Patterns of Risky Health Behaviors and Associations With Chronic Diseases Among Young Adult Nursing Students: A Latent Class Analysis

Chaoqun DONG1,7 • Hua CHEN2,7 • Yeqin YANG3 • Yi Li4 • Yumei SUN5 • Hongyu SUN6•

ABSTRACT

Background: Little is known about how health behaviors cluster to form meaningful patterns that influence health outcomes in young adult nursing students.

Purpose: The purpose of this study was to identify the unique health behavior patterns among young adult nursing students in China and examine the associations between health behaviors and chronic diseases.

Methods: Using an electronic app, the achievements of an exercise target, sedentary behavior, smoking and drinking, and dietary patterns were assessed in 1,480 nursing student participants aged 18–24 years from two medical universities in Eastern China.

Results: A four-class model was developed using latent class analysis that included the “failure to achieve exercise target, alcohol-drinking, and insufficient fruit and vegetable group” (Group 1, n = 187, 12.6%), the “alcohol-drinking and sedentary behavior group” (Group 2, n = 290, 19.6%), the “sedentary behavior only group” (Group 3, n = 721, 48.7%), and the “failure to achieve exercise target only group” (Group 4, n = 282, 19.1%). Logistic regressions indicated that nursing students in Group 2 (odds ratio [OR] = 0.42), Group 3 (OR = 0.51), and Group 4 (OR = 0.30) were less likely to have chronic diseases than those in Group 1 after adjusting for sociodemographic variables.

Conclusions: The health behaviors were clustered in different patterns among young adult nursing students. Tailoring interventions to specific groups is suggested to improve health outcomes.

Key Words: latent class analysis, young adults, nursing students, chronic disease, health behavior.

Introduction

Chronic diseases are a leading cause of death worldwide (Williams et al., 2018). The prevalence of chronic diseases among Chinese adolescents and young adults ranged from 25.8% to 36.6% (Ren & Li, 2022), and chronic diseases ranked among the major causes of death and disability-adjusted life years lost among young adults (Zhou et al., 2019). Chronic diseases are associated with behavioral, biological, and environmental factors (Ma et al., 2017). Health risk behaviors, such as tobacco and alcohol use, reduced physical activity, unbalanced and irregular meals, and sedentary behavior, have been associated with higher risks for cardiovascular diseases, respiratory disorders, chronic gastrointestinal illness, cancer, and other chronic diseases (Caprara, 2021). Furthermore, current evidence supports an association between active smoking and asthma and higher aerobic fitness with a lower risk of cardiovascular diseases (Jaakkola et al., 2019).

Most health-risk behaviors begin to form or consolidate during adolescence and young adulthood but are still modifiable (Tomlinson et al., 2019). Hence, adolescence and young adulthood are unique developmental periods that present ideal opportunities to intervene by instilling healthy lifestyles that will be carried on into later adulthood. For example, an individual in early adulthood who is encouraged to abstain from alcohol use may be more likely to practice moderate alcohol use in later life (Daw et al., 2017). Therefore, making appropriate investments at these periods provides a good chance for young adults to improve their life quality throughout their lifetime (World Health Organization, 2017). It has been proposed that health professionals who do not engage in risky behaviors may provide a role model for their patients to improve their health (Darch et al., 2019). Nursing students will be health professionals in the near future. It is important for them to maintain healthy behaviors that will allow them to have positive impacts on their own health and the health of others (Rodriguez-Gazquez et al., 2017). However, prior studies have found that more than half of young adult nursing
students earn low scores in health-promoting behaviors (Bryer et al., 2013; Park et al., 2015). Therefore, promoting healthy lifestyles targeting this population is a priority.

