It will be important for future research to investigate the long-term trajectories using longitudinal data and for the healthcare system and all stakeholders to strive to alleviate the barriers.

At-Risk Class and Multiple Disadvantages

One cluster of LGBT older adults showed disadvantages in all four dimensions with higher-than-average probabilities of health-risk behaviors, low probabilities of health-promoting behaviors and preventive care, and the highest probabilities of healthcare barriers, and their HRQOLs were significantly lower than the other classes both physically and psychologically.

Predictors of the At-Risk Class Membership Based on the Health Equity Promotion Model

Membership in this class was associated with younger age, people of color, women, day-to-day discrimination, lower social support, and lower mastery. Women being more likely to belong to this class is consistent with the previous knowledge that LGBT older women tend to have broader health disparities than LGBT older men when comparing with heterosexual cisgender counterparts (Fredriksen-Goldsen et al., 2017a, b). The modifiable predictors including social support and mastery in addition to measures to mitigate day-to-day discrimination may be used to build efforts to reduce this gender gap. Drawing on the HEPM that addresses diverse life-course factors, future studies are warranted on gender interactions in the effects of these modifiable factors on the latent clusters.

This study is consistent with the HEPM framework in that marginalization experiences are associated with negative health behaviors and subsequently adverse health outcomes and well-being (Fredriksen-Goldsen et al., 2017a). Membership in the at-risk class was significantly associated with more frequent day-to-day discrimination although not with lifetime discrimination and victimization, which also aligns with previous empirical knowledge where lifetime marginalization effects tend to be overridden by contemporary marginalization effects (Prasad et al., 2020). Social support and mastery were also protective by increasing probabilities of being classified into the healthiest class, aligning with their positive effects on health behaviors and health outcomes via reduced mental distress as found previously (Fredriksen-Goldsen et al., 2017a). Programs and interventions to booster mastery and strengthen social support among LGBT older adults have great importance. Many LGBT older adults have friends or LGBT community members as their social support rather than biological families (Kim et al., 2017). Programs to help them unite and build strong community should continue to be developed and implemented to support each other and expand their social boundaries as needed in resisting marginalization and educating others in society to reduce day-to-day discrimination.

An unexpected finding of this study is the increased odds of being classified into the at-risk class with higher education level. Although it is known that higher education among LGBT people is not necessarily associated with financial advantage (Fredriksen-Goldsen et al., 2017a, b), this finding, i.e., the lack of advantage or the disadvantage of education is not typical and contrasts with existing knowledge that higher education is associated with higher access to resources in healthcare, including health literacy (Paasche-Orlow et al.,

2005). Their unique life experiences associated with their minority status such as marginalization might operate in this unexpected association: effects of education vary by racial/ethnic groups according to the Minorities' Diminished Returns Theory (Assari, 2017); more education may lead to increased perception of discrimination (Hausman et al., 2008) and further have negative effects on health and behavior among minorities according to John Henryism (Hudson et al., 2016), which posits that increased and prolonged exposure to stress from perceived discrimination and corresponding coping efforts can have physiological costs (James et al., 1983). More research is needed to fully understand the relationship between education and barriers to healthcare among LGBT older adults.

Addressing Intersectionality

LGBT older adults of color had increased odds of being classified into the at-risk class with lower physical HRQOL than non-Hispanic Whites, which may reflect the cumulative disadvantages associated with marginalization over lifetime (Cyrus, 2017). The intersectionality of their social identities, being both racial/ethnic and sexual/gender minority, and corresponding experiences may manifest themselves in their health behaviors and healthcare barriers such as distrust in the system. Musa et al. (2009) posited that distrust in doctors/healthcare among people of color might well be conceptualized as institutional rather than intrapersonal distrust considering oppressing societal systems against them. Augmented disadvantages stemming from intersecting minority identities of being LGBT and racial and ethnic minorities, and associated experiences stemming from inequality, oppression, and such power dynamics may result in their outstanding perception of healthcare-related barriers, health-risk behaviors, and compromised health outcomes. Research and practice efforts on multiply-disadvantaged social statuses are at the forefront of endeavors addressing the SDOH. The complexities of intersectionality, cumulative bias experiences, and associated adverse outcomes regarding health behaviors, healthcare barriers, and health outcomes should continue to be studied to tailor intervention efforts for the best possible trajectories of equitable health across the disadvantaged communities.

