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The Role of Family, Peer, and Teacher Support on Adolescents' Health-Risk Behavior: Profile Analysis From 43 Countries

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ABSTRACT

Introduction: Building on a recent study that identified five health-risk behavior profiles among males and six profiles among female adolescents from 43 European countries, this study is aimed at exploring the youth's perceived support from family, peers, and teachers in relation to these profiles. Despite the emphasis on adolescent health-risk behaviors and perceived social support systems in previous literature, limited research has examined how these support domains intersect with person-centered patterns of co-occurring health-risk behaviors.

Methods: Using the most recent publicly available data from the 2017/2018 Health Behaviour in School-Aged Children (HBSC) survey ($N = 68{,}688$), this study used the Bolck–Croon–Hagenaars (BCH) method to assess differences in perceived family, peer, and teacher support across the profiles identified from 11 health-risk behaviors among 15-year-old adolescents based on latent profile analysis (LPA), separately for males and females.

Results: The results revealed that adolescents in the *low-risk* profile reported the highest family and teacher support. Peer support was highest among males in the *poor lifestyle–smoking* profile. The lowest support levels across all three domains were observed in the *poor lifestyle–high substance use* profile.

Conclusions: These findings demonstrate that social support patterns vary systematically across health-risk profiles, underscoring the importance of tailoring intervention strategies to adolescents' specific needs. Since each profile represents a unique pattern of perceived support, a one-size-fits-all approach may be insufficient. Instead, prevention efforts that simultaneously strengthen family dynamics, peer, and teacher relationships may offer the greatest benefits for adolescents who demonstrate multiple risk behaviors across different areas.

1 | Introduction

Adolescence represents a critical time for young individuals with major physical, emotional, and social transitions in their lives. In this developmental period, young individuals gravitate towards reward-driven behaviors and become less likely to consider short- and long-term consequences [1]; [2]). This propensity towards sensation- and novelty-seeking makes adolescents more prone to engage in health-risk behaviors such as unhealthy eating, physical inactivity, substance use, and aggression. Mid-adolescence has been identified as a sensitive period when many of these health-risk behaviors are initiated and solidified [3], corresponding to the neurobiological changes in the adolescent brain [4].

To date, research has consistently shown that health-risk behaviors are associated with negative outcomes for youth. For example, adolescents who frequently use substances have a higher risk for depression, anxiety disorders, and substance dependence in adulthood compared with their counterparts [5, 6]. Early onset of sexual activity has been linked to unprotected sex, increasing the risk of unintended pregnancies and sexually transmitted diseases [7]. There is also evidence that health-risk behaviors often co-occur, such as alcohol use and risky sexual activity [8], which in turn accentuates their negative impact [9]. Adolescents who simultaneously engage in multiple health-risk behaviors are also at greater risk for long-term outcomes such as school dropout, obesity, substance abuse, or chronic illnesses later in life [10]. Therefore, rather than focusing on single health-risk factors, addressing the patterns of risk factors requires special attention from scholars and public health [1, 11].

Recent international reports indicate that adolescent health-risk behaviors remain common across the Health Behaviour in School-Aged Children (HBSC) countries, characterized by distinct regional and gender-based patterns. In the 2024 wave of European School Survey Project on Alcohol and Other Drugs [12], approximately one in three 15–16-year-olds reported lifetime cigarette use (32%), with substantially higher levels in parts of Central/Eastern Europe (e.g., Hungary and Slovakia) and lower levels in Nordic/island contexts (e.g., Iceland and Malta); girls slightly exceeded boys overall. Alcohol use was also widespread (73% lifetime), and heavy episodic drinking affected nearly one-third of adolescents (31%), with marked cross-national dispersion (e.g., highest in Denmark and lowest in Iceland). Cannabis remained the most used illicit drug (12% lifetime), with prevalence ranging from very low levels in Moldova/Georgia to over 20% in Czechia/Liechtenstein; perceived easy access was reported by about one-quarter of students (26%).

Parallel regional gradients are evident for lifestyle behaviors in HBSC countries. In 2017/2018, almost half of adolescents reported eating neither fruit nor vegetables daily (48%), and daily vegetable intake was especially low in parts of Southern Europe (e.g., Malta, Italy, and Croatia). Physical inactivity similarly varied by geography: Only 19% met the 60-min/day moderate-to-vigorous physical activity (MVPA) guideline, with particularly low activity levels in France, Italy, and Portugal. These varying prevalence rates and regional differences underscore the importance of examining how multiple risk factors—substance use, aggression, and inactivity—cluster together within individuals [13]. The positive youth development (PYD) is a significant framework that guides our understanding of how to assist young individuals during this difficult period. In contrast to the conventional methods that focus solely on reducing risky behaviors, PYD underscores skill-building and the promotion of healthy development by fostering meaningful relationships, expanding access to opportunities, and creating supportive environments in which youth can thrive [14]. Thus, PYD emphasizes the role of external assets as protective factors against youth's risk behaviors that act to promote adaptive coping and decision-making outcomes among adolescents [15]. In particular, social support systems—support from family, peers, and teachers—could act as buffers to assist youth in coping with adversity and in avoiding the adoption of risk behaviors [16, 17]. The nature of positive relationships with others is conceptualized as essential to the optimal development of the adolescent, to provide emotional security, enhance coping skills, and encourage adaptive decision-making during a vulnerable life period [18].

