



Long-Term Discrimination Effects on Adolescent Health Behaviors and Well-Being in Four CountriesChristine Emmer^{1,2,3}, Anna Neumer⁴, Frank Kalter^{2,3}, and Jutta Mata^{1,2}¹University of Mannheim, School of Social Sciences, Chair of Health Psychology²University of Mannheim, Mannheim Centre for European Social Research (MZES)³University of Mannheim, School of Social Sciences, Chair of General Sociology⁴University of Mannheim, School of Social Sciences, Chair of Work and Organizational Psychology**Author Note**Christine Emmer  <https://orcid.org/0000-0003-0243-8463>Anna Neumer  <https://orcid.org/0000-0002-6601-1293>Frank Kalter  <https://orcid.org/0000-0003-0294-047X>Jutta Mata  <https://orcid.org/0000-0003-2498-5054>

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Abstract

Objective: Adolescence is a pivotal foundation for lifelong health and a phase vulnerable to the adverse effects of discrimination. We assessed the impact of perceived discrimination on adolescent well-being over 2 years and the mediating effects of protective (physical activity, nutrition, sleep) and risky (substance use) health behaviors. **Methods:** Adolescents ($N = 9,957$; $M_{\text{age}} = 14.90$ years) from the CILS4EU multinational panel (a longitudinal survey in four European countries) were examined across three waves. Direct and indirect relationships were analyzed using path models, adjusting for health behaviors, well-being, and control variables (age, gender, socioeconomic status, migration, religion) assessed in Wave 1. **Results:** Adolescents reported the most discrimination instances within the school environment. Perceived discrimination at Wave 1 was significantly associated with decreased well-being at Wave 3 ($\beta = -.04$, $p < .001$) and decreased protective (physical activity: $\beta = -.02$, nutrition: $\beta = -.04$, sleep: $\beta = -.04$) and increased risky (substance use: $\beta = .03$) health behaviors at Wave 2. Nutrition and sleep mediated the relationship between perceived discrimination and well-being; no mediation was found for physical activity and substance use. **Conclusions:** Even in observational data with 1-year assessment intervals, detrimental long-term effects of perceived discrimination on adolescent well-being are apparent, mediated through changes in nutrition and sleep behaviors. These results extend previous research—predominantly focusing on substance use—showing that perceived discrimination also predicted fewer protective health behaviors. Adolescence represents a strategic window for addressing discrimination and promoting healthy behaviors and well-being to mitigate long-term health disparities.

Keywords: (social) discrimination, health disparities, health behavior, adolescent health

Public Significance Statement: Adolescence is a critical developmental period marked by increased vulnerability to discrimination. This study shows that perceived discrimination adversely affects adolescent health behaviors (physical activity, nutrition, sleep, and substance use) and well-being over time; poorer nutrition and less sleep partly explain this adverse impact on well-being. These insights underscore the importance of addressing discrimination and fostering healthy behaviors among adolescents to improve well-being and reduce future health disparities.

Long-Term Discrimination Effects on Adolescent Health Behaviors and Well-Being in Four Countries

The increasing globalization and rising national wealth in European countries paradoxically contribute to increased social inequality—defined as the unequal distribution of resources and risk factors based on an individual's or group's position within an economic and social hierarchy (e.g., Shaw et al., 2007)—and resulting health disparities among adolescents (Elgar et al., 2015). Adolescence is a crucial foundation for health throughout life: Although noncommunicable chronic diseases—major contributors to premature mortality—typically manifest later in life, their development is significantly influenced by well-being and health behaviors established during adolescence (Elgar et al., 2015). To effectively address social inequalities in health, understanding underlying mechanisms is essential. Discrimination is a key factor through which social disadvantage exacerbates health inequalities (Bauer & Scheim, 2019), particularly chronic and pervasive forms of discrimination (Emmer et al., 2024). Discrimination describes the unfair or prejudicial treatment of people based on their actual or perceived affiliation to socially disadvantaged, marginalized social groups (e.g., ethnicity, gender, or social class; e.g., Emmer et al., 2024). Adolescents affected by inequality experience multiple instances of discrimination daily (English et al., 2020). Importantly, discrimination impacts health and well-being both directly and indirectly through its adverse effects on health behaviors (Pascoe et al., 2022). Adolescent health behaviors tend to progress into adulthood, likely amplifying disparities in adolescent health behaviors over the lifespan (e.g., Viner et al., 2012). A better understanding of the adverse effects of discrimination on adolescent well-being and the role of (protective and risky) health behaviors can substantially contribute to identifying ways to mitigate health disparities. We focus on satisfaction with life in general as a key component of well-being because it encompasses both mental and somatic health and is more prone to differences in adolescence than specific illnesses, which are more likely to manifest later in life (e.g., Avedissian & Alayan, 2021).

Discrimination and Well-Being in Adolescence

Discrimination comes in several forms. Structural or institutionalized discrimination includes policies or institutional practices that perpetuate inequality and impact well-being by restricting access to resources and increasing stress exposure (Krieger, 2012). Interpersonal discrimination involves

direct social interactions that can be overt or more subtle, such as microaggressions (Emmer et al., 2024; Williams, 2020). Interpersonal discrimination, such as social rejection, undermines well-being by threatening basic psychological needs, such as the need to belong (Smart Richman & Leary, 2009). Discrimination is a psychosocial stressor that elicits physiological and psychological stress responses, leading to diminished well-being and long-term health disparities (Emmer et al., 2024; Pascoe & Smart Richman, 2009). Although discrimination can also unconsciously affect well-being (e.g., Bailey et al., 2017), there can be additional consequences when unfair treatment and rejection are perceived as discrimination, as this perception highlights one's social position and experiences of marginalization (c.f. Schmitt et al., 2014).

An especially vulnerable phase for the adverse effects of discrimination is adolescence: Adolescents have limited abilities to cope effectively with discrimination, as their self-regulation and coping capabilities are still under development, while neural changes in their developing brain heighten their responsiveness to social evaluation and rejection (Somerville, 2013). Meta-analyses have indicated stronger associations between perceived discrimination and well-being for adolescents than adults (e.g., Schmitt et al., 2014). Importantly, longitudinal evidence remains limited because most studies were cross-sectional, conducted in the United States, and predominantly focused on racial discrimination (Cave et al., 2020).

Health Behaviors as Pathways for the Adverse Well-Being Effect of Discrimination

Health behaviors are crucial determinants of morbidity and premature mortality and, because they are strongly socially patterned, they serve as central contributors to health inequalities (Petrovic et al., 2018). Key health behaviors for the prevention and treatment of mental and physical disorders include physical activity, nutrition behavior, and sleep as *protective behaviors* and avoiding alcohol, cigarette, and illicit drug use as central and common *risky behaviors* in adolescence (systematic reviews by Firth et al., 2020; Halladay et al., 2020). Engaging in physical activity promotes well-being and resilience among adolescents, whereas physical inactivity significantly increases the risk for cardiometabolic and mental health problems (van Sluijs et al., 2021). Breakfast consumption, an

important indicator of nutrition adequacy, is associated with better well-being and reduced mental distress in adolescents (Lien, 2007). A longer sleep duration is associated with better well-being and healthy development (Matricciani et al., 2019). Substance use during adolescence undermines well-being owing to impaired neurodevelopment and increased predisposition to mental health disorders (e.g., Chaiton et al., 2009).