It has been reported that health behaviors are often interrelated and co-occurring (Hobbs et al., 2018; Silva et al., 2019). For instance, Kritsotakis et al. (2016) reported that only 0.3% of freshmen at a Greek university had one or fewer risk behaviors, whereas 22.3% had 10 or more risk behaviors. Hence, the collective and organized pattern of interrelated behavior based on unobservable knowledge and norms is termed the health lifestyle (Cockerham, 2005). Previous research documenting the association between health behaviors and health outcomes has focused mainly on one or individual categories of health behaviors (Agaba et al., 2019). The simultaneity of different risk behaviors may result in a multiplicative and deleterious effect rather than an additive effect from each behavior. Investigating a single health behavior is insufficient to provide insights into the distinct ways that multiple health behaviors cluster into meaningful patterns to influence health outcomes. Therefore, it is essential to explore the unobserved patterns of health behaviors to examine their associations with chronic diseases. A systematic review identified clustering between smoking and excess alcohol consumption and between an unhealthy diet and smoking in the general population (Vermeulen-Smit et al., 2015). Studies focusing on adolescents have also reported clustering between consuming an unhealthy diet and physical inactivity (Tabacchi et al., 2018) and between alcohol consumption and poor dietary habits (Assanangkornchai et al., 2018). Moreover, an association between a cluster of multiple risk behaviors with mental health symptoms has been reported among young adults in Australia (Champion et al., 2018).

Latent class analysis (LCA), a person-centered technique aimed at identifying homogeneous, mutually exclusive classes in a heterogeneous population based on similar patterns of responses (Lanza & Rhoades, 2013), enables the simultaneous investigation of multiple health-risk behaviors. A person-centered approach moves beyond observed combinations of behaviors to identify specific latent types of participants based on their behaviors (Meeusen et al., 2017), which may offer more insight than provided using a variable-centered approach. Regression models are typical of the latter (Lanza & Rhoades, 2013). LCA is more appropriate for analyzing the associations and interactions between different kinds of behavior variables (Miranda et al., 2019) and is increasingly used to reduce a potentially large number of behavioral combinations into a smaller number of behavioral classes (Noble et al., 2015). Applying LCA to define discrete health behaviors, instead of considering them as a single behavior in behavior-disease relationships, is helpful in avoiding Type I errors (Hagenaars & McCutcheon, 2002). Although several studies have used LCA to determine the patterns of risk behaviors in college and university students (Hutchesson et al., 2021; Jao et al., 2019; Nazar et al., 2019), only one used LCA to explore clustered health behavior patterns among nursing students, subsequently identifying four subtypes of health risks, ranging from low to very high health risk (Macedo et al., 2020). However, to the best knowledge of the authors, no study has systematically updated information on the disparities in the health lifestyle patterns of young adult nursing students and the relationship of these patterns with chronic diseases in China.

Therefore, this study was designed to (a) identify the distinct health-related lifestyle patterns of young adult nursing students in China and (b) examine the associations between different health-related lifestyle patterns and chronic diseases to detect the most at-risk subgroups. This knowledge may be used to inform the development of tailored intervention programs in the design of nursing degrees to improve the health behaviors of nursing students and to indirectly improve the role of nurses as health promoters.

Methods

Study Design and Participants
A cross-sectional survey study was conducted from April 1 to May 30, 2019. A total of 1,576 nursing students from two medical universities in Eastern China were recruited via convenience sampling. The inclusion criteria were as follows: (a) aged 18–24 years and (b) being a student currently enrolled in a full-time associate or baccalaureate degree nursing program. The exclusion criteria were as follows: (a) suffering from a mental disorder, (b) being diagnosed with a congenital disorder (such as congenital heart disease), and (c) unwilling to provide informed consent.

The participants were asked to complete a self-reported electronic questionnaire via a smartphone app named “residential e-health.” This study was approved by the biomedical ethics committee of Peking University on March 25, 2019 (IRB00001052-19018). All of the participants provided informed consent. Of the 1,576 nurses who enrolled as participants, 1,480 completed the questionnaires and provided valid data (response rate: 93.9%).

Data Collection

Sociodemographic characteristics
The sociodemographic characteristics included the gender, age, academic degree program, family monthly income, hometown region, and medical insurance of the participants. Self-reported body weight and height were used to calculate the body mass index (BMI; kg/m²). The following BMI cutoff points were used: underweight (< 18.5 kg/m²), normal weight (18.5–23.9 kg/m²), and overweight (≥ 24 kg/m²; He et al., 2015).

Health behaviors
Seven questions encompassing the four health behavior domains related to habitual daily living activities were used, including (a) achieving exercise targets (vigorous-intensity activity...
and moderate-intensity activity), (b) sedentary behavior, (c) substance use (smoking and alcohol drinking), and (d) dietary behavior (meal regularity, fruit, and vegetable consumption).