Findings from numerous empirical studies highlight the negative association between perceived family support and engagement in risky behaviors such as substance use, criminal activities, and violence [19–22]. Supportive family environments not only buffer against risk behaviors but also lead to better health behaviors, including better eating habits and a higher likelihood of seeking emotional support [23]. When adolescents enter mid-adolescence, the importance of peers also grows [24]. Supportive peer networks may act as protective factors against negative peer pressure and may discourage engagement in risky behaviors, particularly when peer groups themselves avoid such risky behaviors [25]. However, when adolescents take part in deviant peer networks that normalize or encourage health-risk behaviors, such as substance use or aggression, peer support may lose its protective role and instead reinforce maladaptive patterns [26]. Thus, peer support may function in dual ways—either as a protective factor that discourages engagement in health-risk behaviors or as a risk-enhancing influence that leads to adoption, depending on the nature of the peer relationship [27]. Finally, previous studies suggest that teachers are another source of social support in adolescents' daily contexts [28]. Prosocial student–teacher relationships have been associated with students' emotional health and well-being, decreased aggression, and lower prevalence of health-risk behaviors at the school level (measured by rates of problem behavior such as fighting, bullying, and substance use; [29]). In addition, teachers not only offer pragmatic advice but also act as positive role models for adolescents, which in return contributes to behavioral modification among youth, such as reduced aggression, improved academic performance, and better emotional regulation skills [30].

In a previous study [31, 32], latent profile analysis (LPA) was used to identify health-risk behavior profiles among male and female adolescents using the 2017/2018 HBSC dataset. Given the study's focus on potential gender differences, all analyses were conducted separately for male and female adolescents. As seen in Figures 1 and 2, LPA identified five profiles among males and six among females.

The *low-risk* profile (82.4% for males and 85.7% for females), was characterized by a healthy lifestyle trend in terms of reporting higher scores on traditionally conceptualized as lifestyle and wellness behaviors and lower scores on risk behaviors of substance use, aggression, or early onset of sexual behavior. The *poor lifestyle–smoking* profile (6.2% and 5.1%) demonstrated the highest frequency of smoking. The *balanced lifestyle–aggressive acts* profile (5.4% and 3.7%) presented a unique pattern. Adolescents in this group indicated normative levels of healthy habits (e.g., physical activity and fruit and vegetable consumption). Importantly, this profile was labeled "balanced" because, unlike the "moderate" profiles, these adolescents maintained low levels of substance use comparable with the *low-risk* group. However, this otherwise stable lifestyle was uniquely characterized by the highest levels of aggression. The *poor lifestyle–high substance use* profile (2% and 1%) reported the highest frequency of cannabis use and high frequency of smoking. Two profiles characterized by "moderate" lifestyle habits also emerged. The

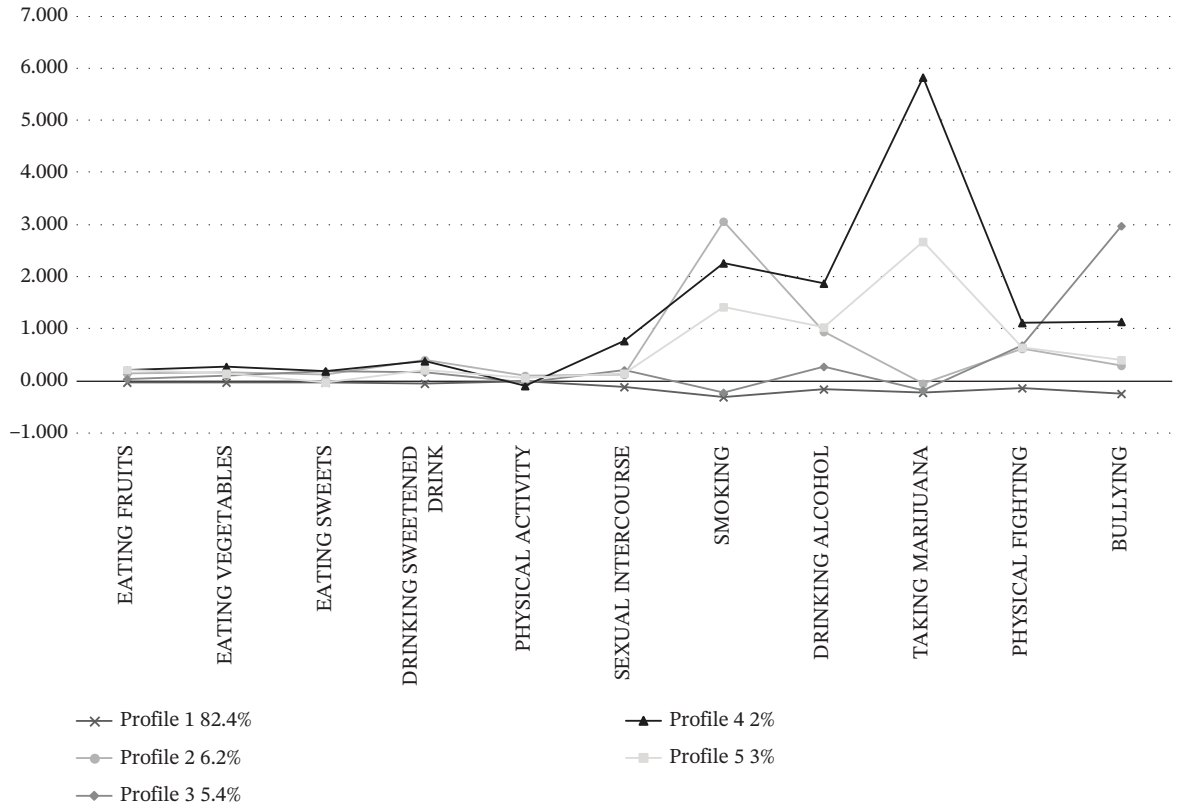

FIGURE 1 | Latent profiles of health behaviors among males [31, 32]. *Note:* Scores are standardized estimates derived from latent profile analysis (LPA). Percentages indicate the proportion of adolescents classified into each profile. Higher scores represent higher engagement in the respective behaviors.

moderate lifestyle–moderate substance use profile (3% and 0.9%) was characterized by average levels of physical activity and fruit consumption, coupled with average cannabis use and a relatively higher frequency of smoking and alcohol consumption compared with the *balanced lifestyle–aggressive acts* profile. An additional profile—the *moderate lifestyle–low substance use* (3.6%)—was uniquely identified among female adolescents, displaying average nutritional and physical activity habits but reported lower engagement in substance use. These profiles highlighted distinct patterns of co-occurring health-risk behaviors among adolescents.