General psychosocial stress longitudinally predicts worse health behaviors, such as decreased physical activity, less healthy eating behaviors and nutrition patterns, and increased substance use in adults (Mouchacca et al., 2013). Discrimination, as a specific form of psychosocial stressor, affects health behaviors through several unique pathways, including constrained access to resources at both interpersonal and institutional levels. This can manifest, for example, as a lack of safe spaces for physical activity (Jones et al., 2017) or a higher exposure to addictive substances and unhealthy eating options in socially disadvantaged areas (Schneider & Gruber, 2013). Moreover, individuals frequently use unhealthy behaviors, such as stress-induced eating or substance use, as a form of self-medication to mitigate adverse physiological and psychological stress responses triggered by discrimination (Brown et al., 2022; Gibbons et al., 2018). These behaviors can lead to negative long-term health outcomes, including disorders related to overweight and addiction. Attempts to regain a sense of belonging compromised by discrimination can lead to increased substance use because consuming substances is often a social activity (Smart Richman & Leary, 2009).

Discrimination was associated with an increase in risky health behaviors and a decrease in protective health behaviors in a recent meta-analysis (Pascoe et al., 2022). In this meta-analysis, most identified studies focused on risk behaviors; the few studies examining adolescents exclusively focused on substance use as outcome and had not addressed protective health behaviors. Further, the identified studies were predominantly cross-sectional and observational. In the few longitudinal studies, health behaviors—again, mostly substance use—have been examined as mediators explaining the effect of discrimination on well-being. For instance, Yang et al. (2019) found that adolescents subjected to discrimination were more likely to engage in substance use in early adulthood, which

compromised their overall physical and psychological health by mid-adulthood. Another longitudinal study (Gibbons et al., 2018) found early discrimination linked to worse well-being and smoking from adolescence into adulthood. Protective health behaviors have predominantly been treated as primary outcomes of discrimination rather than mechanisms through which discrimination adversely affects well-being (e.g., reviews by Rodrigues et al., 2022 or Slopen et al., 2016). Sleep has been the primary focus in the few longitudinal studies considering protective health behaviors as mediators: For instance, using daily diary data, Yip et al. (2022) demonstrate that sleep disturbances mediated the impact of racial discrimination on adolescents' mental health. Similarly, Zeiders (2017) integrated daily diary data with longitudinal assessments, showing that perceived discrimination over the past 12 months was associated with decreased daily sleep quality, though not quantity; however, it did not significantly mediate the effects of discrimination on mental health outcomes two years later. In summary, a significant research gap exists regarding the long-term consequences of discrimination on adolescent well-being and how health behaviors mediate this effect over time. Only a few longitudinal studies have explored health behaviors, and those have focused on risky behaviors—mostly substance use—as pathways. The impact of discrimination on health behaviors during adolescence is pivotal, as it can exacerbate lifelong health disparities. Adolescent health behaviors not only affect concurrent well-being and health outcomes but also have long-term impacts on health in adulthood and shape health behavior patterns that often persist into adulthood (Viner et al., 2012).

Study Aims and Hypotheses

Adolescence is a window of opportunity in which to mitigate the negative effects of discrimination on health and health behaviors and, ultimately, to prevent health disparities. To effectively do so, the long-term consequences of discrimination on adolescent well-being and how particularly protective health behaviors mediate this effect over time need to be researched. Moreover, common forms of discrimination apart from racial discrimination and within the European context have rarely been studied. We addressed these gaps by examining how perceived discrimination affects well-being and health behaviors over time and investigated the mediating role of

protective and risky health behaviors across four European countries. We propose the following hypotheses: (1) Perceived discrimination is negatively related to well-being 2 years later. (2) Perceived discrimination is negatively related to protective health behaviors, namely, (a) physical activity, (b) nutrition, and (c) sleep, and positively related to risky health behaviors, namely, (d) substance use, 1 year later. (3) Health behaviors, namely, (a) physical activity, (b) nutrition, (c) sleep, and (d) substance use, mediate the relationship between perceived discrimination and well-being over time. For a graphical representation of the hypotheses and the proposed theoretical model see Figure 1.

Method

Data and Sample Characteristics

Data from the multinational Children of Immigrants Longitudinal Survey in Four European Countries panel (CILS4EU; Kalter et al., 2016a, 2016b, 2017) were analyzed. CILS4EU is a comprehensive panel on migration in adolescents in four European societies: England, Germany, the Netherlands, and Sweden. This panel makes it possible to explore a central and widespread dimension of health inequality—migration—among adolescents in Europe on an unprecedented scale.¹ Data collection involved standardized self-report questionnaires completed by the adolescents, one of their parents, and one of their teachers, utilizing paper-and-pencil, telephone, and online formats to allow for flexible and comprehensive data collection. Three stages were used for sampling: (1) Schools were categorized and selected on the basis of the proportion of students with a migration background, with those schools having a higher proportion being oversampled; (2) within each selected school, two classes primarily consisting of 14-year-old students were randomly selected and surveyed; and (3) all students within these classes were included in the sample. For this study, data from the first three annual waves of the survey (starting with Wave 1 in 2010–2011) were used because the age of the sample at Wave 1 was 14–15 years, a period in which individuals are vulnerable to adverse discrimination effects and are establishing health behavior patterns. Furthermore, the three separate

¹Migration background plays a crucial role in the European context, often serving as a proxy for race, ethnicity, and culture, particularly in light of the historical sensitivity surrounding the collection of such data in many European countries. Given the challenges of addressing the socially constructed and context-dependent nature of race, ethnicity, and culture in Europe, especially Germany (where race or ethnicity is not part of the official census), using migration background as a proxy allows researchers to examine the experiences of diverse populations while navigating the social and political complexities surrounding these issues in Europe (e.g., Stadler et al., 2023).

measurement points allow for temporally separating predictor, mediator, and outcome variables.

Although this design does not establish causality in the same way as experimental studies, it provides a stronger basis for causal inference than cross-sectional designs (O’Laughlin et al., 2018) and establishes temporal precedence between variables, which reduces common method bias. Table 1 summarizes all sample characteristics. The mean age of the sample at Wave 1 was 14.90 years ($SD = 0.54$), and approximately half of the participants (53.5%) identified as girls.

For the longitudinal analysis, we included only participants who completed all three measurement waves, that is, 9,957 (53%) of the 18,716 adolescents surveyed at Wave 1.² We systematically explored differences between participants who completed all three waves and those who did not (Table S1 for detailed results). Although the statistical tests revealed significant differences between the two groups across several measures, likely owing to the large sample size, the mean differences were usually very small in terms of effect sizes (Cohen's d). The most notable differences were that the largest proportion of completers came from Germany and the largest proportion of dropouts from Sweden. Also, 53.5% were girls among the completer sample, among the dropouts, 45.4%. About 5% more dropouts than completers had a migration background and minority religion affiliation. Concerning health behaviors, the most notable difference was in substance use, where dropouts’ reported use was 0.13 points higher on a 4-point scale.

Measures

Perceived Discrimination

For our analyses, we used perceived discrimination from Wave 1. The frequency of perceived discrimination was assessed using four items, each beginning with “How often do you feel discriminated against or treated unfairly...” followed by “in school,” “in trains, buses, trams, or the subway,” “in shops, stores, cafés, restaurants, or nightclubs,” and “by police or security guards.” Participants responded on a 4-point scale with 0 = *never*, 1 = *sometimes*, 2 = *often*, and 3 = *always*. The

² The results remain comparable when using the full sample ($N = 18,716$) and applying Full Information Maximum Likelihood (FIML) to handle missing data. The only difference was the emergence of an additional significant indirect effect of discrimination on well-being via physical activity, likely due to the increased statistical power from the larger sample size (see Tables S2 and S3 for details).

mean score across these four items was calculated to quantify the average level of discrimination (Cronbach's $\alpha = .65^3$; see Table S7 and Figure S1 for descriptives of the separate items).

