Resilience and Patterns of Health Risk Behaviors in California Adolescents

Ritesh Mistry, PhD, MPH[1], **William J. McCarthy, PhD**[1,2,3], **Antronette K. Yancey, MD, MPH**[1], **Yao Lu, PhD, MA**[4], and **Minal Patel, MPH**[1]

1 *University of California, Los Angeles (UCLA) School of Public Health, Department of Health Services, Division of Cancer Prevention and Control Research*

2 *UCLA Department of Psychology*

3 *WestEd*

4 *UCLA Department of Sociology*

Abstract

OBJECTIVES—Assess whether adolescent health risk behaviors cluster, and whether resiliency factors are associated with observed clusters.

METHODS—The cross-sectional population-weighted 2003 California Health Interview Survey was used (N=4010). Four gender-specific clusters were based on smoking, alcohol use, low fruit/ vegetables consumption, and physical inactivity. Resiliency factors included parental supervision, parental support, role model presence and adolescent mental health. Conditional regression was used to measure the association of individual health risk behaviors and clusters with resiliency factors.

RESULTS—Health risk behaviors clustered as follows: "Salutary Adherents" (no reported health risk behaviors), "Active Snackers" (physically active, low fruit/vegetable consumers), "Sedentary Snackers" (physically inactive, low fruit/vegetable consumers), and "Risk Takers" (smokers, alcohol users, many also physically inactive and low fruit/vegetable consumers). Greater parental supervision was associated with lower odds of being in unhealthful clusters. Among males, having greater parental support reduced odds of being an "Active Snacker" or "Sedentary Snacker." Among females, role model presence reduced odds of being in unhealthful clusters, while depressiveness increased the odds.

CONCLUSIONS—Health promoting interventions should address multiple health risk behaviors in an integrated fashion. Gender-specific, ethnically-targeted, family-centered strategies that address parenting, particularly parental supervision would be useful. Addressing depressiveness may be especially important for female adolescents.

Keywords

tobacco; alcohol; nutrition; physical activity; resilience; lifestyle; clusters

INTRODUCTION

Tobacco use, alcohol consumption, physical inactivity and poor diet contribute to 38% of deaths annually in the Unites States (Mokdad et al., 2004), and together they reduce life expectancy substantially (Khaw et al., 2008). These health risk behaviors sometimes co-occur (Rosal et al., 2001, Laaksonen et al., 2001). Chronic diseases risk increases with an increasing number of these behaviors (Berkman and Breslow, 1983, Knoops et al., 2004), which may act synergistically to yield greater health risks than sums of risks individually (Meng et al., 1999). As such, the study of chronic disease risk and prevention requires going beyond single behavioral risk factor approaches to examining contributions of multiple behaviors in concert (Nigg et al., 2002).

Research on co-occurrence of health risk behaviors has primarily focused on adults (Berrigan et al., 2003, Patterson et al., 1994, Fine et al., 2004, Burke et al., 1997, Galan et al., 2006). The limited research in adolescents suggests that these health risk behaviors tended to cluster, that clusters differed based on gender, and that older age and depressiveness increased the risk of being in unhealthful clusters (Lowry et al., 1996, Lytle et al., 1995, Pronk et al., 2004). Because poor health habits during adolescence lead to poor health habits during adulthood (Kemper et al., 1990) and can impact chronic disease risk, more research in adolescents is needed to understand how health risk behaviors cluster and the role of contributing factors. We extend this literature by examining a diverse population-based sample to identify health risk behavior clusters, their socio-demographic correlates, and the role of resiliency factors.

A resiliency approach provides a conceptual framework for understanding why some youth exposed to threats to their well-being do not exhibit the negative outcomes typically associated with those threats (Luthar et al., 2006). In contemporary society, adolescents are exposed to numerous negative influences that can powerfully shape their health behavior choices (Brown and Witherspoon, 2002). Personal and family assets that contribute to adolescent resiliency (Sharkey et al., 2008) can foster healthier lifestyles by mitigating the effect of these influences (Rew and Horner, 2003).

We examined supportive parenting, parental supervision and adult role models because they are known to bolster adolescent resiliency (Gramezy and Rutter, 1983, Zimmerman et al., 2002). Supportive parenting and parental supervision are essential to adolescent development (Compas et al., 1995), and may protect against smoking (Nowlin and Colder, 2007) and drinking (Petrie et al., 2007, Cohen, 1994 #71, Steinberg, 1994 #95). Positive role models have numerous benefits to adolescents including promotion of healthful lifestyles (Beier et al., 2000, Yancey et al., 2002, Jessor et al., 1998). Additionally, adolescent mental health, an important aspect of resilience (Dumont and Provost, 1999), reduces risk of smoking (Nezami et al., 2005, Patton et al., 1998), alcohol use (Goodman and Huang, 2002), and physical inactivity (Goodman et al., 2003, Fulkerson et al., 2004).

In this study, we identified gender-specific clusters of adolescent health risk behaviors (smoking, alcohol use, physical inactivity and low fruit/vegetable consumption), and assessed the role of parenting, role model presence and adolescent depressive symptoms. Gender-specific analysis was done because gender differences exist in the uptake of health risk behaviors (Lytle et al., 1995), in the development of parental relationships (Compas et al., 1995), and the experience of depressive symptoms (Piccinelli and Wilkinson, 2000).

METHODS

Sample

We used the adolescent subsample (N=4010) of the population-based 2003 California Health Interview Survey (CHIS), a large multistage cross-sectional random-digit-dial telephone survey with a screener cooperation rate of 55.9%, and interview completion rate of 60.0%. Respondents were instructed to find a private location to answer questions comfortably and openly, and to use their telephone touchpad, if needed, to key in responses. When asked after the interview if a parent was listening in, 90.7% said no. Further details about the survey procedures are in the CHIS methodology documentation (CHIS, 2005). Table 1 shows gender-specific sample characteristics.