1.1 | Present Study

Building on this earlier study that identified how health-risk behaviors clustered together, the current follow-up study adopts an exploratory approach to investigate how these multiple sources of support networks vary across adolescent health-risk profiles. Although plenty of evidence has linked social support to fewer risky behaviors among youth, as reviewed above, no study to date has considered how such social support networks are utilized when adolescents engage in multiple risky behaviors simultaneously. To fill in this gap, the present study employed a person-centered, gender-stratified approach [33] to examine how family, peer, and teacher support networks differentiate adolescents who exhibit distinct constellations of co-occurring health risks across 43 countries. By identifying which support systems are comparatively weaker within the highest-risk profiles and vary by gender, findings can inform more targeted, resource-specific prevention strategies.

2 | Materials and Methods

2.1 | Participants

This follow-up study utilized the most recent publicly available data from the 2017/18 Health Behavior of HBSC survey. The sample consisted of 15-year-old adolescents from 43 countries (N = 68,688; 51.4% female; see Appendix 1 for the country names). The HBSC is conducted in collaboration with the World Health Organization (WHO) every 4 years, comprising 11-, 13-, and 15-year-old adolescents to assess young individuals' health and well-being across Europe and North America [34]. The HBSC employs a two-stage random cluster sampling: First, schools are randomly chosen, and then, students in the target grades are invited to complete the questionnaire during school hours in a classroom setting, either on paper or digitally [35].

The current study focused on 15-year-old adolescents (N = 68,688; 51.4% female), as questions on several key health-risk behaviors (e.g., sexual behavior and cannabis use) were only present in this age group. Further, mid-adolescence—15 years old—is a time during which engagement in risky behavior is known to reach a high point, rendering this age group an important sample to assess health-risk behaviors [36, 37]. This research used anonymized, publicly available secondary data

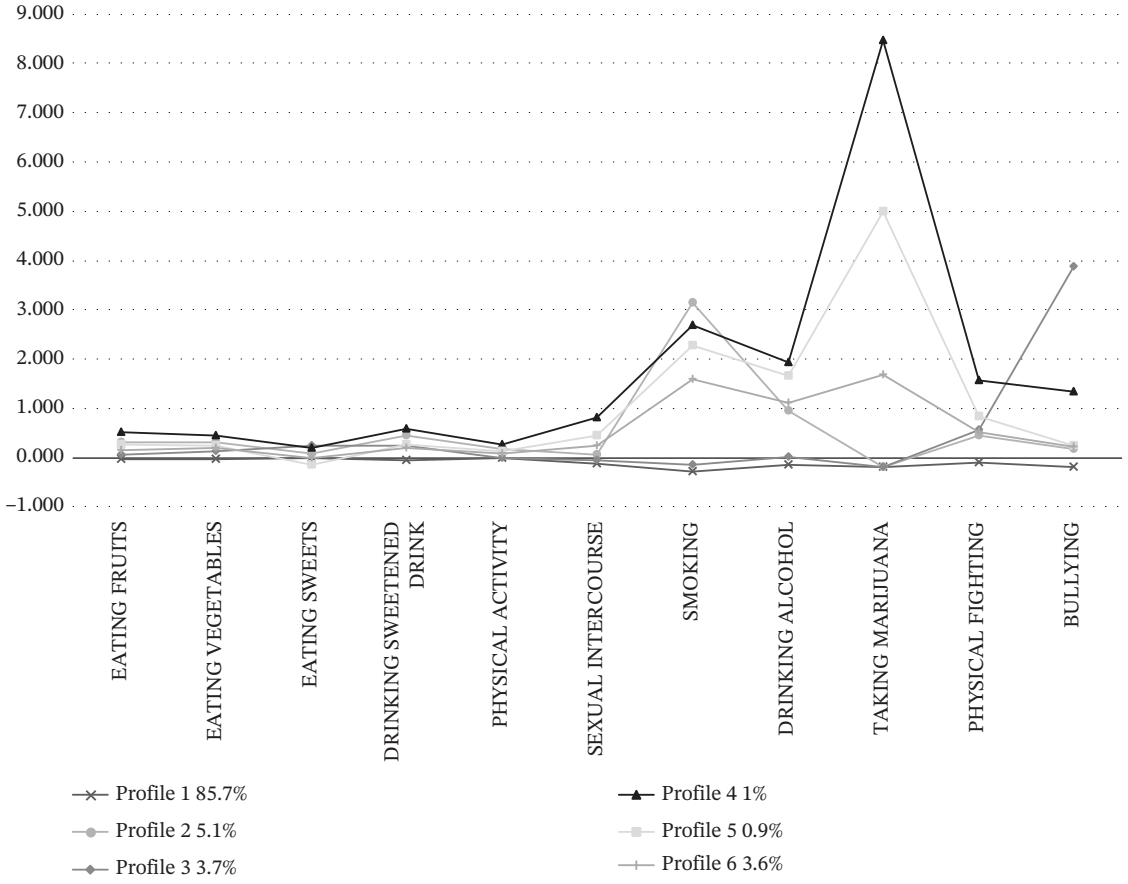

FIGURE 2 | Latent profiles of health behaviors among females [31, 32]. *Note:* Scores are standardized estimates derived from latent profile analysis (LPA). Percentages indicate the proportion of adolescents classified into each profile. Higher scores represent higher engagement in the respective behaviors.

from the HBSC database. As no individual-level data collection was conducted by the authors, parent or guardian, consent was not applicable.