To determine the achievement of exercise targets, the participants were asked to indicate during how many days over the past 7 days and for how long (in minutes) they had performed vigorous-intensity activities (e.g., heavy lifting, digging, aerobics, fast bicycling) and moderate-intensity activities (e.g., carrying light loads, bicycling at a normal speed, playing double tennis; excluding walking) each day. Participants who achieved the exercise target were dichotomized into regularly active (reporting ≥75 minutes/week in vigorous-intensity activities or ≥150 minutes/week in moderate-intensity activities) and inactive (reporting <75 minutes/week in vigorous-intensity activities or <150 minutes/week in moderate-intensity activities; O’Donovan et al., 2017).

Sedentary behavior was assessed using the response to a single question: “How many hours do you spend sitting per day?” Although international sedentary time guidelines/thresholds are not currently available, participants in this study were classified into sedentary (sitting for 8 or more hours per day) and nonsedentary (sitting for less than 8 hours per day) based on the previously noted positive association between sedentary time and health risks (Ekelund et al., 2016).

Smoking was assessed using the single item: “Have you ever smoked?” Possible responses included “never smoked,” “smoked but have quit smoking for at least 6 months,” “sometimes smoke,” and “smoke every day.” Those who have never smoked or had quit smoking for at least 6 months were defined as “nonsmoking,” whereas those who had smoked during the last 6 months were defined as “smoking.”

A single item was used to assess alcohol consumption: “Have you consumed alcohol during the previous 12 months?” The four response options were as follows: “no,” “not more than once a month,” “2–4 times per month,” and “more than 5 times per month.” Those who self-reported as “no” and “not more than once a month” were considered nondrinkers, whereas the others were considered drinkers.

With regard to fruit and vegetable consumption, participants were asked “How often do you usually eat fruits/vegetables?” The response options were “never,” “1–2 days/week,” “3–4 days/week,” “5–6 days/week,” and “every day.” Responses were dichotomized to sufficient (≥5 days/week) versus insufficient fruit/vegetable intake (≤4 days/week; Binns et al., 2017).

Meal regularity was measured using the question: “Do you eat three meals regularly each day?” The responses were categorized as “regular,” which indicated that the meal time and meal frequency were consistent every day, and “irregular,” which indicated that the meal time and meal frequency differed each day.

Chronic diseases
Chronic diseases were assessed using the question “Have you ever been diagnosed with the following diseases: hypertension, coronary heart disease, diabetes, cerebrovascular diseases, chronic gastritis, gastric ulcer, asthma, chronic obstructive pulmonary disease, or others (please specify)?” Participants with one or more of these chronic diseases received a score of 1. Otherwise, they received a score of 0.

Statistical Analysis
Descriptive statistics for the demographic characteristics and comparisons across groups were analyzed using IBM SPSS Statistics Version 22.0 (IBM Corp., Armonk, NY, USA). Mean and standard deviation or frequency and percentage were used as appropriate to present the sociodemographic results.

A three-step LCA, which takes into account classification errors, was conducted using Mplus Version 7.4 (Muthén and Muthén, 1998–2015) to identify unobserved classes of health lifestyles. LCA models with one to six classes were generated, with the final number of classes determined based on the conceptual meaning, statistical model fit indices (Nylund et al., 2007) such as the Akaike information criterion (AIC), Bayesian information criterion (BIC), and adjusted BIC (aBIC). Lower values of AIC, aBIC, and BIC indicate a better model fit. The bootstrap likelihood ratio was examined to identify whether a k-class model fit better than a model with k – 1 classes. Model quality with the inclusion of covariates was evaluated with likelihood ratio tests (G²). Latent classes with less than 5% of the total sample were not considered because of the possibility of class overextraction and poor generalizability (Bauer & Curran, 2003). For illustrative purposes, two additional fit criteria including the chi-squared goodness-of-fit test (χ²) and entropy were presented, with higher values for entropy indicating better fit. In this study, probability values of .50 or lower were considered low probability, probability values between .50 and .75 were considered moderate, and probability values of .75 or higher were considered high for interpretation purposes (de Vries et al., 2008).

