

# Living Arrangements, Knowledge of Health Risks, and Stress as Determinants of Health-Risk Behavior Among College Students

Diane H. Jones, PhD; Yossi Harel, PhD, and Richard M. Levinson, PhD

**Abstract.** The association of knowledge of health risks, living arrangements, and perceived stress with health-risk behaviors was examined in a sample of college students included in the Health Promotion and Disease Prevention Supplement of the National Health Interview Survey. Regressions of each health-risk behavior (dependent variable) were performed on the predicted correlates. Although knowledge was not associated with participation in physical activity or smoking, the study found that students who knew more about the harmful effects of alcohol drank less, and those with greater knowledge of health risks practiced fewer risky behaviors. Students living independently were more likely to smoke, and those living in residence halls were less likely to do so. Drinking, however, was more common among students living in residence halls or independently than among those living at home. Hall residents engaged in more group physical activity than other students did, but their physical activity was unrelated to health-risk behaviors. Stress was associated with smoking but not with other health practices. The findings suggest that smoking may be less influenced by health knowledge and more associated than drinking is with a response to stress. Drinking appears to be a social activity associated with living among peers and is potentially modifiable by increased knowledge about the effects of alcohol on health.

**Key Words.** alcohol consumption, college students, health-risk behavior, physical activity, smoking, stress

---

*The authors were all with the National Center for Chronic Disease Prevention and Health Promotion of the United States Centers for Disease Control in Atlanta at the time of this research. Diane H. Jones and Richard M. Levinson were with the Division of Chronic Disease Control and Community Intervention, Cardiovascular Health Branch, and Yossi Harel was with the Division of Adolescent and School Health, Surveillance, Evaluation, and Research Branch. Dr Jones is now in the office of the director and Dr Harel is with the Department of Sociology at Bar Ilan University in Ramat Gan, Israel.*

College life offers various experiences that can promote health or can increase the incidence of behaviors that place students at risk for poor health. College life typically allows students greater autonomy through freedom from parental supervision, but it also presents new demands and stressors associated with a different structure to daily life.<sup>1-4</sup>

Where and with whom students live can influence health practices. Compared with living at home or in campus residence halls, independent apartment living probably offers the greatest freedom from parents and other adult authorities. Students who live independently are subject to fewer of the controls of adult authorities that inhibit unhealthy behaviors (such as heavy alcohol drinking). These students are removed from peer pressures that could also promote such potentially healthful behaviors as participation in sports and exercise. Alternatively, living at home with parents could reduce peer pressures or opportunities that are associated with both health risks and health-promoting behaviors.

Supervised residence hall living offers an intermediate level of autonomy. As a new and unique living situation, residence hall life brings some stress, often amplified by the removal of past social support and the well-established group identity of high school.<sup>5</sup> Residence hall living, however, provides a good opportunity for social support from students experiencing similar academic and social stresses. Although peer pressure to engage in unhealthy behaviors may be great in the residence halls, the same pressure may result in greater levels of healthful physical activity.

In several studies, knowledge about health has been associated with health-risk behavior.<sup>6</sup> Some studies re-

port that education is inversely associated with various health-risk behaviors,<sup>6,7</sup> and increments in specific health knowledge (about smoking, drinking, etc) have been associated with a reduction in risky behaviors, but not consistently so.<sup>6-10</sup>

Stress is another byproduct of college life that can affect health behavior. Among persons 18 to 25 years of age, perceived stress is higher for college students than for persons with high school education or less and for persons who attended college but who are not currently students.<sup>11</sup> The lives of first-year students can be particularly stressful because of financial obligations, parental expectations, a change in living situations and norms, and other factors.<sup>4</sup> Stress has been associated with many different symptoms, illnesses,<sup>12,13</sup> and patterns of health service use.<sup>14</sup> Stress may also be associated with drinking alcohol, using tobacco, and other health-risk behaviors.<sup>15-19</sup>

We investigated whether different living arrangements (living at home with family, living in a residence hall, and living in an apartment), level of knowledge about health risks, and amount of self-reported stress were associated with health-risk behaviors. Included among the health-risk behaviors we studied were cigarette smoking, consumption of alcohol, an index of health-risk behaviors, and physical inactivity. Physical inactivity was included because of its association with cardiovascular disease.<sup>20</sup>