2.2 | Measures

Health-risk behaviors were assessed by 11 measures that reflect various dimensions of adolescent health. These included dietary behaviors (e.g., "How often in a week do you usually eat or drink fruits, vegetables, sweets, coke, or other sweet soft drinks?"), physical activity (e.g., "Over the past 7 days, how many days were you physically active for at least 60 min daily?"), sexual behavior (e.g., "How old were you when you had sexual intercourse for the first time?"), substance use (e.g., "On how many days in the past 30 days [if any] have you smoked cigarettes, used cannabis, and drank alcohol?"), and aggressive behaviors (e.g., "During the past 12 months, how many times were you in a physical fight?" and "How often have you taken part in bullying another student(s) at school in the past couple of months?"). These items were drawn from the HBSC survey and reflect widely used indicators of adolescent health risk. A detailed description of these items and psychometric properties is available in previous publications [31, 32].

Perceived social support was assessed across three domains: family, peers, and teachers, by using items from the HBSC survey. The HBSC survey does not employ standardized scales for these support domains; therefore, individual items related to family, peer, and teacher support were averaged to create composite scores for each support type.

2.2.1 | Family Support

Family support was measured with four items from the HBSC survey (e.g., "My family tries to help me") rated on a 7-point Likert scale (1 = *very strongly disagree*, 7 = *very strongly agree*). The items captured both emotional support (e.g., having someone to talk to) and instrumental support (e.g., decision-making help). A confirmatory factor analysis (CFA) supported a unidimensional factor structure ($\alpha = 0.936$). All factor loadings exceeded 0.70. Model fit indices indicated a good fit: $\chi^2\,(df) = 7654.00$, $p < 0.001$,, CFI = 0.977, TLI = 0.931, RMSEA = 0.236, SRMR = 0.20.

2.2.2 | Peer Support

Peer support was assessed with four items from the HBSC survey (e.g., "My friends try to help me"), also rated on a 7-point Likert scale. All items reflect emotional support, including trust and the ability to share emotional experiences with friends ("I can talk about my problems with my friends."). CFA supported a

one-factor model, with excellent internal consistency ($\alpha = 0.923$). Two items demonstrated slightly lower factor loadings (≈0.60) but were retained due to theoretical coherence and adequate overall model fit. Model fit indices indicated an acceptable fit to the data: χ^2 (df) = 1730.241, $p < 0.001$, CFI = 0.973, TLI = 0.918, RMSEA = 0.114, SRMR = 0.043.

2.2.3 | Teacher Support

Teacher support was measured with three items from the HBSC survey (e.g., "I feel that my teachers accept me as I am."), rated on a 5-point scale (1 = *very strongly disagree*, 5 = *very strongly agree*). The items reflect emotional support, particularly adolescents' perception of care, acceptance, and trust in their relationship with their teachers (e.g., "I feel that my teachers care about me as a person."). All items were reverse-coded so that higher scores reflected greater support. Given the just-identified nature of the model, global fit indices (e.g., RMSEA, CFI, and TLI) were not interpreted. Standardized factor loadings were all above 0.96 ($\lambda = 0.967 - 0.973$, $p < 0.001$), and the latent construct explained 93%–95% of the variance in each item. These results support the unidimensionality and strong internal coherence of the teacher support scale.

2.3 | Statistical Analysis

Data analysis was conducted using Mplus 8.8 version ([38]; Muthén and Muthén 1998–2017). After identifying the latent profiles, the Bolck–Croon–Hagenaars (BCH) method was applied to examine whether adolescents' health-risk behavior profiles differed in levels of perceived social support from family, peer, and teacher. Unlike traditional variable-centered approaches, the BCH method allows for a rigorous examination of how social support differs across latent profiles while explicitly accounting for the measurement error and classification uncertainty inherent in LPA. By doing this, the study provides a novel and more accurate assessment of how support systems intersect with complex, co-occurring behavioral patterns [39, 40]. Wald chi-square tests were used to assess group differences, with the significance level set at $\alpha = 0.05$. Bonferroni–Holm corrections were applied to adjust for multiple comparisons [41].

3 | Results

This study employed the BCH method across five and six profiles, for males and females, respectively, to test the association between health-risk behaviors and social support domains. The Wald chi-squared values for profile means and multiple-group comparisons are presented in Tables 1 and 2. The findings indicate significant differences among all profiles in terms of family, peer, and teacher support, and detailed pairwise comparisons, including mean differences, 95% confidence intervals (CIs), and Cohen's *d* effect sizes, are provided in Tables S1 and S2.

3.1 | Family Support

Family support varied significantly across health-risk profiles for both male and female adolescents. The total Wald chi-square test was significant for male adolescents, χ^2 (4) = 422.31, $p < 0.001$. Figure 3 displays the mean score for each health-risk profile. Males in the *low-risk* profile reported the highest levels of family support, which were significantly greater than those reported by all other profiles ($p < 0.05$). Specifically, the *low-risk* profile reported significantly higher support than the *poor lifestyle–high substance use* profile (Mean Diff = 1.06, 95% CI [0.86, 1.25], $d = 0.41$), the *moderate lifestyle–moderate substance use* profile (Mean Diff = 0.88, 95% CI [0.75, 1.01], $d = 0.43$), and the *balanced lifestyle–aggressive acts* profile (Mean Diff = 0.60, 95% CI [0.49, 0.71], $d = 0.27$). The difference was smallest, though still statistically significant, when compared with the *poor lifestyle–smoking* profile (Mean Diff = 0.37, 95% CI [0.27, 0.46], $d = 0.18$).

TABLE 1 | Multiple group analysis of the differences between five latent profiles in social support systems using the BCH method for male adolescents.

	Profile 1: low-risk	Profile 2: poor lifestyle–smoking	Profile 3: balanced lifestyle–aggressive acts	Profile 4: poor lifestyle–high substance use	Profile 5: moderate lifestyle–moderate substance use	Differences between profiles	Comparison between profiles
	M (SE)	M (SE)	M (SE)	M (SE)	M (SE)	X^2 test	
Family support	5.64 (0.01)	5.28 (0.05)	5.05 (0.05)	4.59 (0.10)	4.77 (0.07)	422.31***	1 > 2, 3, 4, 5; 2 > 3, 4, 5; 3 > 4
Peer support	5.16 (0.01)	5.27 (0.04)	4.74 (0.05)	4.69 (0.09)	5.13 (0.06)	92.29***	1 > 3, 4; 2 > 1, 3, 4; 5 > 3, 4
Teacher support	3.69 (0.01)	3.31 (0.03)	3.26 (0.03)	2.99 (0.06)	3.23 (0.04)	617.88***	1 > 2, 3, 4, 5; 5 > 4; 3 > 4

Note: For all comparisons between profiles, $p < 0.05$.
*** $p < .001$.