Measures

Current smoking was defined as responses of one or more days to "In the past 30 days, on how many days did you smoke cigarettes?" (Yach et al., 2002) Current alcohol use was defined as responses of one or more to "If we consider one drink to be a can or bottle of beer, a glass of wine, a shot of liquor, or one mixed drink, on how many days in the past 30 days did you have at least one drink of alcohol?" (Pemberton et al., 2008) Fruit/vegetable consumption was measured using responses to: "Yesterday, how many servings of fruit … did you eat?" and "… how many servings of vegetables did you eat?" Less than five combined servings of fruits and vegetables was defined as low consumption (Kann et al., 1995). Meeting the Surgeon General's physical activity recommendations was assessed from responses to "On how many of the past 7 days did you do 20 minutes of physical activity that made you sweat and breathe hard" (vigorous activity) and "On how many of the past 7 days did you do any physical activity for at least half an hour that did not make you sweat or breathe hard" (moderate activity) (Yore et al., 2007). We valued 1 vigorous activity day at 33% of the Surgeon General's recommendation and 1 moderate activity day at 20% of the recommendation. Sums below 100% were defined as low levels of physical activity (Evenson and McGinn, 2005).

Parental supervision was assessed using 3 questions (Steinberg et al., 1992): How much of the time do your parents know what you are really doing in your free time; at night; and most afternoons? Parental support was assessed using 7 questions about whether there was an adult at home who: cares about [adolescent's] school work; listens to [adolescent]; talks with [adolescent] about [his/her] problems; notices [adolescent's] bad moods; wants [adolescent] to do [his/her] best; who believes [adolescent] will be a success; and expects [adolescent] to follow rules. Because these scales exhibited adequate internal consistency (alpha[parental supervision]=0.63; alpha[parental support]=0.81), we used factor analysis with varimax rotation to compute summary scores. Role model presence was defined as a "Yes" response to "Is there a person you know or have read about that you admire and would want to be like?"

Depressiveness was measured with the 7-item Center for Epidemiology Studies-Depression Scale, which has shown good face and construct validity (Huba and Melchior, 1995) as well as internal consistency in our sample (alpha=0.77). Items were about feeling depressed, happy, lonely, sad, whether life is a failure, and persistent unhappiness. Responses were on a 4-point Likert-type scale ranging from "Rarely or none of the time (0)" to "Most or all of the time (3)," which were summed.

Study covariates included age, race/ethnicity (Hispanic/Latino, Asian, African American, white, other), citizenship status, years lived in the United States, federal poverty level (0–99%, 100–199%, 200–299%, 300% and above), parental education (less than high school, high school, more than high school), parental marital status, and whether a parent listened in during interview.

Analysis

First, gender-specific descriptive statistics were produced for study variables. Second, gender-specific clusters were constructed based on the four health risk behaviors. We used the Jaccard binary similarity method (Jaccard, 1912), a non-hierarchical approach that identifies like observations to produce clusters of greatest possible distinction. The STATA 9.2 Jaccard k-means clustering procedure for binary data was used. We limited the number of clusters to 4 in order to balance size with homogeneity within clusters. Third, we described the distribution of health risk behaviors within each gender-specific cluster. Fourth, we used the Fisher's exact test to assess statistically significant gender differences in clusters. Fifth, we used multiple variable regression to estimate the association of each health risk behavior (logistic regression) and cluster (multinomial regression: most healthful cluster used as the referent category) with resiliency factors while controlling for study covariates.

Statistical analysis was conducted using STATA 9.2. Results were adjusted for the survey sampling design, and weighted to represent California adolescents.

RESULTS

Table 1 shows that females were more depressed on average (p<0.001), reported greater parental supervision (p<0.01), and a greater proportion reported low physical activity than males (29.8% versus 22.9%, p<0.001).

Gender-specific health risk behavior clusters ranged from the most healthful (Cluster 1 – "Salutary Adherents") to the least healthful cluster (Cluster 4 – "Risk Takers"), with "Salutary Adherents" reporting none of the health risk behaviors (Table 2). For both genders, Cluster 2 ("Active Snackers") represented active, low fruit/vegetable consumers; Cluster 3 ("Sedentary Snackers") represented physically inactive adolescents, many of whom were low fruit/ vegetable consumers with some alcohol users and smokers; and Cluster 4 ("Risk Takers") represented smokers and alcohol users with a large proportion of low fruit/vegetable consumers and some reporting low physical activity (Table 2). Except for the "Salutary Adherents" cluster (p=0.57), the other clusters differed according to gender (ps<0.01). Some male but no female "Active Snackers" used alcohol (14.5% vs. 0%, p<0.001); and a greater proportion of male "Risk Takers" were current smokers (60.1% vs. 26.9%, p<0.001) while a smaller percentage were physically inactive (16.7% vs. 33.3%, p=0.001) and had low fruit/vegetable consumption (48.3% vs. 78.8%, p=0.04).

Resiliency factors showed similar patterns of associations with individual health risk behaviors for both gender (Table 3). Parental supervision was associated with lower odds of smoking (males: OR=0.48, 95% CI=0.34, 0.67; female: OR=0.44, 95%CI=0.30, 0.64) and drinking (males: OR=0.54, 95% CI=0.43, 0.67; female: OR=0.36, 95%CI=0.28, 0.46), and role model presence was associated with lower odds of low physical activity (males: OR=0.63, 95% CI=0.46, 0.85; female: OR=0.69, 95%CI=0.51, 0.94) and fruit/vegetable consumption (males: OR=0.64, 95% CI=0.48, 0.86; female: OR=0.55, 95%CI=0.40, 0.75). Interestingly, parental support was positively associated with smoking (males: OR=1.52, 95% CI=1.06, 2.19; female: OR=1.45, 95%CI=1.04, 2.04), but was not associated with other factors. Depressiveness was positively associated with smoking (OR=1.99, 95% CI=1.39, 2.86) and drinking (OR=1.66, 95% CI=1.25, 2.18) in males, but was only associated with smoking in females (OR=2.04, 95% CI=1.44, 2.87).