## METHOD

### Sample

The study population was 1,411 college students drawn from a national probability sample of United States adults who responded to the Health Promotion and Disease Prevention Supplement (HPDP) of the National Health Interview Survey (NHIS). Details of the sampling design are available elsewhere.<sup>21</sup>

The NHIS did not specifically ask respondents whether they were college students; their status was inferred from responses to several questions. Young adults aged 18 to 25 were classified as college students if they indicated that their current, full-time, and primary activity was going to school and if they had completed 12 or more years of education. But some persons may have been misclassified. Persons who were working full time and going to school may have been either classified as full-time students or eliminated from the study. Further, we did not know the educational setting of students (vocational school, junior college, university, or other).

Of the study population, 700 persons (49.6%) were men and 711 (50.4%) were women. Ninety-eight (14%) of the men indicated they were black, Hispanic, or of another minority group; 167 (23.5%) of the women were from minority groups. Most participants were 18 to 22 years old; approximately 15% of the men and 13% of the women were 23 to 25 years old. Data in Table 1

summarize characteristics of the sample and the reported health-risk behaviors.

### Independent Variables

The principal independent variables were living arrangement, level of knowledge about health and health risks, and degree of self-reported stress. Respondents' living arrangements were classified as follows: living in a hall; not living in a hall but living alone or with nonrelatives (eg, apartment living); and living with a family or spouse (at home). Unfortunately, the classification system did not allow us to differentiate living in a Greek-letter house from living in other residence halls or with nonrelatives.

Level of health knowledge was based on three indices. The index for smoking knowledge included eight chronic disorders associated with smoking: emphysema, bladder cancer, cancer of the larynx or voice box, cataracts, cancer of the esophagus, chronic bronchitis, gallstones, and lung cancer.

Respondents were asked to indicate whether the risk of developing each disorder is associated with smoking. Response choices were "increases" (1 = *definitely* or 2 = *probably*) and "does not increase" (3 = *probably* or 4 = *definitely*). Because the risk for each illness is known to increase from smoking, the lower the coded response, the more correct we considered it. In our factor analysis of responses, we found that all but one question (that dealing with lung cancer) clustered on a single dimension or factor. Dropping the lung cancer item resulted in an index with a range of from 7 to 28 ( $SD = 4.05$ ) and a Cronbach's alpha of .723.

For the index of alcohol knowledge, respondents were asked to indicate whether they thought alcohol consumption contributed to each of six disorders: throat cancer, cirrhosis of the liver, bladder cancer, cancer of the mouth, arthritis, and blood clots. Response choices were the same as for the index of smoking. A factor analysis of responses showed that all but the item on cirrhosis of the liver clustered on a single dimension or factor. That item was dropped from the index, which left five questions with a range of from 5 to 20 ( $SD = 3.99$ ) and a Cronbach's alpha of .767.

The combined index for knowledge was based on all 14 questions related to smoking and alcohol. Three relationships (alcohol and cirrhosis, smoking and emphysema, and smoking and lung cancer) did not cluster on a single dimension or factor and were dropped from the final index that, when combined, had a range of from 11 to 44 ( $SD = 7.28$ ) and a Cronbach's alpha of .824.

Degree of stress was indicated by two items. Perceived stress was measured by response to the question, "How much stress have you been under in the past two weeks?" Response categories were as follows: 1 = *a lot*, 2 = *moderate*, 3 = *relatively little*, and 4 = *almost none*. For the second item, respondents were asked whether they had thought about or had sought help for personal or emotional problems from family or friends, profes-