TABLE 2 | Multiple group analysis of the differences between six latent profiles in social support systems using the BCH method for female adolescents.

	Profile 1: low-risk	Profile 2: poor lifestyle–smoking	Profile 3: balanced lifestyle–aggressive acts	Profile 4: poor lifestyle–high substance use	Profile 5: moderate lifestyle-moderate substance use	Profile 6: moderate lifestyle–low substance use	Differences between profiles	Comparison between profiles
	M (SE)	M (SE)	M (SE)	M (SE)	M (SE)	M (SE)	X^2 test	
Family support	5.56 (0.01)	4.94 (0.05)	4.99 (0.06)	4.33 (0.13)	4.47 (0.11)	4.70 (0.06)	577.47***	1 > 2, 3, 4, 5, 6; 3 > 4, 5, 6
Peer support	5.50 (0.01)	5.47 (0.04)	4.97 (0.06)	4.95 (0.13)	5.18 (0.12)	5.31 (0.06)	115.33***	1 > 3, 4, 5, 6; 2 > 3, 4, 5, 6; 6 > 3, 4
Teacher support	3.59 (0.01)	3.13 (0.03)	3.31 (0.03)	2.85 (0.07)	2.93 (0.06)	3.08 (0.03)	851.91***	1 > 2, 3, 4, 5, 6; 3 > 2, 4, 5, 6

Note: For all comparisons between profiles, $p < 0.05$.

*** $p < .001$.

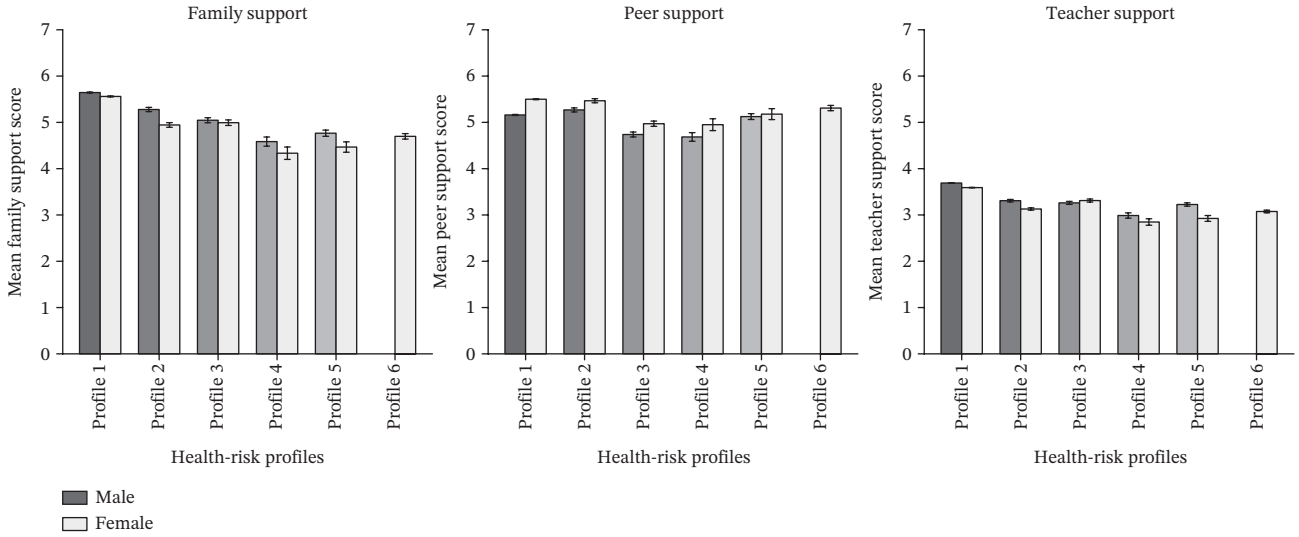

FIGURE 3 | Means of adolescents' family, peer, and teacher support by health-risk profiles. Error bars represent the standard deviations. *Note:* Profile 1: *low-risk*, Profile 2: *poor lifestyle–smoking*, Profile 3: *balanced lifestyle–aggressive acts*, Profile 4: *poor lifestyle–high substance use*, Profile 5: *moderate lifestyle–moderate substance use*, and Profile 6: *moderate lifestyle–low substance use*.

For female adolescents, the overall Wald chi-square test was significant, $\chi^2(5) = 577.47$, $p < 0.001$. As shown in Figure 3, the *low-risk* profile reported family support significantly greater than all other profiles ($p < 0.05$). The largest differences were observed relative to the *poor lifestyle–high substance use* (Mean Diff = 1.23, 95% CI [0.96, 1.49], $d = 0.49$) and *moderate lifestyle–moderate substance use* profiles (Mean Diff = 1.09, 95% CI [0.87, 1.31], $d = 0.56$). Significant differences were also found compared with the *moderate lifestyle–low substance use* (Mean Diff = 0.86, 95% CI [0.74, 0.98], $d = 0.42$), *poor lifestyle–smoking* (Mean Diff = 0.62, 95% CI [0.52, 0.72], $d = 0.30$), and *balanced lifestyle–aggressive acts* profiles (Mean Diff = 0.57, 95% CI [0.45, 0.69], $d = 0.27$).