Health Behaviors

We used health behavior measurements from Waves 1 and 2 in our analyses. **Protective Health Behaviors.** Physical activity and nutrition were assessed with a single item measuring their respective frequency ("How often do you..." "do sports or go to the gym"/"have breakfast?" with answers on a 5-point Likert scale, with 0 = *never*, 1 = *less often* [than once a month], 2 = *once or several times a month*, 3 = *once or several times a week*, and 4 = *every day*. Sleep was operationalized as hours of sleep on a typical school day ("On a typical school night, how many hours of sleep do you get?"). In Wave 1, this was an open-ended question; in Wave 2 any sleep duration exceeding 12 hr was coded as 12 hr. For consistency, we applied this coding to Wave 1 (affecting 0.2% of the Wave 1 sample, i.e., $n = 17$ adolescents). Outliers in sleep duration were identified using boxplot analysis. Extreme values with less than 4 hr of sleep on a typical school night (0.3% of the Wave 1 sample and 0.6% of the Wave 2 sample) were coded as missing values. **Risky Health Behaviors.** Given our theoretical assumptions that discrimination affects the frequency of alcohol, cigarette, and illicit drug use similarly and impacts well-being through comparable mechanisms, we combined the three respective items ("How often do you... drink alcohol/smoke cigarettes/do drugs?") into a mean score for substance use (Cronbach's $\alpha_{\text{Wave1}} = .65$ and $\alpha_{\text{Wave2}} = .65$). Responses were given on 5-point Likert scales of 0 (*never*) to 4 (*every day*). This composite score also reflects that using multiple substances is more common than using just one (Halladay et al., 2020) and accounts for the lower reported frequency of cigarette and drug use compared to alcohol, improving statistical power and enabling more robust estimation (see Table S7 for descriptive statistics for the separate items). In contrast, protective health behaviors are less frequently studied but may represent key intervention targets for promoting healthier outcomes.

³ The low reliability of the discrimination measure likely arises from the diverse life contexts examined, as reflected in the small to moderate inter-item correlations ($r = .24$ to $.48$; see Table S4). A confirmatory factor analysis (CFA) with all four items loading onto one factor demonstrated good fit ($\chi^2(2) = 37.430$, $p < .001$, RMSEA = $.043$, SRMR = $.014$, CFI = $.993$, TLI = $.980$), supporting the use of a mean score across the four life domains. Although a single-factor versus a four-factor model comparison was infeasible due to single-item assessments per domain, additional robustness checks using individual items as predictors further validated the mean score approach. Results were also consistent when analyzed with a latent path model with all items loading onto a single latent discrimination factor (see Tables S5 and S6).

Therefore, a detailed examination of these behaviors may uncover critical areas where prevention efforts could be most effectively focused.

Well-Being

Well-being was operationalized as life satisfaction using the item: “On a scale from 1 to 10 where 1 is very unsatisfied and 10 is very satisfied, how satisfied are you with your life in general?” For our analyses, we used the life satisfaction measures from Waves 1 and 3.

Control Variables

Age, gender, socioeconomic status, migration background, and religious affiliation are included as control variables, as these factors are key determinants of well-being and health behaviors (O’Neill et al., 2014). Since these variables also serve as relevant indicators of structural inequality (O’Neill et al., 2014), their inclusion allows isolating the specific effects of subjective discrimination as perceived by adolescents beyond objective inequality markers. As noted by Schmitt et al. (2014), subjective perceptions of discrimination can have additional negative health effects because they reflect social positioning. For results without control variables, see Table S8. **Age.** We calculated respondents’ age by subtracting their birth month and year from the month and year the survey was administered. **Gender.** Gender was assessed with “Are you a boy or a girl?” using two response categories: boy (reference group) and girl. **Socioeconomic Status.** Socioeconomic status was operationalized as parents’ occupational status (objective indicator) and adolescents’ self-reported subjective material deprivation (subjective indicator). Both indicators had unique effects on well-being and health behaviors; multicollinearity was not observed. Parents provided their occupational status, which was coded according to the 2008 International Standard Classification of Occupations and converted to the interval-scaled International Socio-Economic Index of occupational status (ISEI). The ISEI is a complex indicator combining information about job position, income, and education to reflect the status of an occupation, ranging up to a value of 90 (e.g., for judges). If these data were missing in the parent’s questionnaire, respective data were taken from the child’s questionnaire. For two-parent homes, the higher of the two parents’ ISEI scores was used as a measure of parents’ occupational status. If both

parents (or one parent in single-parent homes) were not employed or had never worked before, the value 0 was assigned. Higher scores represented a higher socioeconomic status. Subjective material deprivation was assessed by asking adolescents whether they missed out on activities with their friends because they could not afford them; answers were given on a scale of 0 (*never*) to 4 (*always*), with higher values representing lower socioeconomic status. **Migration.** In this analysis, migration status was assigned as 0 (no migration background; reference group) or 1 (migration background, including first migration generation, i.e., adolescents who migrated themselves, and second migration generation, i.e., adolescents born in the survey country with at least one parent born abroad).

Religion. Religious affiliation was assessed with one question (“What is your religion?”) and answers were coded into three categories: no religion (30.9% of adolescents in Wave 1), Christianity as the majority religion in the four European countries (46.6%), and all other religions combined into a single “minority religion” category, including Islam (16.2%), Hinduism (1.3%), Sikhism (0.9%), Buddhism (0.6%), Judaism (0.1%), and other religions (3.4%).

Analytic Strategy

We used path analysis in R with the lavaan package (Rosseel, 2012) to test our hypotheses. We used all data available and handled missing data with full information maximum likelihood estimation (FIML). We modeled a direct path from perceived discrimination at Wave 1 to well-being at Wave 3 (Hypothesis 1), from perceived discrimination at Wave 1 to health behaviors at Wave 2 (Hypothesis 2a–d), and from health behaviors at Wave 2 to well-being at Wave 3. Additionally, we modeled paths from the control variables (age, gender, parents’ occupational status, subjective material deprivation, migration, and religion) to health behaviors and well-being. Furthermore, we modeled paths from the health behaviors at Wave 1 to the health behaviors at Wave 2 and a path from well-being at Wave 1 to well-being at Wave 3 to control for baseline levels of the health behaviors and well-being. Last, we allowed correlations between the four health behaviors. To calculate indirect effects from perceived discrimination to well-being via health behaviors (Hypothesis 3a–d), we used unstandardized path

estimates from lavaan (Rosseel, 2012) and computed confidence intervals using the Monte Carlo method with 20,000 simulations (Selig & Preacher, 2009).

Robustness Checks

Multilevel Structure. To account for the multilevel structure of our data—students (Level 1) nested within schools (Level 2) nested within countries (Level 3)—we reanalyzed our data in a multilevel path model. Intraclass correlation coefficients (ICCs) indicated that the majority of variance was located at the participant level (Level 1) across all measures, with relatively small proportions of variance attributable to differences between schools (ranging from 1.22% for life satisfaction to 7.04% for substance use) and between countries (from 0.77% for life satisfaction to 9.43% for perceived discrimination). For an overview of ICCs, see Table S9. Given these low ICCs, we have opted to present one-level models in the manuscript to reduce the complexity of the analyses. We report the multilevel path model as a robustness check for completeness and transparency in the supplemental materials (Tables S10 and S12). Importantly, we did not conduct a path model with three levels because of the small proportion of variance between countries and the very small sample size on the third level with only four countries (below the recommended sample size of at least 10). Initially, we wanted to control for the country level by using dummy variables as control variables for the paths at the school level, but these path models did not converge. Consequently, we replicated the path model used in our main analyses (Hypotheses 1–3) in a two-level path analysis (Preacher et al., 2010). Because our hypotheses all focused on adolescents (Level 1), we modeled all paths on the student level with school-mean-centered predictors and mediators and decomposed the well-being variance on both the student and school levels.

Perceived Discrimination Across Different Life Domains. The rather low Cronbach's alpha of perceived discrimination indicated that experiencing discrimination in one life domain does not necessarily mean experiencing discrimination in other life domains, calling for careful consideration when using a mean index score. To test whether the result patterns replicate by life domain, we replaced the discrimination mean score in the initial path model with four separate discrimination

variables for each life domain. Due to convergence problems when including all four discrimination variables in a single path model, we used a segmented approach with four separate path models.