**TABLE 1**  
**Background Characteristics of College Student Sample**

Characteristic	<i>n</i>	%
Age (years)		
18	305	21.6
19	261	18.5
20	248	17.6
21	243	17.2
22	154	10.9
23	90	6.4
24	58	4.1
25	52	3.7
Sex		
Men	700	49.6
Women	711	50.4
Racial/ethnic group		
White	1,146	81.2
Other	265	18.8
Residence		
Residence hall	439	31.1
Apartment	434	30.8
Home	538	38.1
Sought or considered seeking help for stress		
No	1,024	72.6
Yes	387	27.4
Level of stress in past 2 weeks		
A lot	361	25.9
Moderate	502	36.0
Relatively little	343	24.6
Almost none	187	13.4
Smoking status		
Never smoked	1,076	77.2
Former smoker	24	1.7
Smoke < 5 cigarettes/day	93	6.7
Smoke, ≥ 5 cigarettes/day	201	14.4
Total drinks in past 2 weeks		
0	537	38.1
1-3	168	11.9
4-6	195	13.8
7-9	103	7.3
10-12	102	7.2
13-15	40	2.8
16-18	52	3.7
19-21	37	2.6
22-24	29	2.1
25+	138	10.5
	<i>M</i>	<i>SD</i>
Solo physical activity (minutes over past 2 weeks)	403.4	548.05
Group physical activity (minutes over past 2 weeks)	278.6	478.60

## Dependent Variables

Dependent variables included several health-risk behaviors that could be influenced by the independent variables. For smoking status, respondents were asked to classify themselves as a current smoker, a former smoker, or one who never smoked. Current smokers were asked the number of cigarettes they smoked per day and when they had smoked during the past 2 weeks. Respondents were categorized as never smoked; former smoker; or current smoker of fewer than 5 cigarettes per day, of 5 to 15 per day, of 16 to 25 per day, and of more than 25 cigarettes per day.

To measure drinking behavior, the survey queried participants about how many times they had drunk alcohol in the past 2 weeks and how many drinks they had consumed on each occasion. Responses were used to calculate the number of drinks consumed during the past 2 weeks.

We based our index of health-risk behavior, adapted from the work of Berkman and colleagues,<sup>18</sup> on answers students gave to questions about five specific behaviors. Respondents were assigned 1 point for each of the following behaviors: sleeping fewer than 6 or more than 9 hours per night, rarely or never eating breakfast, usually or often eating between meals, perceiving oneself as being overweight, and rarely or never using automobile seat belts. Scores ranged from 0 to 5.

Physical activity was reported as minutes of participation in activities that involved rhythmic movement of large muscles and was considered to be aerobic. One indicator was based on participation in activities commonly done with others or in groups: dance, aerobics, basketball, volleyball, tennis, handball, baseball, and football. A second physical activity variable was based on activities often done alone: walking, running, swimming, biking, calisthenics, weight training, skiing, hiking, and skating. For each group of activities, frequency and duration of participation over the prior 2 weeks were multiplied, and a total number of minutes spent were summed across activities. The time spent in physical activity was capped at 5 hours a day to avoid skewing of responses by persons who overestimated hours of involvement.

## Analysis

Each dependent variable (smoking, alcohol consumption, general health-risk behaviors, solo physical activity, and group physical activity) was regressed on a series of independent variables. The independent variables included three background characteristics entered as covariates because they were also likely to influence patterns of physical activity: age (a continuous variable from 18 to 25), sex (a dummy variable in which 0 = female and 1 = male), and minority status (a dummy variable in which 0 = white and 1 = minority).

The knowledge indicator used in each regression model was contingent on the dependent variable. For

signals, or self-help groups. Those who had done so were classified as needing help (coded as 1); and those who had not done so were classified as not needing help (coded as 0).

the dependent variable of smoking, the smoking knowledge index was entered; and for alcohol consumption, the alcohol knowledge index was entered. For general health-risk behavior and physical activity, the smoking and alcohol knowledge indices were combined and entered. Living arrangements were included as dummy variables, with 1 = residence hall and 0 = living at home (reference category), and 1 = living independently and 0 = living at home. Perceived stress was treated as an interval variable, as described earlier, and needing help for stress was a dichotomous dummy variable (considering or seeking help = 1, not considering or seeking help = 0). To explore the social context and the level of activity, we classified physical activity as either solo or group.

## RESULTS

### Smoking

The data in Table 2 show the regression (beta values) of each health behavior dependent variable on the independent variables. None of the background characteristics significantly contributed to smoking status. Knowledge of health-risk behaviors also did not play a significant role. Living at home, however, appeared to be associated with more smoking than was living in a residence hall, although the coefficient was not significant; and living independently was associated with more smoking than was living at home. Perceived stress and need for help were also positively associated with smoking. The independent variables accounted for a small proportion of the variance in smoking.