The clusters differed based on socio-demographics (Table 4). Compared to White males, Latino, Asian and African American males were at greater odds of being "Sedentary Snackers" (ps≤0.05). African American females were at higher odds of being either "Active Snackers" (OR=2.94, 95%CI=1.35, 6.40) or "Sedentary Snackers" (OR=3.85, 95%CI=1.73,

8.58) than White females. Males from lower-income compared to higher income households were at lower odds of being "Active Snackers" (ps≤0.010), while females from single-parent households were at increased odds of being "Risk Takers" (OR=2.25, 95%CI=1.33, 3.80).

The results regarding resiliency factors showed that, in males, parental supervision was associated with lower odds of being in unhealthful clusters (ps≤0.05), but in females it was only associated with being a "Risk Taker" (OR=0.30, 95%CI=0.19, 0.44). For males, parental support was associated with lower odds of being an "Active Snacker" (OR=0.79, 95%CI=0.63, 1.00) or "Sedentary Snacker" (OR=0.74, 95%CI=0.57, 0.96). In females, role model presence was associated with lower odds of being in the 3 unhealthful clusters (ps≤0.05), but in males it was only associated with lower odds of being a "Sedentary Snacker" (OR=0.54, 95%CI=0.35, 0.82). Depressiveness was associated with increased odds of being in unhealthful clusters for females (ps≤0.05), but in males it only associated with being an "Active Snacker" (OR=0.69, 95%CI=0.50, 0.96).

DISCUSSION

Consistent with the literature (Brener and Collins, 1998, Lowry et al., 1996, Lytle et al., 1995, Pronk et al., 2004, Zweig et al., 2001), health risk behaviors tended to co-occur with about 29% of males and 40% of females in the two least healthful lifestyles clusters. Physical inactivity and low fruit/vegetable consumption co-occurred in both males and females, while tobacco and alcohol use co-occurred more frequently in males.

There were socio-demographic differences in individual health risk behaviors as well as clusters. The observation that older age was associated with increased odds of reporting one or more health risk behavior corroborates previous findings (Brener and Collins, 1998, Lowry et al., 1996, Lytle et al., 1995, Pronk et al., 2004). However, inconsistent with previous studies (Avenevoli and Merikangas, 2003, Hawkins et al., 1992, Lowry et al., 1996), greater parental education was associated with increased odds of smoking and alcohol use in males. Greater parental education may reflect adolescents with greater economic resources, which could increase access to cigarettes and alcohol. Research examining other socio-demographic differences in clusters of these health risk behaviors is lacking, precluding comparisons of the substantial racial/ethnic differences and gender-specific variations.

Resiliency factors were differentially associated with individual health risk behaviors and clusters depending on gender, suggesting that resiliency may protect against specific risk behaviors differently for male and female adolescents. Surprisingly, we found that parental support was associated with increased odds of smoking, which is not consistent with past research (Cohen et al., 1994, Jackson et al., 1997). Measures of supportive parenting that are explicitly about avoidance of specific health risk behaviors would likely have shown anticipated effects (He et al., 2004).

The findings suggest that effective prevention efforts need to reach adolescents of all ethnic and socioeconomic backgrounds, but particular care should be taken to reach Latinos/Hispanics and African Americans of both genders, Asian males, and female adolescents from single-parent households because they were more likely to be in unhealthful clusters. The positive association found between older age and higher risk of being in unhealthful clusters suggests that prevention programs should target early adolescence, and should address multiple health risk behaviors in an integrated manner. Studies are needed in adolescents to assess whether interventions should address these health risk behaviors serially or concurrently. The results suggest that interventions could be family-centered, address parenting as well as role-modeling and should include a focus on depressiveness, especially in female adolescents. Interventions may also benefit from being gender-tailored because the findings showed notable gender

differences in patterns of co-occurring health risk behaviors and influences of resiliency factors. Although not directly examined in this study, interventions that target communities and broader societal policies to positively impact adolescent resilience could contribute to reduce the likelihood of engagement in health risk behaviors, e.g., improvements in neighborhood quality, school environment, and family social and economic resources may be needed (Rew and Horner, 2003).

Limitations

Because this study used existing data, the availability of variables limited its scope and the ability to include important covariates. The low response rate of the CHIS may introduce bias. However, we used post-stratification weights to adjust for differential non-response. Important limitations of cross-sectional data need to be acknowledged, including the caveat that observed associations could be bidirectional. Specifically, resiliency factors could be interpreted as consequences of health risk behaviors. Health risk behaviors, parenting and depressiveness measures were self-reported. Previous studies, however, have shown these measures to be valid (Smith et al., 1995, Stanton et al., 1996). Finally, the parental supervision scale had a moderately low internal consistency.

Conclusions

The results suggest that adolescent health risk behaviors tend to cluster indicating the need for interventions that address multiple health behaviors. Findings also suggest that these interventions may benefits from modifying the adolescent rsesiliency factors examined in this study. Further research is needed, however, to understand what other resiliency factors may be important, whether resiliency factors operate differently according to ethnicity, and why resiliency factors appear to operate differently based on gender.