Results

Descriptives

Table 1 provides a summary of all descriptives. Most of the adolescents' parents fell within the middle range of the ISEI, and most adolescents indicated no material deprivation (Figure S1). Around 40% of the adolescents had a migration background, and around 20% aligned themselves with a minority religion. Adolescents with a migration background or minority religious affiliation reported slightly higher levels of discrimination compared to those without a migration background or belonging to no or the majority religion (Table S13). Half of the adolescents reported not having encountered discrimination in any of the four life domains assessed, that is, school, public transportation, retail and hospitality, and law enforcement and security (Figures S1 and S3). Most adolescents reported high well-being (Figure S4), as well as engaging in physical activity at least several times a week, eating breakfast daily, and sleeping 8 hr on a typical school day. Risky health behaviors were relatively rare: Most adolescents reported never consuming alcohol, cigarettes, or drugs (Figure S5).

Hypothesis Testing

The path model showed a statistically significant chi-square value, $\chi^2(20, N = 9,957) = 175.202, p < .001$, indicating a misfit of the model. However, because the χ^2 value is sensitive to sample size, it usually indicates a misfit when using large samples, as in this study. Importantly, the RMSEA (0.028), SRMR (0.011), and CFI (0.990) all indicated a good model fit.

The estimated model parameters were thus interpretable. The results of the path model are presented in Table 2 (direct effects) and Table 3 (indirect effects); see Figure 1 for a graphical overview). The first hypothesis, perceived discrimination is negatively related to well-being 2 years later, was supported ($\beta = -.04, p < .001$). Hypothesis 2a–c, perceived discrimination is negatively related to (a) physical activity, (b) nutrition, and (c) sleep 1 year later, was supported (physical activity: $\beta = -.02, p = .049$; nutrition: $\beta = -.04, p < .001$; sleep: $\beta = -.04, p < .001$). Hypothesis 2d, perceived discrimination is positively related to substance use 1 year later, was also supported ($\beta = .03, p = .002$).

Hypothesis 3, health behaviors mediate the relationship between perceived discrimination and well-being, was partially supported (Table 3). We found no support for the hypothesis that perceived discrimination is indirectly negatively related to well-being 2 years later via physical activity (Hypothesis 3a) or substance use (Hypothesis 3d) 1 year later. The indirect effects of perceived discrimination on well-being 2 years later via nutrition (Hypothesis 3b) and sleep (Hypothesis 3c) were significant and negative.

Robustness Checks

Multilevel Structure. The two-level path model with students (Level 1) nested in schools (Level 2) showed a statistically significant chi-square value, $\chi^2(20, N = 9,957) = 191.549, p < .001$, as can be expected given the large sample size. Yet the RMSEA (0.029), SRMR_{within} (0.012), SRMR_{between} (0.000), and CFI (0.987) all indicated a good model fit, and we therefore interpreted the estimated model parameters. The results of the two-level path model are presented in Table S10 (direct effects) and Table S12 (indirect effects). The results are comparable to the findings from the one-level path model reported for Hypotheses 1–3 above, with the one exception that the relationship between perceived discrimination and physical activity 1 year later did not remain significant. Notably, this path was also close to the cut-off value for interpreting the path as nonsignificant in the one-level model ($p = .049$).

Perceived Discrimination Across Different Life Domains. In addition to analyzing discrimination in a mean score across the four life domains, we analyzed discrimination separately in every life domain. The relationships of perceived discrimination in the school context with well-being and health behaviors was equal to the pattern observed for the mean score across the four life domains. The results pattern remained similar in the other three life domains (public transportation, retail and hospitality, and law enforcement and security), but some paths became statistically nonsignificant (Table S14 for details).

Discussion

This large panel study of adolescents across four European countries showed that higher perceived discrimination predicts poorer well-being 2 years later. It also shows that discrimination is related to engaging less in protective (physical activity, nutrition, and sleep) and more in risky

(substance use) health behaviors 1 year later and that nutrition and sleep partially explain the longitudinal relation between discrimination and well-being. Adolescents reported experiencing discrimination more frequently within the school environment than in other life domains.

Interpretation of Findings

Our finding that perceived discrimination in adolescents predicts well-being 2 years later (Hypothesis 1) extends previous research from the United States (e.g., Cave et al., 2020) to the European context and broadens the focus from racial discrimination to a wider spectrum of discrimination types. Also, whereas previous studies examined substance use as a consequence of discrimination (e.g., Cave et al., 2020; Pascoe et al., 2022), the current study additionally investigated the relation between discrimination and protective health behaviors, that is, physical activity, nutrition, and sleep (Hypothesis 2a–d). Of note, the association between perceived discrimination and physical activity 1 year later was not robust. This is in line with cross-sectional findings in adults (Figueroa et al., 2024) in which perceived social class discrimination was also not associated with physical activity but was associated with nutrition, sleep, and substance use. One possible explanation for the non-significant effects of discrimination on physical activity is that different types of discrimination may elicit varying coping responses. For instance, weight-based discrimination might lead to reduced physical activity as an avoidance strategy (Puhl & Lessard, 2020), whereas race-based discrimination might result in increased physical activity as a form of active coping (Jacob et al., 2023). These counteracting effects may obscure the overall relationship when multiple forms of discrimination are assessed simultaneously, as in this study. Consequently, we also did not find physical activity to explain the relationship between perceived discrimination and well-being (Hypothesis 3a). Whereas nutrition and sleep partially explained the link between discrimination and well-being (Hypothesis 3b and c), substance use did not (Hypothesis 3d). This is particularly noteworthy because substance use has been the primary focus for explaining the link between perceived discrimination and well-being among adolescents in previous research (see review by Cave et al., 2020). In the current study, higher perceived discrimination was related to higher substance use

1 year later, but substance use did not explain well-being the following year. This might be because of a generally low reported frequency of substance use, possibly influenced by social desirability bias in school-based self-reports, or selective dropout of adolescents reporting higher substance use. The role of nutrition and sleep in explaining how discrimination impairs well-being over time has not been previously researched. They might therefore be particularly relevant and interesting to the field and nicely complement a recent study showing that the relation between peer bullying in childhood and mental health in late adolescence was explained by physical activity, nutrition, and sleep in middle adolescence (Tsomokos & Slavich, 2024). Importantly, protective health behaviors might have the potential also to reduce the negative impact of psychosocial stressors (e.g., Flueckiger et al., 2016); hence, the adverse effect of discrimination on protective health behaviors may further exacerbate its adverse effects on well-being and health.

Importantly, all our analyses controlled for age, gender, socioeconomic status, migration status, and religious affiliation because these are key determinants of health behaviors and well-being. Acknowledging these variables as central indicators of social inequality and potential discrimination, all current findings thus reflect the impact of subjective discrimination on health behaviors and well-being beyond objective social inequality indicators. The findings underscore that merely capturing objective indicators of inequality is not sufficient to describe the full impact of discrimination.

We explored the impact of perceived discrimination across various life domains separately—school, public transportation, retail and hospitality sectors, and interactions with law enforcement and security. The most robust and consistent effects on well-being and health behaviors were observed in the school context. This finding may be attributable to adolescents spending a large proportion of their time at school or the higher frequency of discrimination incidents reported in educational settings compared to other areas. Prevention of discrimination in the school environment could have long-term benefits for well-being and health behaviors. At the same time, other public life domains should not be overlooked—consistent negative effects on well-being and nutrition behavior were identified for all investigated domains. These may intensify as adolescents age and gain more exposure to them.