### Alcohol Consumption

Two background characteristics were significantly associated with amount of alcohol consumed. Men consumed more than did women, and whites consumed more than minorities did. Knowledge was associated

with alcohol use; students who knew about the health risks associated with alcohol drank less. Students living in residence halls drank more than those living at home, and students living independently drank more than students living at home. We found no significant association between alcohol consumption and stress. The association between the independent variables and amount of alcohol consumed was greater than that for smoking.

### Health-Risk-Behavior Index

Only age and knowledge of health risks significantly contributed to differences in these health-risk behaviors. Younger students engaged in more risky behaviors. Students with greater knowledge (combined index) reported fewer risky behaviors. The amount of variance in health-risk behavior accounted for by the variables was small.

### Physical Activity

Men and minorities reported significantly more minutes spent in solo physical activity than did women and whites. The variance in solo activities explained by the independent variables was small, however.

For group physical activity, the analysis showed that men and minorities were more active than women and whites and that students living in residence halls were more likely to participate in group physical activities than were students living at home, although living arrangement was not associated with amount of solo activity. The independent variables accounted for slightly more variation in group activity than in solo activity.

## DISCUSSION

Overall, the independent variables accounted for little variation in health practices. The pattern of significant associations between the independent variables and health practices provides some insights into how knowl-

TABLE 2  
Association Between Independent Variables and Dependent (Health-Risk Behavior) Variables

Independent variable	Smoking status	Alcohol consumption	Health-risk behavior index	Physical activity	
				Solo	Group
Age	.0403	.0078	-.1146***	-.0270	-.0528
Sex	-.0093	.2306***	-.0375	.1644***	.1996***
Racial/ethnic group	-.0085	-.1325*	.0386	.0876**	.1562***
Knowledge†	-.0108	.0587*	.0729**	-.0183	-.0340
Residence hall (v home)	-.0995	.1124***	-.0445	-.0147	.0727**
Independent living (v home)	.0673*	.1202***	-.0010	-.0044	.0025
Perceived stress	-.0790**	-.0268	.0011	-.0517	-.0434
Need for help	.0577*	.0394	.0390	.0255	-.0123
Adjusted R <sup>2</sup>	.0338	.1047	.0162	.0255	.0610

†For smoking status, a smoking health-risk knowledge index was used; for alcohol consumption, an alcohol health-risk knowledge index was used; for general health risks and solo or group physical activity, a combination of responses to both indices was used.  
\* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

edge, living arrangements, and stress are associated with health-risk behavior.

Smoking, but not alcohol consumption, was associated with perceived stress. Some researchers have suggested that smoking is a coping mechanism that reduces stress and that the amount of cigarette smoking increases with stress.<sup>19</sup> Our findings are consistent with these hypotheses. Similar arguments, however, have been made for alcohol consumption,<sup>16,17</sup> but we did not find drinking to be associated with two indicators of stress. Among college students, alcohol consumption may be a social behavior more than a response to stress.<sup>15-17,22-25</sup> Although some persons may increase their intake in response to stress, most college students appeared to drink in social situations in which alcohol is present.

Group norms may promote drinking, but they may also discourage smoking. Students living in residence halls smoked less than those living at home, and students living independently (eg, in apartments) smoked more than those living at home.

Greater knowledge about health risks associated with alcohol consumption was associated with less drinking, and knowledge about the health risks of alcohol and smoking was associated with a healthier lifestyle in general. Unfortunately, the cross-sectional data do not allow conclusions about whether the associations are causal.

Knowledge of health risks was not associated with smoking or amount of physical activity. Other researchers have reported that most smokers in the United States know the health risks of smoking<sup>26</sup> and, when asked, most adult smokers say they would like to quit.<sup>27</sup> Because physical addiction is believed by some to be more likely to be associated with smoking than with drinking, knowledge of health risks may influence drinking (and other risk behaviors) more than knowledge affects smoking behavior.