Acknowledgments

References

Avenevoli S, Merikangas KR. Familial influences on adolescent smoking. Addiction 2003;98:1–20. [PubMed: 12752359]

Beier SR, Rosenfeld WD, Spitalny KC, Zansky SM, Bontempo AN. The Potential Role of an Adult Mentor in Influencing High-Risk Behaviors in Adolescents. Archives of Pediatrics and Adolescent Medicine 2000;154:327–331. [PubMed: 10768667]

Berkman, L.; Breslow, L. The Alameda County Study. Oxford: Oxford University Press; 1983. Health and ways of living.

Berrigan D, Dodd K, Troiano RP, Krebs-Smith SM, Barbash RB. Patterns of health behavior in U.S. adults. Prev Med 2003;36:615–23. [PubMed: 12689807]

Brener ND, Collins JL. Co-occurrence of health-risk behaviors among adolescents in the United States. J Adolesc Health 1998;22:209–13. [PubMed: 9502008]

Brown JD, Witherspoon EM. The mass media and American adolescents' health. J Adolesc Health 2002;31:153–70. [PubMed: 12470911]

Burke V, Milligan RAK, Beilin LJ, Dunbar D, Spencer M, Balde E, Gracey MP. Clustering of health-related behaviors among 18-year-old Australians. Preventive Medicine 1997;26:724–733. [PubMed: 9327483]

CHIS. CHIS 2003 Methodology Series: Report 1 - Sample Design. Los Angeles, CA: UCLA Center for Health Policy Research; 2005.

Cohen DA, Richardson J, LaBree L. Parenting behaviors and the onset of smoking and alcohol use: a longitudinal study. Pediatrics 1994;94:368–375. [PubMed: 8065865]

Compas BE, Hinden BR, Gerhardt CA. Adolescent development: pathways and processes of risk and resilience. Annu Rev Psychol 1995;46:265–93. [PubMed: 7872731]

Dumont M, Provost MA. Resilience in Adolescents: Protective Role of Social Support, Coping Strategies, Self-Esteem, and Social Activities on Experience of Stress and Depression. Journal of Youth and Adolescence 1999;28:343–363.

Evenson KR, McGinn AP. Test-retest reliability of adult surveillance measures for physical activity and inactivity. Am J Prev Med 2005;28:470–8. [PubMed: 15894151]

Fine LJ, Philogene GS, Gramling R, Coups EJ, Sinha S. Prevalence of multiple chronic disease risk factors 2001 National Health Interview Survey. American Journal of Preventive Medicine 2004;27:18–24. [PubMed: 15275670]

Fulkerson JA, Sherwood NE, Perry CL, Neumark-Sztainer D, Story M. Depressive symptoms and adolescent eating and health behaviors: a multifaceted view in a population-based sample. Preventive Medicine 2004;38:865–875. [PubMed: 15193910]

Galan I, Rodriiguez-Artalejo F, Diez-Ganan L, Tobias A, Zorrilla B, Gandarillas A. Clustering of behavioural risk factors and compliance with clinical preventive recommendations in Spain. Preventive Medicine 2006;42:343–347. [PubMed: 16545444]

Goodman E, Huang B. Socioeconomic status, depressive symptoms, and adolescent substance use. Arch Pediatr Adolesc Med 2002;156:448–53. [PubMed: 11980549]

Goodman E, Slap GB, Huang B. The public health impact of socioeconomic status on adolescent depression and obesity. Am J Public Health 2003;93:1844–50. [PubMed: 14600051]

Gramezy, N.; Rutter, M. Stress, coping and development in childhood. New York: McGraw-Hill; 1983.

Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention. Psychol Bull 1992;112:64–105. [PubMed: 1529040]

He K, Kramer E, Houser RF, Chomitz VR, Hacker KA. Defining and understanding healthy lifestyles choices for adolescents. Journal Of Adolescent Health 2004;35:26–33. [PubMed: 15193571]

Huba, GJ.; Melchior, LA. The Measurement Group and HRSA/HAB's SPNS Cooperative Agreement Steering Committee Module 26B: CES-D8 Form (Interview). Culver City, CA: The Measurement Group; 1995.

Jaccard P. THE DISTRIBUTION OF THE FLORA IN THE ALPINE ZONE. New Phytologist 1912;11:37–50.

Jackson, C.; Henriksem, L.; Dickinson, D.; Levine, DW. American Journal of Public Health. Am Public Health Assoc; 1997. The early use of alcohol and tobacco: its relation to children's competence and parents' behavior.

Jessor R, Turbin MS, Costa FM. Protective factors in adolescent health behavior. Journal Of Personality And Social Psychology 1998;75:788–800. [PubMed: 9781412]

Kann L, Warren CW, Harris WA, Collins JL, Douglas KA, Collins ME, Williams BI, Ross JG, Kolbe LJ. Youth Risk Behavior Surveillance - United-States, 1993. Journal Of School Health 1995;65:163–171. [PubMed: 7637332]

Kemper HC, Snel J, Verschuur R, Storm-van Essen L. Tracking of health and risk indicators of cardiovascular diseases from teenager to adult: Amsterdam Growth and Health Study. Prev Med 1990;19:642–55. [PubMed: 2263575]

Khaw KT, Wareham N, Bingham S, Welch A, Luben R, Day N. Combined impact of health behaviours and mortality in men and women: the EPIC-Norfolk prospective population study. PLoS Med 2008;5:e12. [PubMed: 18184033]

Knoops KTB, de Groot L, Kromhout D, Perrin AE, Moreiras-Varela O, Menotti A, van Staveren WA. Mediterranean diet, lifestyle factors, and 10-year mortality in elderly European men and women - The HALE project. Jama-Journal Of The American Medical Association 2004;292:1433–1439.