Limitations and Future Research

An essential strength of this study is its large sample of adolescents, including a large proportion of hard-to-reach adolescents with a migration background. This research covers an especially vulnerable stage for the negative impacts of perceived discrimination during mid to late adolescence. It is among the first studies of its magnitude to explore perceived discrimination in a European context (but see Bécares et al., 2024 for the UK), covering a wide range of discrimination types as well as protective health behaviors in addition to substance use. Although observational, the longitudinal design across three yearly waves enhances the potential for causal conclusions (O’Laughlin et al., 2018) and mitigates common method bias.

Although this data set is comprehensive, it has some limitations: The dropout rate was about 47% and possibly selective, with adolescents reporting higher substance use being less likely to participate across all three assessment waves. To model the data from participants of all three assessment waves optimally and handle missing data, we employed full information maximum likelihood estimation. This statistical technique allows for including all available data, providing a more accurate representation than excluding cases with missing information.

As is common for panel studies, the variables in the current panel were often rather broadly assessed with a few items, for example, perceived discrimination, well-being, and health behaviors. Assessing discrimination is particularly challenging because the most frequent forms of discrimination in daily life are subtle and ambiguous and, hence, harder to recognize as discrimination (Williams, 2020). Importantly, discrimination harms health, even without conscious recognition (Bailey et al., 2017). While the items used in the study assessed the frequency of discrimination or unfair treatment, not all unfair treatment constitutes discrimination. The meta-analysis by Emmer et al. (2024) illustrated that unfair treatment based on nonmarginalized identities (e.g., men experiencing gender-based unfairness) did not affect well-being in experimental studies, unlike unfair treatment based on marginalized identities (e.g., women experiencing sexism). This emphasizes how discrimination is shaped by social structures and power dynamics beyond its overt manifestation in unfair treatment,

which this study could not account for. Additionally, the broad measure of discrimination did not allow for a detailed analysis of different types of discrimination. Given that nearly 40% of the sample had a migration background, and that both migration status and minority religious affiliation were associated with higher reported discrimination, exploring the effects of specific types of discrimination could provide deeper insights into the differential impacts of discrimination types on well-being. Future research could incorporate more comprehensive measures capturing psychosocial aspects of discrimination experience, such as stress intensity (Krieger, 2012), and structural factors beyond interpersonal behavior, such as neighborhood deprivation (Schneider & Gruber, 2013). Furthermore, while this study encompasses a broad range of relevant life domains, expanding to additional domains, such as social media and online contexts (e.g., English et al., 2020; Lewis et al., 2015) or family environments (e.g., Parker et al., 2018) could provide a fuller picture of the discrimination experienced by adolescents. Additionally, adopting more comprehensive well-being measures that capture dimensions such as competence, emotional stability, engagement, positive relationships, resilience, and self-esteem (Ruggeri et al., 2020) could provide a broader perspective on the adverse effects of discrimination. Nevertheless, the life satisfaction item used in the current study is a widely accepted and validated measure (Cheung & Lucas, 2014). Similarly, future panel research could benefit from using more complex measures for health behavior, including more informative dimensions of physical activity, such as activity type, duration, or intensity (Ainsworth et al., 2015), healthfulness of breakfast and specific nutrients consumed or comprehensive dietary patterns (Lien, 2007), or measures such as sleep quality or sleep disturbances (Slopen et al., 2016). Such measures could also reduce bias from retrospective recall and self-reporting. Measuring substance use is particularly challenging, especially considering that the survey was conducted at schools and substance use among adolescents is illegal in the surveyed countries, potentially affecting the honesty of responses.

Another limitation pertains to the operationalization of gender in this panel, which was restricted to binary classifications of boy or girl. This simplification does not reflect the full spectrum of gender identities. Future research should aim to include more diverse gender categorizations.

In sum, the broad measurements, coupled with the comparably long yearly time intervals between survey waves and the potentially selective sample of adolescents across four countries, may have contributed to underestimating the effects identified in this study and may explain the small effect sizes. However, given that discrimination is a chronic psychosocial stressor and the negative effects of discrimination on health accumulate over the lifespan (Reskin, 2012), even small effects pose a considerable threat to health and mortality. In particular, the adverse effects on health behaviors not only impact current well-being but also influence future health because adolescence is a critical period for establishing health behavior patterns that can persist over the lifespan, potentially exacerbating health inequalities and posing a risk to public health and societal equity.

Implications

The results of this study have several implications. First, the findings underscore the importance of focusing on adolescence in research on social inequality, discrimination, and public health because perceived discrimination has long-lasting negative impacts on well-being and health behaviors. Prioritizing early intervention and prevention strategies is key, as they not only improve immediate well-being and health but also stave off long-term health and social inequalities (Elgar et al., 2015). Promising interventions targeting affected adolescents to mitigate the negative effects of discrimination on well-being and health include, for instance, values affirmation and sense of belonging interventions (see Lewis et al., 2015). Additionally, it is crucial to consider interventions to reduce prejudice and discrimination, particularly targeting populations not directly affected by discrimination. A promising approach involves empowering bystanders to actively prevent or stop discriminatory incidents, to support targeted individuals and create a safe and inclusive environment for everyone (Dessel et al., 2017).

Second, interventions should also target social contexts to enhance health and diminish disparities throughout the lifespan. The current study suggests that schools are particularly relevant because most discrimination incidents and the strongest effects on well-being and health behaviors were observed in this context. Also, school-based discrimination from peers and educators extends

beyond well-being and health to outcomes such as academic performance (Stevens et al., 2018) and social isolation (Doyle & Barreto, 2023). As key public institutions, schools can be particularly effective in reaching disadvantaged populations, which is an ongoing challenge in health prevention and intervention programs. One approach to enhance the effectiveness of anti-discrimination interventions within the school context could be to target social referents—peers who play a central role in the school social network—due to their greater capacity to influence social change at the climate level (see Paluck et al., 2016). Moreover, structural interventions, including anti-discrimination laws and policies, are crucial in mitigating discrimination overall (e.g., Fields & Wotipka, 2022).

Third, health behaviors are modifiable and should, therefore, be targeted in prevention and intervention programs; particularly protective health behaviors can mitigate the negative effects of psychosocial stressors (e.g., Flueckiger et al., 2016). To address health behaviors as a modifiable mechanism, future interventions and prevention efforts should target determinants of health behaviors that are impacted by discrimination, such as self-efficacy (Cavaliere et al., 2019), social support (Doyle & Barreto, 2023), or maladaptive coping strategies (Brown et al., 2022; Gibbons et al., 2018). Furthermore, programs promoting changes in general health behavior should place a special focus on promoting and maintaining health behaviors in at-risk adolescents. Recognizing health behaviors as both outcomes of discrimination and as protective factors highlights the complexity of addressing health disparities and suggests a multifaceted approach to reducing discrimination exposure and strengthening resilience through positive health behaviors.

Conclusion

This study provides new insights into the long-term effects of discrimination on adolescent well-being and highlights the role of health behaviors in explaining these effects. By identifying specific pathways through which discrimination affects well-being and different discrimination contexts, this research contributes to a more nuanced understanding of health disparities. Schools emerged as a potential context for addressing health behaviors and mitigating discrimination effects. Adolescence is a strategic window for intervention and prevention efforts to reduce social inequality and promote equitable health outcomes with possible positive consequences across the entire lifespan.