The lack of association between health knowledge and physical activity could have resulted from our measure of knowledge, which concerned the risks from smoking and alcohol consumption but not with the risk of sedentary behavior. Although previous research findings on the association between health knowledge and physical activity in adults have been inconsistent,<sup>6-10</sup> a more appropriate knowledge measure might have resulted in some association.

Several of the associations between health-risk behaviors and background variables are worthy of comment. The index of health-risk behaviors was higher for younger students than for older students, but age was not associated with the amount of smoking, drinking, and sedentary behavior. Perhaps as students mature and adapt to college life, the risk behaviors included in the index are reduced, particularly as students become more knowledgeable about health risks. Age, however, was not associated with the consumption of alcohol. Although the survey data were gathered when alcohol was available to students under the age of 21 in some states, we an-

tipiculated that older students would consume more alcohol. More recent survey data might reveal an association with age, but college students under the legal drinking age often have opportunities to consume alcohol.<sup>15,24,25</sup>

Men not only drink more than women but are more physically active. Other investigations of adults in the United States have found this to be true.<sup>28</sup> White students consumed more alcohol than minority students, and minority students were more physically active than were white students. Of the 18.8% of students who were from various ethnic groups, 76.6% were black ( $n = 203$ ), 19.6% were Asian or Pacific Islanders ( $n = 52$ ), and 3.8% were other minorities ( $n = 12$ ). Unfortunately, the small sample size prevented us from examining patterns within the different minority groups.

A critical piece of missing information was the socioeconomic status of students. From the survey data, we could not determine anything about parental education, income, and occupation. The HPDP asked for income of the family head, but because of the sampling method we could not be certain whether the college students reported their personal income or that of their parents. Previous research has shown socioeconomic background to be associated with health-risk behaviors.<sup>18,27-30</sup> Although respondents studied were somewhat homogeneous because all were college students, their behavior still may have been influenced by the status of their family of origin. Socioeconomic status may have been confounded with living arrangements (eg, lower income students living at home rather than on campus) or with other variables.

## CONCLUSIONS

We draw several tentative conclusions from our findings. Knowledge of health risks does have some association with health-risk behavior. Health education or heightening awareness of behavioral risk factors may promote healthful lifestyles among college students. In particular, the need to reduce drinking among residence hall students and to promote smoking cessation among students living off campus is apparent. Knowledge of health risks from alcohol consumption can be addressed through educational programs or peer educators, and such education might be focused, in part, on group sporting events at which drinking is very common.

Perhaps the most salient message is that we still have much to explain. The variables examined account for just a small amount of the variance in health-risk behavior. Effective interventions must consider other factors amenable to intervention that could help promote healthful behaviors among college and noncollege youth.

## REFERENCES

1. O'Neil MK, Mingie P. Life stress and depression in university students: Clinical illustrations of recent research. *J Am Coll Health*. 1988;36:235-240.
2. Segal BE. Epidemiology of emotional disturbance