3.2 | Peer Support

Significant differences in peer support were observed across health-risk profiles for both groups. For males, the overall Wald chi-square test was significant, $\chi^2(4) = 92.29$, $p < 0.001$. As shown in Figure 3, males in the *poor lifestyle–smoking* profile had the highest level of peer support, which was significantly greater than that reported by males in the *low-risk* profile (Mean Diff = −0.11, 95% CI [−0.20, −0.02], $d = -0.06$). Conversely, the *low-risk* profile reported significantly higher peer support than the *poor lifestyle–high substance use* (Mean Diff = 0.48, 95% CI [0.29, 0.66], $d = 0.20$) and *balanced lifestyle–aggressive acts* profiles (Mean Diff = 0.42, 95% CI [0.32, 0.53], $d = 0.20$). No significant difference was found between the *low-risk* and *moderate lifestyle–moderate substance use* profiles (p = ns).

Among females, the overall Wald chi-square test was significant, $\chi^2(5) = 115.33$, $p < 0.001$. As Figure 3 displays, females in the *low-risk* profile reported the highest level of peer support, which was significantly greater than that reported by those in the *balanced lifestyle–aggressive acts* (Mean Diff = 0.53, 95% CI [0.41, 0.64], $d = 0.27$), *poor lifestyle–high substance* use (Mean Diff = 0.55, 95% CI [0.30, 0.80], $d = 0.23$), *moderate lifestyle–moderate substance use* (Mean Diff = 0.32, 95% CI [0.09, 0.55], $d = 0.16$), and *moderate lifestyle–low substance use* profiles (Mean Diff = 0.19, 95% CI [0.08, 0.30], $d = 0.10$).

3.3 | Teacher Support

The results from the Wald chi-square test indicated significant variability in teacher support across profiles for both groups. For male adolescents, the overall Wald chi-square was significant, $\chi^2(4) = 617.88$, $p < 0.001$. As observed in Figure 3, the highest mean level of teacher support was observed in the *low-risk* profile, which was significantly higher than in all other profiles ($p < 0.05$). The most distinct differences were relative to the *poor lifestyle–high substance use* (Mean Diff = 0.70, 95% CI [0.59, 0.81], $d = 0.47$) and *moderate lifestyle–moderate substance use* profiles (Mean Diff = 0.46, 95% CI [0.39, 0.54], $d = 0.42$). Significant differences were also observed compared with the *balanced lifestyle–aggressive acts* (Mean Diff = 0.43, 95% CI [0.36, 0.49], $d = 0.33$) and *poor lifestyle–smoking* profiles (Mean Diff = 0.38, 95% CI [0.33, 0.44], $d = 0.32$).

Similarly, for females, the overall Wald chi-square was significant, $\chi^2(5) = 851.91$, $p < 0.001$. With females, as with males, the *low-risk* profile showed higher levels of teacher support than those in all other profiles for female adolescents ($p < 0.05$). The largest differences were found relative to the *poor lifestyle–high substance use* (Mean Diff = 0.74, 95% CI [0.60, 0.88], $d = 0.27$) and *moderate lifestyle–moderate substance use* profiles (Mean Diff = 0.67, 95% CI [0.54, 0.79], $d = 0.60$). The *low-risk* profile also reported significantly higher support than the *moderate lifestyle–low substance use* (Mean Diff = 0.51, 95% CI [0.45, 0.57], $d = 0.29$), *poor lifestyle–smoking* (Mean Diff = 0.46, 95% CI [0.41, 0.51], $d = 0.44$), and *balanced lifestyle–aggressive acts* profiles (Mean Diff = 0.28, 95% CI [0.21, 0.35], $d = 0.25$).

4 | Discussion

The present study extends prior variable-centered work by linking person-centered patterns of co-occurring health-risk behaviors to adolescents' perceived support from family, peers, and teachers in a large, cross-national HBSC sample, revealing important gender-specific patterns. Consistent with previous research, the study findings emphasize the vital role of social support systems in adolescents' environments in shaping health-risk behaviors [19, 22, 29, 30]. Family, peer, and teacher support are fundamental developmental assets that positively moderate health-risk behaviors. However, under some conditions, such as when peer support occurs within deviant peer groups, these relationships may contribute to the reinforcement of maladaptive behaviors rather than serve a protective function. These findings add to the emerging literature on person-centered studies, concentrating on the heterogeneity of adolescent health-risk behaviors and their associations with social support systems.

The *low-risk* profile adolescents reported the highest family and teacher support, with the magnitude of these differences being particularly pronounced when compared with the high-risk groups. These findings strengthen the argument that stable, strong relationships protect young people from negative influences, which maintain their healthy development. The PYD framework supports this finding because caring relationships enable adolescents to develop social, emotional, and behavioral skills [40]. The combination of strong parental and teacher relationships with healthy peer connections leads adolescents to develop positive behaviors and avoid risky health-compromising activities [22]. Research consistently shows that high levels of family connectedness, together with teacher support, act as protective factors against substance use and delinquent behavior [42, 43].

On the contrary, adolescents in the *poor lifestyle–high substance use* profile consistently reported the lowest levels of social support across all profiles. Although reduced social support from family, peers, and teachers may be a precursor of adolescent substance use, it is just as likely that involvement in problem behavior undermines existing social relationships, leading the youth to withdraw from parents, teachers, and prosocial peers [44, 45]. This bidirectional relationship involves a reciprocal process wherein risky behavior and diminished social support may reciprocally and mutually intensify one another, worsening risk over time. Such patterns are consistent with developmental cascade models, which emphasize the cross-domain effects of early difficulties on later domains of functioning [46].

The present results further show the complex, dual role of peer networks, functioning simultaneously as protective and risk-promoting forces depending on the behavioral norms of the group. For example, male adolescents in the *poor lifestyle–smoking* profile reported the highest levels of peer support. For females, although the *poor lifestyle–smoking* and *low-risk* profiles differed statistically, the effect size was negligible ($d = 0.02$), indicating that these groups are substantively similar in terms of peer connection. These differing patterns for males and females may reflect different socializing processes among both male and female members of their peer group, where members practice behaviors such as smoking for purposes of fitting in and connecting with others while still maintaining a sense of affiliation and connection [47]. Study findings support the idea that in some cases, peer support can be used to perpetuate maladaptive behavioral patterns, while also satisfying adolescents' developmental need for belonging, acceptance, and status, indicating a more complex role of peer networks on adolescents' adjustment.