References

- Ainsworth, B., Cahalin, L., Buman, M., & Ross, R. (2015). The current state of physical activity assessment tools. *Progress in Cardiovascular Diseases, 57*(4), 387–395. <https://doi.org/f6wq24>
- Avedissian, T., & Alayan, N. (2021). Adolescent well-being: A concept analysis. *International Journal of Mental Health Nursing, 30*(2), 357-367. <https://doi.org/mpvc>
- Bailey, Z. D., Krieger, N., Agénor, M., Graves, J., Linos, N., & Bassett, M. T. (2017). Structural racism and health inequities in the USA: Evidence and interventions. *The Lancet, 389*(10077), 1453–1463. <https://doi.org/b5cw>
- Bauer, G. R., & Scheim, A. I. (2019). Methods for analytic intercategory intersectionality in quantitative research: Discrimination as a mediator of health inequalities. *Social Science & Medicine, 226*, 236–245. <https://doi.org/gf3xw8>
- Bécares, L., Taylor, H., Nazroo, J., Kapadia, D., Finney, N., Begum, N., & Shlomo, N. (2024). The persistence and pervasiveness of racial discrimination in Great Britain: Capturing experienced racial discrimination over time and life domains. *Ethnic and Racial Studies, 1*-22. <https://doi.org/nspr>
- Brown, K. L., Hines, A. L., Hagiwara, N., Utsey, S., Perera, R. A., & LaRose, J. G. (2022). The weight of racial discrimination: Examining the association between racial discrimination and change in adiposity among emerging adult women enrolled in a behavioral weight loss program. *Journal of Racial and Ethnic Health Disparities, 9*, 909–920. <https://doi.org/nw79>
- Cavaliere, K. E., Chwalisz, K., & Greer, T. M. (2019). The role of self-efficacy in the relationship between discrimination and health care utilization among college students in the United States. *Journal of Health and Social Sciences, 4*(3), 373–388. <https://doi.org/nw8b>
- Cave, L., Cooper, M. N., Zubrick, S. R., & Shepherd, C. C. J. (2020). Racial discrimination and child and adolescent health in longitudinal studies: A systematic review. *Social Science & Medicine, 250*, Article 112864. <https://doi.org/gn9v5p>
- Chaiton, M. O., Cohen, J. E., O’Loughlin, J., & Rehm, J. (2009). A systematic review of longitudinal studies on the association between depression and smoking in adolescents. *BMC Public Health, 9*(1), 356. <https://doi.org/fqtz5r>

- Cheung, F., & Lucas, R. E. (2014). Assessing the validity of single-item life satisfaction measures: Results from three large samples. *Quality of Life Research, 23*, 2809–2818. <https://doi.org/f6pbgz>
- Dessel, A. B., Goodman, K. D., & Woodford, M. R. (2017). LGBT discrimination on campus and heterosexual bystanders: Understanding intentions to intervene. *Journal of Diversity in Higher Education, 10*(2), 101–116. <https://doi.org/ggdmdb>
- Doyle, D. M., & Barreto, M. (2023). Relational consequences of stigma: Bridging research on social stigma with relationship science. *Journal of Social Issues, 79*(1), 7–20. <https://doi.org/gr5dxm>
- Elgar, F. J., Pförtner, T.-K., Moor, I., De Clercq, B., Stevens, G. W. J. M., & Currie, C. (2015). Socioeconomic inequalities in adolescent health 2002–2010. *The Lancet, 385*(9982), 2088–2095. <https://doi.org/f3g5cb>
- Emmer, C., Dorn, J., & Mata, J. (2024). The immediate effect of discrimination on mental health: A meta-analytic review of the causal evidence. *Psychological Bulletin, 150*(3), 215–252. <https://doi.org/mw8r>
- Emmer, C., Neumer, A., Kalter, F., & Mata, J. (2024, November 18). Long-Term Discrimination Effects on Adolescent Health Behaviors and Well-Being in Four European Countries. Retrieved from osf.io/8he5m
- English, D., Lambert, S. F., Tynes, B. M., Bowleg, L., Zea, M. C., & Howard, L. C. (2020). Daily multidimensional racial discrimination among Black U.S. American adolescents. *Journal of Applied Developmental Psychology, 66*, Article 101068. <https://doi.org/ggk3md>
- Fields, X., & Wotipka, C. M. (2020). Effect of LGBT anti-discrimination laws on school climate and outcomes for lesbian, gay, and bisexual high school students. *Journal of LGBT Youth, 19*(3), 307–329. <https://doi.org/g67f9z>
- Figueroa, D. G., Parker, J. E., Hunger, J. M., Kraus, M. W., Muscatell, K. A., & Tomiyama, A. J. (2024). Social class stigma and poorer health behaviors: Evidence from the eating in America study. *Social Science & Medicine, 347*, 116765. <https://doi.org/nsps>
- Firth, J., Solmi, M., Wootton, R. E., Vancampfort, D., Schuch, F. B., Hoare, E., Gilbody, S., Torous, J., Teasdale, S. B., Jackson, S. E., Smith, L., Eaton, M., Jacka, F. N., Veronese, N., Marx, W., Ashdown-Franks, G., Siskind, D., Sarris, J., Rosenbaum, S., Carvalho, A. F., & Stubbs, B. (2020). A meta-review of “lifestyle psychiatry”: the role of exercise, smoking, diet and sleep in the prevention and treatment of mental disorders. *World Psychiatry, 19*(3), 360–380. <https://doi.org/ghcd9h>

- Flueckiger, L., Lieb, R., Meyer, A. H., Witthauer, C., & Mata, J. (2016). The importance of physical activity and sleep for affect on stressful days: Two intensive longitudinal studies. *Emotion, 16*(4), 488–497. <https://doi.org/f8x7tz>
- Gibbons, F. X., Fleischli, M. E., Gerrard, M., & Simons, R. L. (2018). Reports of perceived racial discrimination among African American children predict negative affect and smoking behavior in adulthood: A sensitive period hypothesis. *Development and Psychopathology, 30*(5), 1629–1647. <https://doi.org/ggs52w>
- Halladay, J., Woock, R., El-Khechen, H., Munn, C., MacKillop, J., Amlung, M., Ogrodnik, M., Favotto, L., Aryal, K., Noori, A., Kiflen, M., & Georgiades, K. (2020). Patterns of substance use among adolescents: A systematic review. *Drug and alcohol dependence, 216*, 108222. <https://doi.org/nm9j>
- Jacob, G., Faber, S. C., Faber, N., Bartlett, A., Ouimet, A. J., & Williams, M. T. (2023). A systematic review of Black People coping with racism: Approaches, analysis, and empowerment. *Perspectives on Psychological Science, 18*(2), 392-415. <https://doi.org/grqq8f>
- Jones, B. A., Arcelus, J., Bouman, W. P., & Haycraft, E. (2017). Barriers and facilitators of physical activity and sport participation among young transgender adults who are medically transitioning. *International Journal of Transgenderism, 18*(2), 227–238. <https://doi.org/gm642w>
- Kalter, F., Heath, A. F., Hewstone, M., Jonsson, J. O., Kalmijn, M., Kogan, I., & van Tubergen, F. (2016a). *Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU)—Reduced data (ZA5656 Version 1.2.0)*. GESIS Data Archive, Cologne. <https://doi.org/10.4232/cils4eu.5656.1.2.0>
- Kalter, F., Heath, A. F., Hewstone, M., Jonsson, J. O., Kalmijn, M., Kogan, I., & van Tubergen, F. (2016b). *Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU)—Reduced data (ZA5656 Version 2.3.0)*. GESIS Data Archive, Cologne. <https://doi.org/10.4232/cils4eu.5656.2.3.0>
- Kalter, F., Heath, A. F., Hewstone, M., Jonsson, J. O., Kalmijn, M., Kogan, I., & van Tubergen, F. (2017). *Children of Immigrants Longitudinal Survey in Four European Countries (CILS4EU)—Reduced data (ZA5656 Version 3.3.0)*. GESIS Data Archive, Cologne. <https://doi.org/10.4232/cils4eu.5656.3.3.0>
- Krieger, N. (2012). Methods for the scientific study of discrimination and health: An ecosocial approach. *American Journal of Public Health, 102*(5), 936–944. <https://doi.org/ggdrzc>