- among college undergraduates: A review analysis. *J Nerv Ment Dis.* 1966;134:348-362.
3. Rimmer JD, Halikas JA, Schuckit MA. Prevalence and incidence of psychiatric illness in college students: A four-year prospective study. *J Am Coll Health.* 1982;30:207-211.
  4. Chickering AW. *Education and Identity.* San Francisco: Jossey-Bass; 1976.
  5. Ingra A, Moos RH. Alcohol use among college students: Some competing hypotheses. *Youth and Adolescence.* 1979;8:393-405.
  6. Levine DM, Green LW. Behavioral change through health education. In: Kaplan N, Stamler J, eds. *Preventive Cardiology.* Philadelphia: WB Saunders; 1984.
  7. Valente CM, Sobal J, Muncie HL, Levine DM, Antlitz AM. Health promotion: Physicians' beliefs, attitudes, and practices. *Am J Prev Med.* 1986;2:82-88.
  8. Levine DM, Green LW, Deeds SG. Health education for hypertensive patients. *JAMA.* 1979;16:1700-1703.
  9. Tamragouri RN, Martin RW, Cleavenger RL, Sieber WK. Cardiovascular risk factors and health knowledge among freshman college students with a family history of cardiovascular disease. *J Am Coll Health.* 1986;34:267-270.
  10. Farquhar J, Wood P, Breitrose H, et al. Community education for cardiovascular health. *Lancet.* 1977;1:1192-1195.
  11. Harel Y, Levinson RM, Jones DH. Health knowledge, health habits and risk behaviors among college and non-college students. Presented at the American Association of Higher Education Meeting; May 1988; Denver.
  12. Holmes TH, Masuda M. Life change and illness susceptibility. In: Dohrenwend BS, Dohrenwend BP, eds. *Stressful Life Events.* New York: John Wiley; 1974.
  13. Kessler RC, Wortman CB. Social and psychological factors in health and illness. In: Freeman HE, Levine S, eds. *Handbook of Medical Sociology,* 4th ed. Englewood Cliffs, NJ: Prentice Hall; 1989.
  14. Gortmaker SL, Eckenrode J, Gore S. Stress and the utilization of health services: A time series and cross-sectional analysis. *J Health Soc Behav.* 1982;23:25-38.
  15. Berkowitz AD, Perkins HW. Recent research on gender differences in collegiate alcohol use. *J Am Coll Health.* 1987;36:123-129.
  16. Ratliff KG, Burkhart BR. Sex differences in motivation for and effects of drinking among college students. *J Stud Alcohol.* 1984;45:26-32.
  17. Brown SA, Goldman MS, Inn AI, Anderson LR. Expectations of reinforcement from alcohol: Their domain and relation to drinking patterns. *J Consult Clin Psychol.* 1980;48:419-426.
  18. Berkman LF, Breslow L, Wingard D. Health practices and mortality risk. In: Berkman LF, Breslow L, eds. *Health and Ways of Living: The Alameda County Studies.* New York: Oxford University Press; 1983.
  19. Lindenthal JJ, Myers JK, Pepper M. Smoking, psychological status and stress. *Soc Sci Med.* 1972;6:583-591.
  20. Powell KE, Thompson PD, Caspersen CJ, Kendrick JS. Physical activity and the incidence of coronary heart disease. *Annu Rev Public Health.* 1987;8:253-287.
  21. US Public Health Service. *National Health Interview Survey, 1985. Health Promotion and Disease Prevention Supplement.* Rockville, MD: National Center for Health Statistics; 1985.
  22. Belloc NB, Breslow L. Relationship of physical health status and health practices. *Prev Med.* 1972;3:409-421.
  23. Hickenbottom JP, Bissonette RP, O'Shea RM. Preventive medicine and college alcohol use. *J Am Coll Health.* 1987;36:67-71.
  24. Hughes SP, Dodder RA. Alcohol consumption patterns among college populations. *Coll Stud Personnel.* 1983;24:257-264.
  25. Hill FE, Bugen LA. A survey of drinking behavior among college students. *Coll Stud Personnel.* 1979;20:236-243.
  26. *Reducing the Health Consequences of Smoking: 25 Years of Progress. A Report of the Surgeon General.* Rockville, MD: US Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health; 1989. CDC Publication 89-8411.
  27. *Smoking and Health: A National Status Report. A Report to Congress,* 2nd ed. Rockville, MD: US Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health; 1990. CDC Publication 90-8396.
  28. Dishman RK, Sallis JF, Orenstein DR. The determinants of physical activity and exercise. *Public Health Rep.* 1985;100:158-172.
  29. Kaplan GA, Haan MN, Syme SL, Minkler M, Winkleby M. Socioeconomic status and health. In: Amler RW, Dull HB, eds. *Closing the Gap: The Burdens of Unnecessary Illness.* New York: Oxford University Press; 1987.
  30. Dutton DB. Social class, health and illness. In: Aiken L, Mechanic D, eds. *Applications of Social Science to Clinical Medicine and Health Policy.* New Brunswick, NJ: Rutgers University Press; 1986.

**IMMUNIZATION RECORDS...****...EASY****...FAST****...ACCURATE**

**A software package for IBM and compatible computers, manages immunization records, rosters and correspondence.**

**COMPUTER EXPERIENCE NOT REQUIRED!**



**BERKSHIRE  
DATA  
WORKS**

P.O. Box 912  
NORTH ADAMS, MA 01247  
(413) 663-3992