Laaksonen M, Prattala R, Karisto A. Patterns of unhealthy behaviour in Finland. Eur J Public Health 2001;11:294–300. [PubMed: 11582610]

Lowry R, Kann L, Collins JL, Kolbe LJ. The effect of socioeconomic status on chronic disease risk behaviors among US adolescents. Jama 1996;276:792–7. [PubMed: 8769588]

Luthar SS, Sawyer JA, Brown PJ. Conceptual issues in studies of resilience: past, present, and future research. Ann N Y Acad Sci 2006;1094:105–15. [PubMed: 17347344]

Lytle LA, Kelder SH, Perry CL, Klepp K. Covariance of adolescent health behaviors: the Class of 1989 study. Health Education Research 1995;10:133–146.

Meng L, Maskarinec G, Lee J, Kolonel LN. Lifestyle factors and chronic diseases: application of a composite risk index. Prev Med 1999;29:296–304. [PubMed: 10547055]

Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000. Jama 2004;291:1238–45. [PubMed: 15010446]

Nezami E, Unger J, Tan S, Mahaffey C, Ritt-Olson A, Sussman S, Nguyen-Michel S, Baezconde-Garbanati L, Azen S, Johnson CA. The influence of depressive symptoms on experimental smoking and intention to smoke in a diverse youth sample. Nicotine Tob Res 2005;7:243–8. [PubMed: 16036281]

Nigg CR, Allegrante JP, Ory M. Theory-comparison and multiple-behavior research: common themes advancing health behavior research. Health Educ Res 2002;17:670–9. [PubMed: 12408211]

Nowlin PR, Colder CR. The role of ethnicity and neighborhood poverty on the relationship between parenting and adolescent cigarette use. Nicotine Tob Res 2007;9:545–56. [PubMed: 17454711]

Patterson RE, Haines PS, Popkin BM. Health lifestyle patterns of U.S. adults. Prev Med 1994;23:453–60. [PubMed: 7971872]

Patton GC, Carlin JB, Coffey C, Wolfe R, Hibbert M, Bowes G. Depression, anxiety, and smoking initiation: a prospective study over 3 years. Am J Public Health 1998;88:1518–22. [PubMed: 9772855]

Pemberton, MR.; Colliver, JD.; Robbins, TM.; Gfroerer, JC. Underage alcohol use: Findings from the 2002–2006 National Surveys on Drug Use and Health (DHHS Publication No. SMA 08-4333, Analytic Series A-30). Rockville, MD: Substance Abuse and Mental Health Services Administration, Office of Applied Studies; 2008.

Petrie J, Bunn F, Byrne G. Parenting programmes for preventing tobacco, alcohol or drugs misuse in children< 18: a systematic review. Health Education Research 2007;22:177. [PubMed: 16857779]

Piccinelli M, Wilkinson G. Gender differences in depression Critical review. The British Journal of Psychiatry 2000;177:486–492. [PubMed: 11102321]

Pronk NP, Anderson LH, Crain AL, Martinson BC, O'Connor PJ, Sherwood NE, Whitebird RR. Meeting recommendations for multiple healthy lifestyle factors. Prevalence, clustering, and predictors among adolescent, adult, and senior health plan members. Am J Prev Med 2004;27:25–33. [PubMed: 15275671]

Rew L, Horner SD. Youth Resilience Framework for reducing health-risk behaviors in adolescents. J Pediatr Nurs 2003;18:379–88. [PubMed: 15058534]

Rosal MC, Ockene JK, Ma YS, Hebert JR, Merriam PA, Matthews CE, Ockene IS. Behavioral risk factors among members of a health maintenance organization. Preventive Medicine 2001;33:586–594. [PubMed: 11716654]

Sharkey JD, You S, Schnoebelen K. Relations among school assets, individual resilience, and student engagement for youth grouped by level of family functioning. PSYCHOLOGY IN THE SCHOOLS 2008;45:402.

Smith GT, McCarthy DM, Goldman MS. Self-Reported Drinking And Alcohol-Related Problems Among Early Adolescents - Dimensionality And Validity Over 24 Months. Journal Of Studies On Alcohol 1995;56:383–394. [PubMed: 7674672]

Stanton WR, McClelland M, Elwood C, Ferry D, Silva PA. Prevalence, reliability and bias of adolescents' reports of smoking and quitting. Addiction 1996;91:1705–1714. [PubMed: 8972928]

Steinberg L, Lamborn SD, Dornbusch SM, Darling N. Impact of parenting practices on adolescent achievement: authoritative parenting, school involvement, and encouragement to succeed. Child Dev 1992;63:1266–81. [PubMed: 1446552]

Yach D, Warren CW, Silva VLD, Riley L, Eriksen MP, Henson R, Asma S, Blanton C, Caraballo R, Horton R, et al. Tobacco use among youth: a cross country comparison. Tobacco Control 2002;11:252–270. [PubMed: 12198280]

Yancey AK, Siegel JM, McDaniel KL. Role Models, Ethnic Identity, and Health-Risk Behaviors in Urban Adolescents. Archives of Pediatrics & Adolescent Medicine 2002;156:55. [PubMed: 11772191]

Yore MM, Ham SA, Ainsworth BE, Kruger J, Reis JP, Kohl HW 3rd, Macera CA. Reliability and validity of the instrument used in BRFSS to assess physical activity. Med Sci Sports Exerc 2007;39:1267–74. [PubMed: 17762359]

Zimmerman MA, Bingenheimer JB, Notaro PC. Natural mentors and adolescent resiliency: a study with urban youth. Am J Community Psychol 2002;30:221–43. [PubMed: 12002244]

Zweig JM, Lindberg LD, McGinley KA. Adolescent health risk profiles: The co-occurrence od Health risks Among Females and Males. Journal of Youth and Adolescence 2001;30:701–728.