- Lewis, T. T., Cogburn, C. D., & Williams, D. R. (2015). Self-reported experiences of discrimination and health: Scientific advances, ongoing controversies, and emerging issues. *Annual Review of Clinical Psychology, 11*(1), 407–440. <https://doi.org/gf8gmz>
- Lien, L. (2007). Is breakfast consumption related to mental distress and academic performance in adolescents? *Public Health Nutrition, 10*(4), 422–428. <https://doi.org/cj2vqh>
- Matricciani, L., Paquet, C., Galland, B., Short, M., & Olds, T. (2019). Children’s sleep and health: A meta-review. *Sleep Medicine Reviews, 46*, 136–150. <https://doi.org/10.1016/j.smr.2019.04.011>
- Mouchacca, J., Abbott, G. R., & Ball, K. (2013). Associations between psychological stress, eating, physical activity, sedentary behaviours and body weight among women: A longitudinal study. *BMC Public Health, 13*, 828. <https://doi.org/gbdsfs>
- O’Laughlin, K. D., Martin, M. J., & Ferrer, E. (2018). Cross-sectional analysis of longitudinal mediation processes. *Multivariate Behavioral Research, 53*(3), 375–402. <https://doi.org/ggf5k3>
- O’Neill, J., Tabish, H., Welch, V., Petticrew, M., Pottie, K., Clarke, M., Evans, T., Pardo Pardo, J., Waters, E., & Tugwell, P. (2014). Applying an equity lens to interventions: Using PROGRESS ensures consideration of socially stratifying factors to illuminate inequities in health. *Journal of Clinical Epidemiology, 67*(1), 56–64. <https://doi.org/ghrzpr>
- Paluck, E. L., Shepherd, H., & Aronow, P. M. (2016). Changing climates of conflict: A social network experiment in 56 schools. *Proceedings of the National Academy of Sciences, 113*(3), 566–571. <https://doi.org/f77xdh>
- Parker, C. M., Hirsch, J. S., Philbin, M. M., & Parker, R. G. (2018). The need for research and interventions to address family-based stigma and discrimination against lesbian, gay, bisexual, transgender, and queer youth. *Journal of Adolescent Health, 63*(4), 383–393. <https://doi.org/gfds2r>
- Pascoe, E. A., Lattanner, M. R., & Richman, L. S. (2022). Meta-analysis of interpersonal discrimination and health-related behaviors. *Health Psychology, 41*(5), 319–331. <https://doi.org/nspq>
- Pascoe, E. A., & Smart Richman, L. (2009). Perceived discrimination and health: A meta-analytic review. *Psychological Bulletin, 135*(4), 531–554. <https://doi.org/d3ccxs>
- Petrovic, D., de Mestral, C., Bochud, M., Bartley, M., Kivimäki, M., Vineis, P., Mackenbach, J., & Stringhini, S. (2018). The contribution of health behaviors to socioeconomic inequalities in health: A systematic review. *Preventive Medicine, 113*, 15–31. <https://doi.org/gdqnn>

- Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods, 15*(3), 209–233. <https://doi.org/dqcxz7>
- Puhl, R. M., & Lessard, L. M. (2020). Weight stigma in youth: prevalence, consequences, and considerations for clinical practice. *Current obesity reports, 9*, 402–411. <https://doi.org/gp2jdx>
- Reskin, B. (2012). The race discrimination system. *Annual Review of Sociology, 38*, 17–35. <https://doi.org/gf8xjz>
- Rodrigues, Y. E., Fanton, M., Novossat, R. S., & Canuto, R. (2022). Perceived racial discrimination and eating habits: a systematic review and conceptual models. *Nutrition Reviews, 80*(7), 1769–1786. <https://doi.org/nw8d>
- Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software, 48*(2), 1–36. <https://doi.org/f3r4v8>
- Ruggeri, K., Garcia-Garzon, E., Maguire, Á., Matz, S., & Huppert, F. A. (2020). Well-being is more than happiness and life satisfaction: A multidimensional analysis of 21 countries. *Health and Quality of Life Outcomes, 18*, Article 192. <https://doi.org/mjpw>
- Schmitt, M. T., Branscombe, N. R., Postmes, T., & Garcia, A. (2014). The consequences of perceived discrimination for psychological well-being: A meta-analytic review. *Psychological Bulletin, 140*(4), 921–948. <https://doi.org/f57qfj>
- Schneider, S., & Gruber, J. (2013). Neighbourhood deprivation and outlet density for tobacco, alcohol and fast food: First hints of obesogenic and addictive environments in Germany. *Public Health Nutrition, 16*(7), 1168–1177. <https://doi.org/f4znbf>
- Selig, J. P., & Preacher, K. J. (2009). Mediation models for longitudinal data in developmental research. *Research in Human Development, 6*(2–3), 144–164. <https://doi.org/bdth9b>
- Shaw, M., Galobardes, B., Lawlor, D. A., Lynch, J., Wheeler, B., & Smith, G. D. (2007). *The handbook of inequality and socioeconomic position*. Bristol: The Policy Press.
- Slopen, N., Lewis, T. T., & Williams, D. R. (2016). Discrimination and sleep: A systematic review. *Sleep Medicine, 18*, 88–95. <https://doi.org/ggzpq7>

- Smart Richman, L., & Leary, M. R. (2009). Reactions to discrimination, stigmatization, ostracism, and other forms of interpersonal rejection: A multimotive model. *Psychological Review*, *116*(2), 365–383. <https://doi.org/c3fpzb>
- Somerville, L. H. (2013). The teenage brain: Sensitivity to social evaluation. *Current Directions in Psychological Science*, *22*(2), 121–127. <https://doi.org/f4v57z>
- Stevens, C., Liu, C. H., & Chen, J. A. (2018). Racial/ethnic disparities in US college students' experience: Discrimination as an impediment to academic performance. *Journal of American College Health*, *66*(7), 665–673. <https://doi.org/gm2gt9>
- Stadler, G., Chesaniuk, M., Haering, S., Roseman, J., Straßburger, V. M., Martina, S., & Diversity Assessment Working Group (2023). Diversified innovations in the health sciences: Proposal for a Diversity Minimal Item Set (DiMIS). *Sustainable Chemistry and Pharmacy*, *33*, 101072. <https://doi.org/k68f>
- Tsomokos, D. I., & Slavich, G. M. (2024). Bullying fosters interpersonal distrust and degrades adolescent mental health as predicted by social safety theory. *Nature Mental Health*, *2*(3), 328–336. <https://doi.org/gt2gms>
- van Sluijs, E. M. F., Ekelund, U., Crochemore-Silva, I., Guthold, R., Ha, A., Lubans, D., Oyeyemi, A. L., Ding, D., & Katzmarzyk, P. T. (2021). Physical activity behaviours in adolescence: Current evidence and opportunities for intervention. *Lancet*, *398*(10298), 429–442. <https://doi.org/gmc78k>
- Viner, R. M., Ozer, E. M., Denny, S., Marmot, M., Resnick, M., Fatusi, A., & Currie, C. (2012). Adolescence and the social determinants of health. *The Lancet*, *379*(9826), 1641–1652. <https://doi.org/f2fd7p>
- Williams, M. T. (2020). Microaggressions: Clarification, Evidence, and Impact. *Perspectives on Psychological Science*, *15*(1), 3–26. <https://doi.org/ggcr9r>
- Yang, T.-C., Chen, I.-C., Choi, S., & Kurtulus, A. (2019). Linking perceived discrimination during adolescence to health during mid-adulthood: Self-esteem and risk-behavior mechanisms. *Social Science & Medicine*, *232*, 434–443. <https://doi.org/gprqbv>
- Yip, T., Xie, M., Cham, H., & El Sheikh, M. (2022). Linking ethnic/racial discrimination to adolescent mental health: Sleep disturbances as an explanatory pathway. *Child Development*, *93*(4), 973–994. <https://doi.org/gp9bdx>
- Zeiders, K. H. (2017). Discrimination, daily stress, sleep, and Mexican-origin adolescents' internalizing symptoms. *Cultural Diversity & Ethnic Minority Psychology*, *23*(4), 570–575. <https://doi.org/nspf>