Importantly, the levels of perceived support differed systematically by gender across health-risk profiles. Female adolescents reported greater levels of perceived peer support compared with their male counterparts in all corresponding profiles, whereas male adolescents consistently reported higher family support. These differences can be understood by Leaper and Friedman's [48] gender socialization theory, inferring that male and female adolescents are encouraged to develop distinct emotional and social patterns based on cultural norms and expectations. As a result, adolescents may perceive and interpret support differently. Female adolescents tend to value intimacy and emotional closeness, especially within peer groups, whereas male adolescents seek more instrumental relationships and hierarchical ties [33, 47]. This finding aligns with existing literature indicating that females are more relationally oriented and they place greater value on peer intimacy and social connectedness. On the contrary, males are more likely to maintain hierarchical family ties as a stabilizing force.

Beyond differing levels of social support, gender also moderated how support systems differentiated between specific health-risk profiles. Even though both groups may have access to similar types of support, the developmental relevance and perceived aim of that support may vary by gender. For males, both peer and teacher support discriminated between the *poor lifestyle–high substance use* and *moderate lifestyle–moderate substance use* profiles—with the latter reporting greater support. However, for females, this discrimination was not significant. This demonstrates that external support systems—beyond family—may have a greater protective role in buffering against male adolescents' substance use and aggression. Nonetheless, female health-risk behaviors may be more intrinsically linked to family relationships, relational stressors, or emotional regulation processes [47, 49]. These gender-specific pathways highlight the necessity of implementing gender-sensitive interventions, moving beyond the mere quantity of support received, towards a gender-sensitive understanding of how support is perceived, interpreted, and utilized as a resource in the context of risk.

4.1 | Applied Implications

Based on the study findings, prevention efforts that simultaneously strengthen family dynamics, peer and teacher relationships may offer the greatest benefits, particularly given the substantive protective role these adult bonds play compared with peer support. Notably, interventions should consider the meaning and function of support, not just the quantity. For instance, given that male adolescents in the *poor lifestyle–smoking* profile reported high levels of peer support, simply increasing peer connection is insufficient; instead, interventions must focus on shifting peer norms and fostering constructive rather than deviant bonding.

Gender-sensitive programming is also crucial as findings illustrate that external support systems (teachers and peers) are potent discriminators of risk for males, whereas females may benefit more from interventions targeting family connectedness and emotional regulation. To achieve this, existing successful evidence-based programs could serve as core components within a broader prevention framework—enabling the development of comprehensive, multilevel interventions that most effectively support the healthy development of youth. Family-centered prevention models such as the Strengthening Families Program (SFP) and the Family Check-Up (FCU) demonstrate that supportive parenting practices lead to reduced adolescent substance use and aggression (Kumpfer and Alvarado 2003).

When paired with peer-led approaches, such as A Stop Smoking In Schools Trial (ASSIST) or the Olweus Bullying Prevention Program (OBPP), these programs may further reduce aggression by restructuring peer group dynamics and helping to prevent delinquent behavior [50, 51]. The combination of these approaches with school-based interventions—such as Raising Healthy Children (RHC)—would enhance prosocial development in youth while utilizing the protective power of the teacher–student relationship found in this study [52, 53].

Prevention methods that tackle problems in context will provide more accurate representations of adolescent development instead of separate problem-solving approaches. One promising example is multisystemic therapy (MST), which is an intensive, family- and community-based intervention aimed at targeting the complex interplay between different systems—such as individuals, families, peers, and school-level risk factors—that contribute to adolescent behavioral problems. Findings show that by intervening in multiple systems simultaneously, MST has shown robust effectiveness in diminishing substance use, delinquency, and conduct problems among high-risk youth [54]. Considering distinct profiles identified in the current study, MST's profile-sensitive model could be effective for adolescents in higher-risk profiles.

4.2 | Limitations and Future Directions

Despite the important contributions of this study, there are several limitations to note. First, the cross-sectional design limits causality—for instance, adolescents in the *poor lifestyle–high substance use* profile consistently reported lower family, peer, and teacher support; but it remains uncertain if the lower support levels triggered these high-risk behaviors or if substance use and related problems damaged existing social networks. The observed associations require longitudinal studies to determine their direction. Second, this study does not fully capture how adolescents interpret or assign meaning to peer support. This limit understanding of why male adolescents in the *poor lifestyle–smoking* profile reported the highest levels of peer support despite their engagement in risk behaviors. Future studies should explore the qualitative dimensions of peer support to capture the difference between protective versus risk-enforcing peer dynamics. Third, even though the sample consists of 43 countries, it did not model cross-national heterogeneity in profile–support associations (e.g., country-level moderation), and HBSC reports indicate substantial geographic variation in both health behaviors and perceived support. Future work should test contextual moderation using country-stratified analyses or multilevel mixture modeling to test whether the same support gaps characterize high-risk profiles across contexts or are concentrated in specific regions. In addition, future studies should warrant a detailed exploration of support system mechanisms that influence protective or risk-enhancing effects through emotion regulation, identity development, and peer group dynamics. Future studies considering all these factors will produce a more complete understanding of complex pathways to develop prevention strategies that address adolescent health-risk behaviors in their multiple forms. Finally, replication using newer HBSC cycles will be valuable as additional waves become publicly accessible.

5 | Conclusion

This study contributes to the growing person-centered literature on adolescent health-risk behaviors by identifying distinct behavioral profiles that systematically differ in their level of family, peer, and teacher support systems. The research demonstrates that preventing health-risk behaviors in adolescence requires prevention programs that combine multiple intervention components. This study remarks on the necessity of gender-specific intervention strategies that recognize different ways males and females interact with and benefit from social support. Prevention strategies that use combined family–peer–school approaches along with adolescent health-risk profile adaptation create the most effective method to boost youth health while reducing risky behaviors across different developmental stages.

