HEALTH PROMOTION INTERNATIONAL Vol. 16, No. 2

Printed in Great Britain

Gender-specific health behaviors of German university students predict the interest in campus health promotion

CHRISTIANE STOCK, LUTZ WILLE and ALEXANDER KRÄMER
Department of Public Health Medicine, School of Public Health, University of Bielefeld, P.O. Box 100131, D-33501 Bielefeld, Germany

SUMMARY

This cross-sectional study aimed to provide an assessment of the needs for health promotion in university freshmen, based on lifestyle variables and the interest in health-promoting activities. A questionnaire survey was performed using a sample of 288 male and 362 female university freshmen from 19 to 33 years of age. Male students were significantly more likely to engage in drug-taking behaviors, referring to alcohol and cannabis use, and had a higher body mass index. No gender difference was noted in the numbers of regular smokers. Preventive behaviors with respect to healthy nutrition and dental hygiene were reported more often in females, whereas the duration of physical activity per week and the use of condoms with a new sexual partner showed no gender difference. There was a strong demand for group health-oriented programs (79.5% of respondents). Substantial proportions of students had a high interest in individual counseling aiming at stress management (24.5%), healthy nutrition (19.3%) and prevention of sexually transmitted diseases (18.2%). Women expressed a greater interest in most programs than men. Multivariate regression analyses showed that a disposition for alcohol abuse was the strongest predictor of interest in health counseling in male students ($p < 0.001$), while psychosocial stress was the most important predictor in female students ($p < 0.001$). From the prevalence of health risks and the students' interest in health promotion programs it was concluded that there is a strong need for health promotion in the university setting in Germany. Results suggested that individuals at risk would probably benefit most from an individual counseling program.

Key words: counseling; health behavior; health promotion; university students

INTRODUCTION

A significant amount of the mortality and morbidity experienced by Germans today is preventable. Research directed towards identification of the health promotion needs of the population, and moreover of specific target groups, may contribute to the development and implementation of programs and activities that help people to adopt healthy behavior throughout their lifespan. Although target-group-specific health promotion has become an important issue in Germany, the population of university students has widely been neglected in health promotion research. Existing studies focusing on health behaviors of German students reflect mainly on risk-taking behaviors (von Troschke and Westenhoff, 1989; Weiderer, 1990; Steinert, 1995), but studies addressing a broader spectrum of health-related and preventive behaviors are lacking. Moreover, there is little knowledge about students' interests and needs in health-promoting activities at universities. As a prerequisite for health policy and program development it is essential to collect these data besides studying the health status of students.

After healthy schools, healthy hospitals and healthy cities, the WHO Regional office for Europe in Copenhagen is striving to establish and network universities as health-promoting

settings (Tsouros *et al*., 1998). The concept of health-promoting universities is oriented on the experiences of the Healthy Cities projects. However, in many European countries, including Germany, studies that are involved with the health conditions in the university environment are lacking and can provide a basis for health-promoting interventions in this setting.

The purpose of this survey was to study students' health behavior and to identify their health promotion needs with respect to the university environment. Needs for health promotion were assessed, considering educational and behavioral modification programs, such as health counseling or group programs, and also looking at environmental changes within the campus, aiming towards the promotion of a healthy lifestyle. A central question was to what extent the students' interest in health counseling was predicted by health awareness and behavior. A particular emphasis was placed on studying gender differences.

METHODS

Sample and procedure

In the winter semester of 1995–1996, a sample of freshmen was asked to complete a self-administered questionnaire assessing health behaviors and needs for health promotion at the University of Bielefeld, Germany. Trained data collectors administered the questionnaires in the classroom. Survey procedures were designed to protect students' privacy and to allow for anonymous participation. The response rate was 85%. The survey sample consisted of 650 students (288 males, 362 females) with the gender ratio well representing that of the total number of freshmen in that academic year. The mean age (± standard deviation) of the respondents was 21.4 ± 3.6 years (range 19–33 years). The study was conducted in the faculties of biology, chemistry, mathematics, education, psychology, law and languages, which adequately represented the subjects studied at the University of Bielefeld.