Furthermore, bivariate and multinomial logistic regressions were employed to examine the distribution and associations with demographic characteristics among the identified latent classes. Binary logistic regression was used to explore the association between the identified latent classes and chronic illness. The association was presented in terms of odds ratios (ORs) and 95% confidence interval (CI) for the factors, with significance determined when p < .05 (two-tailed).

Results
As shown in Table 1, the 1,480 participants (352 men, 1,128 women) had a mean age of 19.69 (SD = 1.10) years. The hometowns of 1,226 (82.8%) were located in either Southern or Eastern China. The family monthly income of 1,151 (77.8%) was higher than 2,000 RMB (equivalent to 285 USD as of December 22, 2019), and 1,153 (77.9%) had medical insurance. With regard to BMI, 267 (18.0%) were underweight, 997 (67.4%) were of normal weight, and 216 (14.6%) were overweight. Seventy-eight (5.3%) reported
having a chronic disease condition, specifically hypertension \((n = 15)\), hyperlipidemia \((n = 4)\), Type 2 diabetes mellitus \((n = 1)\), chronic gastritis \((n = 44)\), gastric ulcer \((n = 6)\), asthma \((n = 3)\), irritable bowel syndrome \((n = 4)\), and inflammatory bowel disease \((n = 1)\).

The percentages of participants who did not participate in vigorous-intensity activity and moderate-intensity activity were 44.3% and 38.9%, respectively, and 61.1% reported being sedentary. The prevalence of smoking and alcohol consumption was 10.5% and 31.6%, respectively. Most of the participants (85.2%) reported eating regular meals each day, and 52.1% reported insufficient fruit intake.

### Clustering of Health Behaviors

A latent class model with seven manifest variables (vigorous-intensity activity, moderate-intensity activity, sedentary behavior, smoking, drinking, meal regularity, and fruit and vegetable consumption) was generated. The model fit statistics for each model are shown in Table 2. The four-class model resulted in the smallest AIC (10795.61), BIC (10959.91), and aBIC (10861.43), as well as significant \(p\) values for bootstrap likelihood ratio and the highest entropy (.792), indicating this model had overall superior metrics and enabled better interpretability of the classes as well. Therefore, the four-class LCA model was adopted. The latent class membership and response probabilities for each indicator are summarized in Table 3. Larger conditional probabilities are in bold print to highlight the overall pattern.

Group 1 \((n = 187, 12.6\%)\), the “failure to achieve exercise target, alcohol-drinking, and insufficient fruit and vegetable group,” was characterized by a high probability of alcohol drinking and insufficient fruit and vegetable intake, a low probability of vigorous-intensity and moderate-intensity activities, and a moderate probability of sedentariness compared with the other groups. Group 2 \((n = 290, 19.6\%)\), the “alcohol-drinking and sedentary behavior group,” was characterized by high probabilities of sedentariness, alcohol drinking, and vigorous-intensity and moderate-intensity activities. Group 3 \((n = 721, 48.7\%)\), the “sedentary behavior only group,” was characterized by relatively high probabilities of sedentariness, alcohol drinking, and vigorous-intensity and moderate-intensity activities. Group 4 \((n = 282, 19.1\%)\), the “failure to achieve exercise target only group,” was characterized by a pattern of relatively healthy dietary consumption and the lowest probabilities of physical activity, sedentariness, and cigarette and alcohol use.
Sociodemographic Factors Associated With Clustered Health Behaviors

The associations between latent classes and sociodemographic factors are shown in Table 4. Group 1 was used as the reference for analysis. This group was used because it clustered with the most risky health behaviors and represented the least healthy lifestyle pattern. The results showed that the participants in Group 2 had a lower probability of having an associate degree (OR = 0.60, 95% CI [0.37, 1.00]) and were more likely to have medical insurance (OR = 1.99, 95% CI [1.30, 3.06]) and be of normal weight (OR = 1.80, 95% CI [1.02, 3.18]) than their peers in Group 1. The participants with an associate degree (OR = 0.61, 95% CI [0.40, 0.93]) and medical insurance (OR = 2.48, 95% CI [1.71, 3.60]) were also more likely to be in Group 3 than in Group 1. Finally, participants from Northern and Western China were more likely to be in Group 4 (OR = 2.82, 95% CI [1.71, 4.66]) than in Group 1.