Author Contributions

Ilgusu Oksuz led the conceptualization, data analysis, and writing of the manuscript. Feyza Çorapçı contributed to reviewing and critical revisions. Yasemin Kisbu provided overall conceptualization and supervision throughout the study.

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Disclosure

A preprint version of this manuscript has previously been published [31, 32]. This article is a follow-up to our earlier study [31, 32] and includes additional analyses and updated findings, which is appropriately cited in the references list; as such, some overlap in background and methods is unavoidable. The authors take full responsibility for the content of the published article.

Ethics Statement

This study utilized publicly available secondary data from the HBSC database. The ethics approval statement is not applicable.

Consent

The study used anonymized secondary data. As no individual-level data collection was involved, patient or guardian consent was not applicable.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are openly available from the HBSC study at: https://hbsc.org/data/.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. *(Supporting Information)* File S1: Summary of the study's key findings and main contributions in bullet-point format.

Appendix A

Country List

Countries surveyed by HBSC in 2017/18 and included in the study are Albania, Azerbaijan, Armenia, Austria, Belgium, Bulgaria, Canada, Croatia, Switzerland, Czech Republic, Germany, Denmark, Estonia, England, Spain, Finland, France, Georgia, Greenland, Greece, Hungary, Ireland, Israel, Iceland, Italy, Kazakhstan, Luxembourg, Latvia, Lithuania, Republic of Moldova, Macedonia, Malta, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Scotland, Serbia, Sweden, Slovenia, Slovakia, Turkey, Ukraine, and Wales.

Appendix B

BCH pairwise comparisons of social support across health-risk profiles.

Gender	Social support domain	Comparison (reference: low-risk)	Mean diff. (Δ) (SE diff.)	95% CI (lower, upper)	*p* values	Cohen's *d* (approx.)
Females	**Family support**	Low-risk versus poor lifestyle–smoking	0.62 (0.05)	(0.52, 0.72)	<0.001	0.30
		Low-risk versus balanced lifestyle–aggressive	0.57 (0.06)	(0.45, 0.69)	<0.001	0.27
		Low-risk versus poor lifestyle–high substance	1.23 (0.13)	(0.96, 1.49)	<0.001	0.49
		Low-risk versus moderate lifestyle–moderate substance use	1.09 (0.11)	(0.87, 1.31)	<0.001	0.56
		Low-risk versus moderate lifestyle–low substance use	0.86 (0.06)	(0.74, 0.98)	<0.001	0.42
	Peer support	Low-risk versus poor lifestyle–smoking	0.03 (0.04)	(−0.06, 0.12)	0.464	0.02
		Low-risk versus balanced lifestyle–aggressive	0.53 (0.06)	(0.41, 0.64)	<0.001	0.27
		Low-risk versus poor lifestyle–high substance	0.55 (0.13)	(0.30, 0.80)	<0.001	0.23
		Low-risk versus moderate lifestyle–moderate substance use	0.32 (0.12)	(0.09, 0.55)	0.006	0.16
		Low-risk versus moderate lifestyle–low substance use	0.19 (0.06)	(0.08, 0.30)	0.002	0.10
	Teacher support	Low-risk versus poor lifestyle–smoking	0.46 (0.03)	(0.41, 0.51)	<0.001	0.44
		Low-risk versus balanced lifestyle–aggressive	0.28 (0.03)	(0.21, 0.35)	<0.001	0.25
		Low-risk versus poor lifestyle–high substance	0.74 (0.76)	(0.60, 0.88)	<0.001	0.27
		Low-risk versus moderate lifestyle–moderate substance use	0.67 (0.06)	(0.54, 0.79)	<0.001	0.60
		Low-risk versus moderate lifestyle–low substance use	0.52 (0.03)	(0.46, 0.57)	<0.001	0.50
Males	**Family support**	Low-risk versus poor lifestyle-smoking	0.37 (0.05)	(0.27, 0.46)	<0.001	0.18

(Continues)

(CONTINUED)

Gender	Social support domain	Comparison (reference: low-risk)	Mean diff. (*Δ*) (SE diff.)	95% CI (lower, upper)	*p* values	Cohen's *d* (approx.)
		Low-risk versus balanced lifestyle–aggressive	0.60 (0.05)	(0.49, 0.71)	<0.001	0.27
		Low-risk versus poor lifestyle–high substance	1.06 (0.10)	(0.86, 1.25)	<0.001	0.41
		Low-risk versus moderate lifestyle–moderate substance use	0.88 (0.07)	(0.75, 1.01)	<0.001	0.43
	Peer support	Low-risk versus poor lifestyle–smoking	−0.11 (0.04)	(−0.20, −0.02)	0.017	−0.06
		Low-risk versus balanced lifestyle–aggressive	0.42 (0.05)	(0.32, 0.53)	<0.001	0.20
		Low-risk versus poor lifestyle–high substance	0.48 (0.09)	(0.29, 0.66)	<0.001	0.20
		Low-risk versus moderate lifestyle–moderate substance use	0.04 (0.06)	(−0.09, 0.16)	0.588	0.02
	Teacher support	Low-risk versus poor lifestyle–smoking	0.38 (0.03)	(0.33, 0.44)	<0.001	0.32
		Low-risk versus balanced lifestyle–aggressive	0.43 (0.03)	(0.36, 0.49)	<0.001	0.33
		Low-risk versus poor lifestyle–high substance	0.70 (0.06)	(0.59, 0.81)	<0.001	0.47
		Low-risk versus moderate lifestyle–moderate substance use	0.46 (0.04)	(0.39, 0.54)	<0.001	0.42

Note: Mean differences are BCH pairwise contrasts (reference: *low-risk*). 95% CIs for contrasts were computed from the BCH Wald χ^2 tests $\left(SE(\Delta) = |\Delta|/\sqrt{\chi^2}\right)$. *d* values are standardized mean differences (approx.) derived from χ^2 and class sizes.