Table 1

Descriptive statistics of study variables (2003, California).

	Male (N=2,048)	Female (N=1,962)
	Means	
Age (years)	14.4	14.5
Years lived in the US	13.7	13.7
Depressiveness [***]	4.1	4.8
Parental supervision [**][a]	−0.03	0.02
Parental support [a]	0.02	−0.02
	Percents	
Race/ethnicity		
White	40.9	41.9
Latino	34.4	33.7
Asian	10.5	9.9
African American	9.0	9.1
Other	5.3	5.5
Citizenship		
US born	85.4	84.6
Naturalized	4.5	5.1
Non-citizen	10.1	10.3
Percent Federal Poverty level (FPL)		
0–99% FPL	20.1	20.1
100–199% FPL	21.3	23.2
200–299% FPL	16.0	13.1
300% FPL	42.7	43.6
Parental education		
Less than high school	23.9	22.5
High school	20.8	22.6
More than high school	55.4	54.9
Parental marital status		
Married	58.2	58.2
Separated/divorced/widowed	30.9	30.9
Never married	10.9	10.9
Presence of role model	57.8	60.7
Health lifestyle behaviors		
Current smoking	5.5	6.1
Current alcohol use	17.1	15.7
Low physical activity [***]	22.9	29.8
Low fruit/vegetable consumption	73.9	76.2

[**] p≤0.01,

[***] p≤0.001,

[a]Parental supervision and parental support values represent scores produced from factor loadings

Table 2

Proportion reporting each health risk behavior within each cluster of health risk behaviors (2003, California).

	Percent reporting health risk behavior in each cluster				Percent Males or Females in Each Cluster
	Current Smoking	Current Alcohol Use	Low Physical Activity	Low Fruit/Vegetable Consumption	
Male (N=2,048)					
Cluster 1 – Salutary Adherents	0.0	0.0	0.0	0.0	19.0
Cluster 2 – Active Snackers	1.8	14.5	0.0	100.0	52.3
Cluster 3 – Sedentary Snackers	1.6	13.6	100.0	83.8	21.8
Cluster 4 – Risk Takers	60.1	93.6	16.7	48.3	7.0
Female (N=1,962)					
Cluster 1 – Salutary Adherents	0.0	0.0	0.0	0.0	16.7
Cluster 2 – Active Snackers	1.6	0.0	0.0	100.0	42.9
Cluster 3 – Sedentary Snackers	4.4	0.0	100.0	84.6	24.5
Cluster 4 – Risk Takers	26.9	98.4	33.3	78.8	15.9

Note: Clusters were generated separately for males and females

Table 3

Table 3a. Logistic regression models predicting each health risk behavior for males, N=2,048 (2003, California).

	Odds Ratio (95% Confidence Interval)			
	Current smoking	**Current Alcohol Use**	**Low Physical Activity**	**Low Fruit/Vegetable Consumption**
Age	[***]1.89 (1.46, 2.44)	[***]1.75 (1.49, 2.05)	[BL]1.13 (1.00, 1.27)	[***]1.24 (1.10, 1.40)
Race/ethnicity				
White	-	-	-	-
Latino	0.69 (0.32, 1.48)	1.20 (0.76, 1.92)	1.37 (0.89, 2.10)	1.39 (0.91, 2.12)
Asian	[**]0.15 (0.04, 0.55)	[***]0.27 (0.13, 0.59)	[**]2.18 (1.32, 3.59)	1.20 (0.69, 2.10)
African American	[*]0.26 (0.08, 0.86)	[**]0.31 (0.12, 0.78)	[**]2.40 (1.30, 4.44)	1.52 (0.73, 3.14)
Other	0.77 (0.23, 2.56)	1.89 (0.86, 4.14)	0.82 (0.40, 1.68)	1.08 (0.55, 2.13)
Citizenship				
US born	-	-	-	-
Naturalized	1.53 (0.33, 7.09)	0.89 (0.34, 2.36)	0.75 (0.32, 1.76)	0.80 (0.31, 2.10)
Noncitizen	1.09 (0.22, 5.21)	0.79 (0.25, 2.46)	0.71 (0.31, 1.64)	1.32 (0.60, 2.91)
Years lived in the US Poverty level	1.11 (0.93, 1.32)	0.95 (0.86, 1.05)	0.99 (0.91, 1.08)	0.95 (0.86, 1.04)
0–99% FPL	[**]3.99 (1.63, 9.72)	0.87 (0.47, 1.62)	1.37 (0.80, 2.36)	[**]0.49 (0.30, 0.79)
100–199% FPL	[*]2.38 (1.05, 5.39)	0.72 (0.42, 1.23)	[*]1.73 (1.12, 2.68)	0.68 (0.44, 1.05)
200–299% FPL	[*]2.88 (1.22, 6.82)	1.09 (0.66, 1.81)	1.28 (0.81, 2.02)	0.74 (0.48, 1.13)
300% FPL	-	-	-	-
Parental education				
Less than HS	-	-	-	-
HS	[*]2.88 (1.07, 7.80)	[**]2.48 (1.30, 4.74)	0.83 (0.49, 1.42)	[*]1.94 (1.15, 3.26)
More than HS	2.42 (0.91, 6.43)	[*]2.06 (1.10, 3.87)	0.98 (0.61, 1.59)	1.61 (0.99, 2.62)
Parental marital status				
Married	-	-	-	-
Separated/divorced/widowed	1.36 (0.73, 2.54)	[*]1.91 (1.32, 2.77)	1.18 (0.82, 1.72)	[*]1.50 (1.06, 2.13)
Never married	2.08 (0.88, 4.92)	1.34 (0.69, 2.62)	0.70 (0.41, 1.21)	1.29 (0.76, 2.17)
Parent did not listen in during interview	0.78 (0.31, 2.01)	1.34 (0.71, 2.53)	1.40 (0.81, 2.42)	1.33 (0.86, 2.06)
Parental supervision	[***]0.48 (0.34, 0.67)	[***]0.54 (0.43, 0.67)	0.91 (0.74, 1.14)	0.85 (0.69, 1.04)
Parental support	[*]1.52 (1.06, 2.19)	1.01 (0.81, 1.26)	0.89 (0.73, 1.09)	[BL]0.83 (0.69, 1.00)
Has role model	0.61 (0.36, 1.03)	0.98 (0.69, 1.39)	[**]0.63 (0.46, 0.85)	[**]0.64 (0.48, 0.86)
Depressiveness	[***]1.99 (1.39, 2.86)	[***]1.66 (1.25, 2.18)	1.11 (0.85, 1.44)	0.85 (0.65, 1.11)