Validation study

In order to validate self-reported health data, a medical examination comprising measurements of weight and height and the collection of urine was accomplished. A subsample of 166 students (56 males, 110 females) of the total sample was eligible for this additional procedure. Urine samples were tested for cotinine concentrations using a commercial semi-quantitative enzyme-linked immunoassay (DRG Instruments, Marburg, Germany). A cut-off point of 500 ng/ml was used to indicate regular smoking, according to the manufacturer's recommendations.

Measures

The questionnaire assessed socio-demographic variables and self-reported weight and height. Data on weight and height were used to calculate the body mass index (BMI) according to the formula weight (kg)/height $(m)^2$. The respondents were asked how much they care about their health on a four-point scale (from very much to not at all). Students' awareness of healthy nutrition was rated as very high, high, low or very low. Students rated their diet as being low-fat on a four-point scale (from not at all to absolutely). The measure for physical activity was the number of self-reported hours of exercise per week. Smoking behavior in the last 3 months was reported as a categorical variable (every day/occasionally/never). Respondents were asked for the frequency of their alcohol consumption (never/up to once a month/up to once a week/several times a week/every day). In addition, an alcoholism screening test, the CAGE test (Ewing, 1984), was applied in its German translation, VÄSE (John, 1993) (Cronbach's alpha = 0.69). Those who gave positive answers to two out of four questions were considered at risk of alcohol abuse, and those who gave positive answers in three or more were diagnosed as clinically significant with respect to the alcohol dependency syndrome according to Ewing (Ewing, 1984). The frequency of cannabis (listed as hashish) and amphetamine (listed as speed or ecstasy) use was determined in the categories never used/seldom used/up to once a week/several times a week. The measure for preventive behavior regarding sexually transmitted diseases (STDs) was the frequency of condom use with a new sexual partner. This was examined using the categories always/occasionally/never. As a measure for dental hygiene, respondents were asked how often they brush their teeth (never/several times a week/once a day/twice a day/after each meal). Students rated their psychosocial stress by referring to 12 potential stressors

(e.g. partnership) on a four-point scale (Cronbach's alpha = 0.76). In addition, they were asked to rate their overall psychosocial stress (very high/high/low/very low) as a self-assessment of life stress. Students' interests in health-promoting group programs (e.g. smoking cessation) were assessed in a dichotomous fashion (yes/no). To determine their attitudes towards a healthy environment at the university, they rated several listed statements (e.g. 'non–smoking areas at the university should be enlarged') on a four-point scale (from 'I do not agree at all' to 'I totally agree'). The respondents were asked to rate their interest in individual counseling, referring to different health themes on a five-point scale (from very high to very low). The survey instrument was reviewed by experts and pilot tested in one class.

Analysis

Proportions and 95% confidence intervals (CI) were calculated for the whole sample, and for males and females separately. The effect of gender on all variables of interest was assessed using logistic regression analysis, with gender as independent variable and adjusted for faculty as a nominal variable. For dependent variables with more than two categories, proportional odds models were calculated if the assumption of proportional odds was fulfilled. The score test was used to test for the assumption of proportional odds. If proportional odds could not be assumed, separate binary logistic regression models were calculated for each category with respect to one reference category, as suggested by Bender and Grouven (Bender and Grouven, 1998).

Sensitivity and specificity were calculated in order to evaluate the accuracy of self-reported data on smoking. Sensitivity was defined as the proportion of respondents with a positive level of urinary cotinine that reported regular smoking. Specificity was defined as the proportion of respondents with a negative level of urinary cotinine that reported not to smoke regularly. The agreement between BMI data based on self-reported weight and height (BMIself-reported) and the BMI data based on measurements of weight and height (BMImeasured) was assessed using the statistical method of Bland and Altman (Bland and Altman, 1986).