Associations Between Clustered Health Behaviors and Chronic Diseases

The percentages of participants with chronic diseases were 9.1%, 4.5%, 5.5%, and 2.8% for the four clustered health behavior patterns, respectively. Bivariate analysis revealed a significant association between latent classes of health behaviors and chronic diseases ($\chi^2(3) = 9.28, p = .026$). As shown in Table 5, Group 2 (OR = 0.47, 95% CI [0.22, 0.99]) and Group 4 (OR = 0.29, 95% CI [0.12, 0.69]) were associated with a lower risk of chronic illness than Group 1 in the unadjusted models. After adjusting for the effects of the sociodemographic variables, Group 1 still exhibited a higher risk of chronic illness than the other three groups.

Discussion

Four distinct health lifestyle patterns were identified in this study in a sample of young adult nursing students in China using LCA based on participants’ self-reported performance in terms of exercise, sedentary behavior, substance use, and eating habits. These patterns ranged from engaging in multiple health-risk behaviors such as smoking, alcohol drinking, physical inactivity, and insufficient fruit consumption to engaging in one health-risk behavior only. However, regardless of group membership, this study found a high prevalence of health-risk behaviors among nursing students, among which the most prominent were sedentary behavior (61.1%) and insufficient fruit consumption (52.1%). The findings are consistent with the results of previous research from different
countries indicating that nursing students are usually involved in sedentary behavior during their studies (Macedo et al., 2020; Thwaite et al., 2020) and that most young adults do not consume the recommended amount of fruit (Akbari & Azadbakht, 2014; Nour et al., 2017; Wattick et al., 2018).

Most of the participants reported having regular meals each day, which is encouraging given that this health behavior has been associated with better health outcomes. This finding contrasts with the high prevalence of meal irregularity previously reported among female college students (Alzamil et al., 2019) and may be attributable to the better dietary knowledge among these future health professionals. However, the self-evaluation of diet habits used in this study may underestimate the actual rate of meal irregularity. Therefore, internationally validated measures such as food frequency questionnaires should be used in future studies to better understand the eating habits of participants.

Another finding worth mentioning is the considerable participation of the participants in smoking and alcohol consumption. In this study, 31.6% and 10.5% of nursing students reported being current alcohol drinkers and smokers, respectively. Our data also provide evidence of the co-occurrence

Table 4
Comparisons Between Latent Classes on Sociodemographic Covariates and Risk for Chronic Diseases

| Variable                        | Group 2 vs. Group 1 | Group 3 vs. Group 1 | Group 4 vs. Group 1 |
|--------------------------------|---------------------|---------------------|---------------------|
| Age                            | −0.05 0.95 [0.80, 1.13] | −0.07 0.94 [0.81, 1.09] | −0.01 0.99 [0.84, 1.17] |
| Gender                         |                     |                     |                     |
| Male                           | −0.23 0.76 [0.49, 1.16] | −0.29 0.75 [0.51, 1.08] | −0.16 0.85 [0.56, 1.31] |
| Female                         | Ref                 | Ref                 | Ref                 |
| Academic degree program        |                     |                     |                     |
| Associate                      | −0.51* 0.60 [0.37, 1.00] | −0.50* 0.61 [0.40, 0.93] | −0.35 — |
| Bachelor                       | Ref                 | Ref                 | Ref                 |
| Income                         |                     |                     |                     |
| ≤2,000/month/person            | −0.23 0.79 [0.51, 1.23] | −0.32 0.72 [0.49, 1.06] | −0.24 0.79 [0.51, 1.23] |
| >2,000/month/person            | Ref                 | Ref                 | Ref                 |
| Insurance                      |                     |                     |                     |
| No                             | 0.69** 1.99 [1.30, 3.06] | 0.91*** 2.48 [1.71, 3.60] | 0.18 — |
| Yes                            | Ref                 | Ref                 | Ref                 |
| Region                         |                     |                     |                     |
| Northern/Western China         | 0.20 1.22 [0.71, 2.10] | 0.12 1.12 [0.69, 1.82] | 1.04*** 2.82 [1.71, 4.66] |
| Southern/Eastern China         | Ref                 | Ref                 | Ref                 |
| BMI                            |                     |                     |                     |
| Underweight                    | 0.43 1.53 [0.78, 3.02] | 0.31 1.36 [0.77, 2.42] | 0.25 1.28 [0.68, 2.42] |
| Normal weight                  | 0.59* 1.80 [1.02, 3.18] | 0.23 1.26 [0.81, 1.98] | −0.20 0.82 [0.50, 1.36] |
| Overweight                     | Ref                 | Ref                 | Ref                 |