Implications for Clinical Practice and Health Promotion

This study emphasizes the importance of addressing health behaviors and healthcare barriers concomitantly in identifying different risk groups among LGBT older adults and providing customized health-promoting practices. While variable-centered studies found a positive association between healthy behaviors and healthcare access (e.g., McKirnan et al., 2013), this study suggests that positive health behaviors may or may not accompany access to and trust in healthcare system. Barriers to care are also multilayered, even without considering the impact of health behaviors. Some types of barriers may center around reluctance to or delaying receiving care and other barriers may be associated with the lack of resources or distrust. The healthcare system needs to comprehensively assess LGBT patients' resources and needs, weakness and strengths, and advantages and disadvantages and provide care and resources based on specific outcomes. Above all distinct circumstances and situations, however, improvement on competency with sexual and gender minorities and equitable operations across diverse populations including LGBT older adults is critically needed. Accessible and welcoming healthcare can be effective and efficient sources to establish health-promoting behaviors and to mitigate health-risk behaviors, not to mention, to facilitate use of preventive care and other needed care in time. Furthermore, programs and interventions to booster mastery and strengthen social support are needed. Development of a community or social gatherings within healthcare systems and among patients with the same conditions may reduce barriers, strengthen health-promoting behaviors and social support, and encourage others to combat discrimination, including implicit biases.

Limitations and Future Studies

There are limitations to be noted. We used cross-sectional data so the findings do not imply causality. Future longitudinal studies can test causality and further clarify potential changes and trajectories in the latent classifications as the participants' age. Qualitative studies may be useful to further explore the meaning of the quantitative finding of this study. Study variables were measured by self-reports, so any limitations inherent in retrospective self-reports apply, including imperfect memory. Future studies using data that have sufficient variability in other indicators would expand our understanding, including having healthcare coverage, a primary physician and the nature of the relationship, and engagement in wellness activities, social or aging-related services, and other types of preventive care. Lastly, replication studies are needed for generalizability. Sensitivity analyses produced some changes in the distribution of the classes in the sample, e.g., an increase of the healthiest class and a decrease of the at-risk class.

Conclusion

This study provides an important foundation on which to build future research on health behaviors and healthcare access and barriers. Based on the finding that different social locations, bias experiences, psychological, and social

factors are all associated with class memberships of health behaviors and healthcare barriers, future studies can expand on other potentially influencing variables from the HEPM framework to better identity and understand modifiable factors and implement interventions addressing them. The finding that six out of ten LGBT older adults have healthy behaviors, i.e., low health-risk and high health-promoting behaviors and high use of preventive care, is important to recognize. Simultaneously however, efforts to mitigate healthcare system barriers among LGBT older adults, associated with low use of preventive care, compromised quality of care, and adverse health outcomes are critically needed. Positive health behaviors are not necessarily linked to use of preventive care nor to perception of accessible healthcare, and not necessarily associated with positive health outcomes depending on other resources or barriers, which highlights the importance of employing person-centered approaches to address multi-dimensional factors that potentially predict health outcomes and quality of life.

Funding Research reported in this presentation was supported by the National Institute on Aging of the National Institutes of Health under Award Number R01AG026526 (Fredriksen-Goldsen, PI). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Declarations

Ethics Approval This study was performed in accordance with the principles of the 1964 Declaration of Helsinki and its later amendments and approved by the Institutional Review Board of University of Washington (STUDY00000266).

Consent to Participate Informed consent was obtained from participants.

Conflict of Interest The authors declare no competing interests.

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