Table 3b. Logistic regression models predicting each health risk behavior for females, N=1,962 (2003, California).

	Odds Ratio (95% Confidence Interval)			
	Current smoking	**Current Alcohol Use**	**Low Physical Activity**	**Low Fruit/Vegetable Consumption**
Age	***1.41 (1.15, 1.71)	***1.49 (1.25, 1.78)	***1.28 (1.12, 1.48)	**1.23 (1.07, 1.41)
Race/ethnicity				
White	-	-	-	-
Latino	0.68 (0.33, 1.36)	1.31 (0.80, 2.15)	1.17 (0.79, 1.72)	1.16 (0.79, 1.72)
Asian	*0.14 (0.03, 0.70)	*0.39 (0.15, 0.99)	1.50 (0.85, 2.64)	0.62 (0.36, 1.06)
African American	0.90 (0.27, 3.07)	***0.23 (0.11, 0.52)	*1.86 (1.09, 3.18)	*2.24 (1.15, 4.38)
Other	1.41 (0.56, 3.56)	0.99 (0.40, 2.41)	1.41 (0.72, 2.80)	1.68 (0.93, 3.06)
Citizenship				
US born	-	-	-	-
Naturalized	1.97 (0.60, 6.50)	0.61 (0.22, 1.67)	0.61 (0.24, 1.54)	***0.26 (0.12, 0.59)
Noncitizen	1.17 (0.23, 6.06)	0.32 (0.09, 1.21)	1.21 (0.50, 2.95)	*0.34 (0.14, 0.82)
Years lived in the US	1.04 (0.91, 1.18)	1.10 (0.96, 1.27)	0.95 (0.86, 1.04)	***0.84 (0.77, 0.93)
Poverty level				
0–99% FPL	0.82 (0.26, 2.56)	1.03 (0.52, 2.06)	1.05 (0.61, 1.81)	0.75 (0.46, 1.23)
100–199% FPL	1.42 (0.69, 2.92)	0.95 (0.55, 1.62)	1.26 (0.84, 1.89)	1.36 (0.88, 2.10)
200–299% FPL	1.23 (0.40, 3.82)	1.74 (0.95, 3.17)	1.21 (0.79, 1.85)	1.24 (0.79, 1.97)
300% FPL	-	-	-	-
Parental education				
Less than HS	-	-	-	-
HS	0.54 (0.19, 1.52)	1.58 (0.79, 3.16)	1.11 (0.67, 1.83)	1.21 (0.70, 2.10)
More than HS	0.52 (0.20, 1.39)	1.25 (0.61, 2.59)	0.75 (0.46, 1.23)	1.06 (0.67, 1.70)
Parental marital status				
Married	-	-	-	-
Separated/divorced/widowed	**2.63 (1.43, 4.85)	**2.21 (1.46, 3.33)	1.15 (0.83, 1.61)	0.97 (0.69, 1.36)
Never married	1.56 (0.58, 4.19)	0.95 (0.51, 1.77)	1.35 (0.83, 2.21)	1.48 (0.84, 2.60)
Parent did not listen in during interview	*4.72 (1.31, 17.08)	1.23 (0.58, 2.61)	1.20 (0.75, 1.91)	0.90 (0.57, 1.44)
Parental supervision	***0.44 (0.30, 0.64)	***0.36 (0.28, 0.46)	1.05 (0.83, 1.33)	BL0.78 (0.61, 1.00)
Parental support	*1.45 (1.04, 2.04)	1.07 (0.84, 1.37)	0.99 (0.82, 1.20)	0.86 (0.70, 1.05)
Has role model	1.54 (0.75, 3.18)	1.08 (0.72, 1.62)	*0.69 (0.51, 0.94)	***0.55 (0.40, 0.75)
Depressiveness	***2.04 (1.44, 2.87)	1.19 (0.91, 1.55)	1.23 (0.97, 1.55)	1.28 (0.98, 1.67)

*
p≤0.05,

**
p≤0.01,

***
p≤0.001, BL=Borderline significance

Table 4

Table 4a. Multinomial logit model predicting each cluster of health behaviors, males, N=2,048 (2003, California).