Note. Group 1 as reference. Group 1 = failure to achieve exercise target, alcohol-drinking, and insufficient fruit and vegetable consumption group; Group 2 = alcohol-drinking and sedentary behavior group; Group 3 = sedentary behavior only group; Group 4 = failure to achieve exercise target only group.

*p < .05. **p < .01. ***p < .001.

Table 5
Unadjusted and Fully Adjusted Association of Clustered Health Behaviors and Chronic Illness

| Clustered Health Behavior                          | Unadjusted | Adjusted a |
|----------------------------------------------------|------------|------------|
|                                                   | OR 95% CI  | p          | OR 95% CI  | p          |
| Group 2: alcohol-drinking and sedentary behavior group | 0.47 [0.22, 0.99] | .047       | 0.42 [0.20, 0.89] | .024       |
| Group 3: sedentary behavior only group             | 0.59 [0.33, 1.06] | .078       | 0.51 [0.28, 0.93] | .029       |
| Group 4: failure to achieve exercise target only group | 0.29 [0.12, 0.69] | .005       | 0.30 [0.12, 0.71] | .006       |

Note. Group 1 as reference.
a Adjusted for age, gender, academic degree program, income, insurance, region, and body mass index.
of smoking and alcohol drinking among young adults (Atorkey et al., 2021). Moreover, no typical “healthy” group was found to be characterized by a low prevalence or absence of health-risk behaviors previously identified in the literature (Champion et al., 2018; Miranda et al., 2019). In our sample, all four groups were characterized by a moderate-to-high probability of engaging in at least one health-risk behavior. Specifically, none of the identified classes contained individuals who were both physically active and non-sedentary, which was similar to the results of previous studies showing that nursing students do not meet the physical activity guidelines (Blake et al., 2017; Macedo et al., 2020). Although nursing students are educated about healthy lifestyles, our results indicate that this knowledge does not always translate into their personal lifestyle choices. Hence, for nursing students, actions should be taken to promote their establishment of healthy lifestyle behaviors before entering the public health workforce.

Group 1 was the unhealthiest group, with multiple health-risk behaviors that included high probabilities of physical inactivity, alcohol drinking, and insufficient fruit and vegetable intake and a moderately high probability of sedentary behavior. After controlling for sociodemographic variables, the other three latent classes had significantly lower ORs for chronic diseases compared with Group 1, suggesting that a lifestyle with multiple health-risk behaviors may have a synergistic effect on the deterioration of individual health (Alamian & Paradis, 2009). If the multiple-risk behavior pattern persists, chronic illness rates among young adult nursing students may increase even further. Notably, Group 1 was the group with the lowest probability of fruit and vegetable consumption. Infrequent intake of fruit together with physical inactivity contributes to increased risks of being overweight and obese (Williams et al., 2018), which consequently increases the risk of contracting chronic diseases. Again, this suggests the need for health interventions to target multiple health risk behaviors in this group simultaneously rather than sequentially (Ahmadi-Montecalvo et al., 2019).

Group 2 was characterized by a high probability of engaging in physical activity, sedentary behavior, and alcohol drinking. Despite engaging in highly sedentary behavior, this group had a relatively low proportion of members who were overweight. A possible explanation for this may be that the members of this group were generally physically active. A recent systematic review revealed that high levels of moderate-intensity physical activity may eliminate the increased risk for chronic diseases associated with the sedentary period (Wu et al., 2017). Therefore, interventions targeting this group must focus on keeping these individuals active and avoiding increases in sedentary and alcohol-drinking behaviors.