Stepwise multivariate linear regression analyses were performed to examine associations between the interest in health counseling regarding stress management, healthy nutrition, STD prevention and alcohol consumption as dependent variables and various health variables. Since the counseling interests were substantially different for each sex, analyses were specified separately for males and females. Prior to these analyses, bivariate χ^2 statistics were calculated between the interest in health counseling in these four categories and the health behavior variables specified in Tables 1 and 2. The selection of variables included in the stepwise multivariate regression analyses was based on the significance of the bivariate analyses and comprised smoking status, CAGE score, psychosocial stress, health awareness, conscious effort to ensure healthy nutrition, low-fat diet and physical activity. In addition, variable condom use was included as a hypothetical predictor for the interest in STD prevention counseling. With the exception of two pairs of variables, Spearman correlation coefficients between all these independent variables were <0.2, suggesting that multicolinearity was not a substantial problem. The correlation between health awareness and conscious effort for healthy nutrition was 0.5, and 0.4 between engagement in low-fat diet and conscious effort towards healthy nutrition.

A reduced model was used to maximize the amount of variation explained while minimizing the number of variables, but a criterion for the selection of variables for these reduced models was that they were significant in a model with all variables.

RESULTS

Health behaviors and health awareness

The results with respect to health risks and psychosocial stress are represented in Table 1. The proportion of regular smokers was almost equal in men and women (overall rate 24.5%). A significantly higher frequency of drinking alcohol was found in male students compared with female students. The CAGE test identified 7.8% of all respondents at risk for alcohol abuse and diagnosed an additional proportion of 5.8% as alcohol-dependent, with a substantially higher risk in men than in women. Cannabis products were used by 37.4% of respondents and 12.2% reported regular use at least once a week. Men were significantly more likely to consume cannabis products than women. Amphetamines

Table 1: Health risks and psychosocial stress in university freshmen

	All students (n = 650)	Male students (n = 288)	Female students (n = 362)	OR[a]	p value
Smoking status					
Never	64.3	61.3	66.8	1.0	
Occasionally	10.9	13.8	8.5	1.8	0.035
Every day	24.5	24.2	24.7	1.3	0.274
Not reported	0.3	0.7	0.0		
Frequency of drinking alcohol					
Never	11.5	9.4	13.5	1.0	
Up to one time per month	40.4	28.8	49.6	0.7	0.176
One time per week	21.4	22.2	20.8	1.4	0.267
Several times per week	21.3	30.2	13.9	2.2	0.009
Every day	5.4	9.4	2.2	4.4	0.004
Not reported	0.0	0.0	0.0		
Alcoholism screening test (CAGE)					
Not at risk	85.5	79.2	90.6		
At risk	7.8	10.4	5.8		
Alcohol dependency	5.8	9.3	3.1	2.9[b]	<0.0001
Not reported	0.9	1.1	0.5		
Cannabis use					
Never	60.6	54.0	65.9		
Seldom	25.2	27.7	23.3		
Up to one time per week	7.7	11.0	5.0		
Several times per week	4.5	5.5	3.6	2.2[b]	<0.0001
Not reported	2.0	1.8	2.2		
Amphetamine use					
Never	89.1	86.9	90.9	1.0	
Seldom	3.5	4.8	2.5	2.7	0.036
Up to one time per week	0.8	1.0	0.6	2.4	0.386
Several times per week	0.3	0.7	0.0	n.c.[c]	
Not reported	6.3	6.6	6.0		
Psychosocial stress					
Very low	5.8	8.3	3.9		
Low	54.0	51.9	55.7		
High	18.9	19.0	18.8		
Very high	2.5	0.7	3.9	1.5[b]	0.054
Not reported	18.8	20.1	17.7		
Body mass index					
Low (<20)	17.1	3.5	28.0	1.0	
Medium (20–25)	59.4	76.8	45.4	14.6	<0.0001
High (>25)	6.5	10.4	3.32	5.7	<0.0001
Weight and/or height not reported	17.0	9.3	23.3		

[a]Odds ratios for gender (0 = female, 1 = male) adjusted for faculty.
[b]Proportional odds model with proportional odds assumption fulfilled.
[c]n.c., not calculated due to low number of cases in this category.

had been used by 4.6% of all respondents, and 1.1% reported regular use. Men were more likely to partake in occasional use of amphetamines than females. A proportion of 21.4% of students rated their psychosocial stress as high or very high, with no significant effect of gender noted. Male students had a substantially higher BMI than females.