	Relative Risk Ratio (95% Confidence Interval)		
	Cluster 2 *"Active Snackers"*	Cluster 3 *"Sedentary Snackers"*	Cluster 4 *"Risk Takers"*
Age	***1.33 (1.14, 1.55)	***1.41 (1.19, 1.67)	***2.01 (1.58, 2.54)
Race/ethnicity			
White	-	-	-
Latino	1.51 (0.90, 2.53)	*1.95 (1.05, 3.60)	1.04 (0.48, 2.28)
Asian	1.07 (0.57, 2.02)	*2.33 (1.16, 4.70)	*0.27 (0.08, 0.92)
African American	1.57 (0.67, 3.65)	*3.17 (1.24, 8.14)	0.33 (0.06, 1.94)
Other	0.93 (0.42, 2.03)	0.82 (0.32, 2.06)	0.87 (0.22, 3.35)
Citizenship			
US born	-	-	-
Naturalized	0.71 (0.21, 2.33)	0.52 (0.14, 1.99)	1.14 (0.22, 5.89)
Noncitizen	1.32 (0.51, 3.44)	0.87 (0.32, 2.34)	1.02 (0.22, 4.78)
Years lived in the US	0.90 (0.80, 1.01)	0.91 (0.80, 1.02)	0.97 (0.83, 1.14)
Poverty level			
0–99% FPL	***0.39 (0.22, 0.68)	0.70 (0.35, 1.38)	0.97 (0.36, 2.61)
100–199% FPL	**0.47 (0.28, 0.78)	0.97 (0.54, 1.74)	0.80 (0.35, 1.82)
200–299% FPL	0.71 (0.43, 1.16)	1.03 (0.56, 1.89)	1.58 (0.72, 3.49)
300% FPL	-	-	-
Parental education			
Less than HS	-	-	-
HS	1.57 (0.82, 3.01)	1.14 (0.53, 2.44)	2.12 (0.74, 6.16)
More than HS	1.44 (0.78, 2.65)	1.25 (0.63, 2.49)	1.88 (0.68, 5.16)
Parental marital status			
Married	-	-	-
Separated/divorced/widowed	1.38 (0.91, 2.10)	1.45 (0.88, 2.44)	1.59 (0.85, 2.97)
Never married	1.33 (0.73, 2.45)	0.87 (0.42, 1.83)	2.06 (0.76, 5.65)
Parent did not listen in during interview	1.47 (0.89, 2.43)	*1.91 (1.01, 3.61)	1.58 (0.57, 4.37)
Parental supervision	**0.68 (0.52, 0.89)	**0.63 (0.47, 0.86)	***0.39 (0.27, 0.56)
Parental support	BL0.79 (0.63, 1.00)	*0.74 (0.57, 0.96)	0.95 (0.66, 1.38)
Has role model	0.73 (0.52, 1.04)	**0.54 (0.35, 0.82)	0.75 (0.42, 1.34)
Depressiveness	*0.69 (0.50, 0.96)	0.83 (0.55, 1.23)	1.46 (0.95, 2.26)

Table 4b. Multinomial logit model predicting each cluster of health risk behaviors, female, N=1,962 (2003, California)

	Relative Risk Ratio (95% Confidence Interval)		
	Cluster 2 *"Active Snackers"*	Cluster 3 *"Sedentary Snackers"*	Cluster 4 *"Risk Takers"*
Age	*1.23 (1.03, 1.46)	***1.48 (1.22, 1.81)	***1.88 (1.51, 2.35)
Race/ethnicity			
White	-	-	-
Latino	1.07 (0.66, 1.71)	0.88 (0.52, 1.49)	1.22 (0.67, 2.24)
Asian	*0.46 (0.24, 0.88)	0.71 (0.34, 1.48)	*0.24 (0.09, 0.68)
African American	**2.94 (1.35, 6.40)	***3.85 (1.73, 8.58)	1.05 (0.33, 3.31)
Other	1.83 (0.87, 3.87)	1.58 (0.67, 3.77)	1.62 (0.56, 4.65)
Citizenship			
US born	-	-	-
Naturalized	0.40 (0.14, 1.15)	0.35 (0.11, 1.20)	*0.29 (0.09, 0.98)
Noncitizen	0.36 (0.11, 1.20)	0.69 (0.19, 2.54)	*0.16 (0.03, 0.92)
Years lived in the US	**0.83 (0.73, 0.95)	***0.83 (0.72, 0.94)	0.93 (0.79, 1.11)
Poverty level			
0–99% FPL	0.92 (0.49, 1.73)	0.88 (0.43, 1.80)	1.01 (0.44, 2.31)
100–199% FPL	1.65 (0.94, 2.90)	1.80 (0.97, 3.31)	1.43 (0.71, 2.90)
200–299% FPL	0.94 (0.52, 1.68)	1.16 (0.62, 2.19)	1.72 (0.82, 3.61)
300% FPL	-	-	-
Parental education			
Less than HS	-	-	-
HS	1.58 (0.82, 3.03)	1.41 (0.67, 2.96)	1.96 (0.80, 4.79)
More than HS	1.37 (0.78, 2.41)	0.84 (0.45, 1.60)	1.19 (0.51, 2.80)
Parental marital status			
Married	-	-	-
Separated/divorced/widowed	0.98 (0.63, 1.52)	1.09 (0.67, 1.78)	**2.25 (1.33, 3.80)
Never married	0.98 (0.49, 1.97)	1.59 (0.75, 3.36)	1.33 (0.53, 3.35)
Parent did not listen in during interview	0.83 (0.48, 1.47)	0.97 (0.53, 1.78)	1.16 (0.49, 2.80)
Parental supervision	0.73 (0.50, 1.06)	0.88 (0.56, 1.38)	***0.30 (0.19, 0.44)
Parental support	0.91 (0.71, 1.17)	0.89 (0.66, 1.19)	1.00 (0.73, 1.38)
Has role model	***0.52 (0.35, 0.77)	***0.39 (0.25, 0.60)	*0.59 (0.36, 0.99)
Depressiveness	BL1.43 (1.00, 2.05)	*1.58 (1.05, 2.38)	*1.66 (1.09, 2.54)

*
p≤0.05,

**
p≤0.01,

***
p≤0.001, BL=Borderline significance

Note: Cluster 1 – "Salutary Adherents" is the base outcome category.

Note: Cluster 1 – "Lifestyle Adherents" is the base outcome category.