Group 3 had the highest level of sedentary behavior, whereas Group 4 had the lowest probability of physical activity. Interestingly, Group 4 had the lowest OR for chronic diseases relative to Group 1, when compared with Groups 2 and 3 (both highly sedentary). This finding supports the assertion that sedentariness may affect chronic illness differently than physical inactivity (Garcia et al., 2014). A sedentary lifestyle, more than simply the absence of physical activity (Hamilton et al., 2008), has been associated with chronic illnesses that are not associated with level of engagement in physical activity (Biswas et al., 2015). Because Group 3 accounted for almost half of the total participant number, reducing and breaking the sedentary period into several shorter periods represents a possible health priority for young adult nursing students. Interventions tailored to Group 4 must promote all of the domains of physical activity to promote a healthy and active lifestyle.

Differences in the demographic profiles were observed across heterogeneous classes, suggesting that meaningful health disparities exist among young adult nursing students. Our results suggest that individuals without medical insurance or with lower levels of education are more likely to engage in the unhealthiest lifestyle patterns (Group 1), which is consistent with the known health disparities related to socioeconomic status and educational attainment. Individuals without medical insurance usually have fewer opportunities to access preventive healthcare (Zhang et al., 2018), and those with fewer years or lower levels of education may have lower levels of health consciousness and health literacy (Almutairi et al., 2018). Students from Northern and Western China were found to be more likely to engage in the lifestyle pattern associated with Group 4 than Group 1, suggesting significant regional disparities exist among nursing students. Thus, future studies should focus on addressing regional differences in lifestyle to develop and implement more efficient interventions.

**Implications for Practice**

The results of this study suggest that health-risk behaviors are not homogeneous among young adult nursing students. Effective health promotion interventions should address patterns of health-risk behaviors rather than individual behaviors (Macedo et al., 2020). This study provides evidence supporting the implementation of holistic health behavior prevention approaches in clinical settings (Meader et al., 2016). For instance, programs aimed at promoting physical activity may also take into account that other health behaviors (such as dietary habits) may be influenced by changes in a specific behavior and that simply changing physical activities may be less effective in preventing the development of chronic diseases. By targeting multiple health-risk behaviors concurrently, the knowledge and experiences gained from one behavior may be transferred to others if there are similarities among the domains (James et al., 2016). In addition, nuanced differences in health lifestyle patterns should be taken into account when designing health promotion programs for nursing students to improve program effectiveness. In particular, the results of this study highlight a need for future studies to explore the potential mechanisms underlying unhealthy lifestyles among nursing students and to facilitate programs that focus on promoting and monitoring the involvement and regular participation in healthy lifestyles of future health professionals deemed to be at a particular risk.
These interventions would benefit nursing students directly and likely benefit patients indirectly by improving the quality of provided health services.

**Limitations**

This study is affected by several limitations. First, the cross-sectional design used does not allow causal inferences to be made between health lifestyles and chronic diseases. Second, the responses for all seven health behaviors were self-reported and assessed retrospectively, which may introduce social desirability and recall biases. Objective data are needed in future studies to validate self-report responses. Third, the survey instrument used in this study did not cover all health-risk behaviors, which may limit the application of the findings to noncovered health-risk behaviors. The dichotomization of the health behavior variables to facilitate data interpretation may have led to the loss of crucial information. Moreover, it is worth mentioning that the classifications may be significantly different if recall bias significantly affects participant responses. Hence, planned longitudinal data collection to track health behaviors would facilitate the accurate assignment of participants to health lifestyle groups. Fourth, although adjustments were made for common demographic factors in the analysis, other residual confounding factors may have been present. Finally, the relatively small sample size and the low chronic disease incidence among the participants may have influenced the findings of this study. Therefore, larger studies at the national level are required.

**Conclusions**

LCA was used to identify four health lifestyle pattern groups in a sample of young adult nursing students in China based on variables that included vigorous-intensity activity, moderate-intensity activity, sedentary behavior, smoking, drinking alcohol, meal regularity, and fruit and vegetable consumption. The results from this study support relationships between these health-risk behaviors and chronic diseases. Clinicians are encouraged to examine the cluster of health-risk behaviors as an important step in developing chronic disease prevention interventions tailored to the needs and habits of target groups.

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**Author Contributions**

Study conception and design: HS  
Data collection: HC, YS, YY  
Data analysis and interpretation: CD, HC, YL  
Drafting of the article: CD  
Critical revision of the article: HS

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