Table 1*Sample Characteristics*

Characteristic	Wave 1	Wave 2	Wave 3
Survey country			
Germany	32.7%		
England	22.4%		
Netherlands	22.6%		
Sweden	22.3%		
Age (13–18 years at Wave 1; <i>M, SD</i>)	14.90 (0.57)		
Gender (% girls)	53.5%		
Socioeconomic status			
Parents' occupational status (0–90; <i>M, SD</i>)	52.73 (22.26)		
Subjective material deprivation (0–4; <i>M, SD</i>)	0.45 (0.66)		
Migration status (% with migration background)	38.4%		
Religious affiliation (% minority religion)	21.2%		
Perceived discrimination (0–3; <i>M, SD</i>)	0.25 (0.36)		
Health behaviors (Wave 1)			
Frequency of physical activity (scale 0–4; <i>M, SD</i>)	2.52 (1.16)	2.58 (1.13)	
Frequency of having breakfast (scale 0–4; <i>M, SD</i>)	3.41 (1.07)	3.41 (1.06)	
Hours of sleep (hours; <i>M, SD</i>)	7.95 (1.19)	8.24 (1.06)	
Frequency of substance use (scale 0–4; <i>M, SD</i>)	0.44 (0.65)	0.60 (0.75)	
Well-being (1–10; <i>M, SD</i>)	7.73 (1.92)	7.79 (1.95)	7.77 (1.68)

Note. Parents' occupational status was assessed with the interval-scaled International Socio-Economic Index of occupational status (ISEI), with higher values indicating higher occupational status and, thus, higher socioeconomic status. Higher values of subjective material deprivation indicate higher material deprivation and, thus, lower socioeconomic status.

Table 2*Results of Path Analysis: Direct Effects*

Variable	Physical activity (W2)	Nutrition (W2)	Sleep (W2)	Substance use (W2)	Well-being (W3)
Age	-.03** (.02)	.02 [†] (.02)	-.01 (.02)	.04*** (.01)	.01 (.03)
Gender (ref. male)	-.10*** (.02)	-.01 (.02)	.06*** (.02)	-.05*** (.01)	-.08*** (.03)
Parents' occupational status (ISEI)	.04*** (.00)	.03** (.00)	.03** (.00)	.03** (.00)	-.03* (.00)
Subjective material deprivation	-.03** (.02)	.00 (.01)	.00 (.02)	.00 (.01)	-.06*** (.03)
Migration status (ref. natives)	-.03** (.03)	-.05*** (.02)	-.07*** (.03)	-.05*** (.02)	.00 (.04)
Religious affiliation (ref. no/majority)	-.01 (.03)	.00 (.03)	.02 [†] (.03)	-.06*** (.02)	.02* (.05)
Physical activity (W1)	.51*** (.01)				
Nutrition (W1)		.59*** (.01)			
Sleep (W1)			.36*** (.01)		
Substance use (W1)				.64*** (.01)	
Well-being (W1)					.28*** (.01)
Perceived discrimination (W1)	-.02* (.03)	-.04*** (.02)	-.04*** (.03)	.03** (.02)	-.04*** (.05)
Physical activity (W2)					.05*** (.01)
Nutrition (W2)					.05*** (.02)
Sleep (W2)					.02* (.02)
Substance use (W2)					.00 (.02)

Note. $N = 9,957$ adolescents. The table shows standardized path estimates, β , with standard errors in parentheses. Control variables in the model included age, gender (reference group: male), parents' occupational status (measured by the International Socio-Economic Index [ISEI] of occupational status, range 0–90; higher values indicate higher occupational status and thus higher socioeconomic status), subjective material deprivation (scale of 0–4; higher values indicate higher material deprivation and thus lower socioeconomic status), migration status (reference group: natives), and religious affiliation (reference group: no religion and majority religion). Coefficients with p values $< .05$ are highlighted in bold for emphasis. Ref. = reference group. W1, W2, and W3 = First, second, and third measurement wave, respectively. [†] $p < .01$. * $p < .05$. ** $p < .01$. *** $p < .001$.

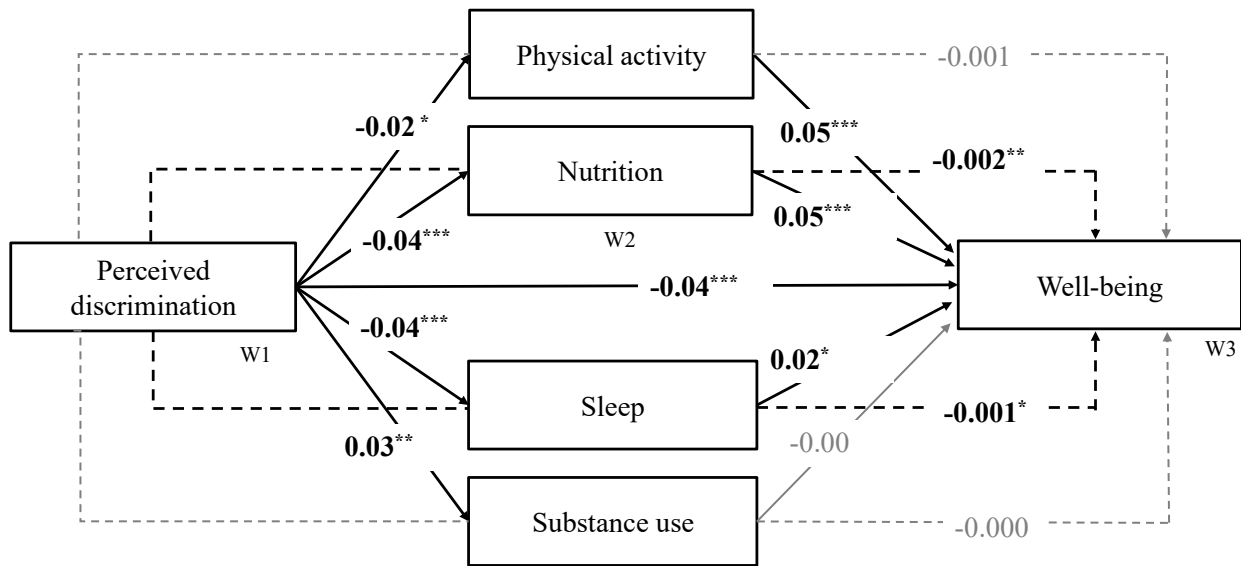
Table 3*Results of Path Analysis: Indirect Effects*

Path	β	95% CI
Perceived discrimination → Physical activity → Well-being	-.001 (.002)	[-0.008, 0.000]
Perceived discrimination → Nutrition → Well-being	-.002 (.003)	[-0.016, -0.005]
Perceived discrimination → Sleep → Well-being	-.001 (.002)	[-0.010, -0.001]
Perceived discrimination → Substance use → Well-being	-.000 (.001)	[-0.003, 0.002]

Note. β = standardized path estimate; CI = confidence interval computed using the Monte-Carlo Method with 20,000 simulations (Selig & Preacher, 2009). Confidence intervals that do not include zero are shown in bold. Standard errors are shown in parentheses.

Figure 1

Representation of the Hypotheses and the Proposed Theoretical Model



Note. Standardized path estimates, β , are shown. Solid lines indicate direct paths (Hypotheses 1 and 2). Dashed lines indicate indirect paths (Hypothesis 3a–d). Black and bold = Significant paths that were in line with our hypotheses. Correlations between the health behaviors and paths from control variables on the mediators and well-being were specified in our analyses but omitted from the figure for clarity reasons (covariances of mediators can be found in Table S10). W1, W2, and W3 = First, second, and third measurement wave, respectively.

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