Table 2 represents preventive behaviors and health awareness in students. A percentage of 60.0% reported taking care of their health very much or much, without substantial gender difference. A high or very high conscious effort to ensure healthy nutrition was reported by 43.5% of students and 53.2% reported to have a low-fat diet. Women had a higher awareness for healthy nutrition than men and were significantly more likely to have a low-fat diet. Sixty-nine percent of students reported having had sexual intercourse. Among this group, 28.4% only occasionally or never used a condom with a new sexual partner. The frequency of condom use

Table 2: Preventive behaviors and health awareness in university freshmen

	All students (n = 650)	Male students (n = 288)	Female students (n = 362)	OR[a]	p value
Health awareness					
Very high	10.6	12.1	9.4	1.0[b]	0.802
High	49.4	47.8	50.7		
Low	37.8	36.7	38.8		
Very low	2.0	3.1	1.1		
Not reported	0.2	0.3	0.0		
Conscious effort for a healthy nutrition					
Very high	6.9	6.6	7.2	0.6	0.281
High	36.6	27.7	43.8	0.4	0.001
Low	42.6	47.4	38.8	0.9	0.685
Very low	13.7	18.0	10.2	1.0	
Not reported	0.2	0.3	0.0		
Low-fat diet					
yes	53.2	65.7	43.2	1.0	<0.0001
no	46.6	34.0	56.8	0.4	
Not reported	0.2	0.3	0.0		
Condom use with a new sexual partner[c]					
Always	59.6	58.6	60.3	1.2[b]	0.386
Occasionally	22.4	25.3	20.2		
Never	6.0	5.6	6.3		
Not reported	12.0	10.5	13.2		
Dental hygiene (tooth brushing)					
At least twice a day	78.6	71.6	84.3	0.5	0.0004
Less than twice a day	21.1	28.1	15.4	1.0	
Not reported	0.3	0.3	0.3		
Physical activity					
>4 h/week	33.7	40.8	28.0	1.4	0.092
1–4 h/week	40.6	35.3	44.9	0.8	0.441
<1 h/week	3.8	2.4	5.0	0.4	0.109
None	21.9	21.5	22.1	1.0	
Not reported	0.0	0.0	0.0		

[a]Odds ratios for gender (0 = female, 1 = male) adjusted for faculty.
[b]Proportional odds model with proportional odds assumption fulfilled.
[c]Students who had already had sexual intercourse (n = 454; males = 199; females = 255).

showed no gender difference. A proportion of 78.6% of respondents (71.6% males, 84.3% females) reported brushing their teeth at least twice a day. Women were significantly more likely to brush teeth at least twice a day than men. Students reported being highly physically active. Only 21.8% of respondents did not exercise at all, with no substantial difference between males and females.

Validity of self-reported health data

The validation study in a subsample of 166 students resulted in a sensitivity of self-reported smoking (gold standard: urinary cotinine ⩾500 ng/ml) of 87.9% (CI 76.9–98.9%) and a specificity of 96.7% (CI 93.8–99.6%). A comparison of the BMIself-reported with the BMImeasured showed a mean difference of 0.18. The limits of agreement according to Bland and Altman were –1.9 and 2.2 (Bland and Altman, 1998), and thus small enough to be confident that weight and height were reported accurately. Since the limits of agreement contained zero, there is no systematic error.

Interest of students in campus health promotion

Figure 1 shows students' responses with respect to environmental changes on campus. About two-thirds of respondents agreed to an extension of non-smoking areas in the university building (62.4%: 59.1% males versus 64.4% females; p = 0.09). Among non-smoking students (n = 416) this proportion was as high as 81.9%, while 17.3% of smokers (n = 162) and 47.9% of occasional smokers (n = 72) agreed to this policy. One-half of respondents (46.2%: 39.9% males versus 51.3% females; p = 0.02) wanted a better supply of healthy food at the campus. A reduction in

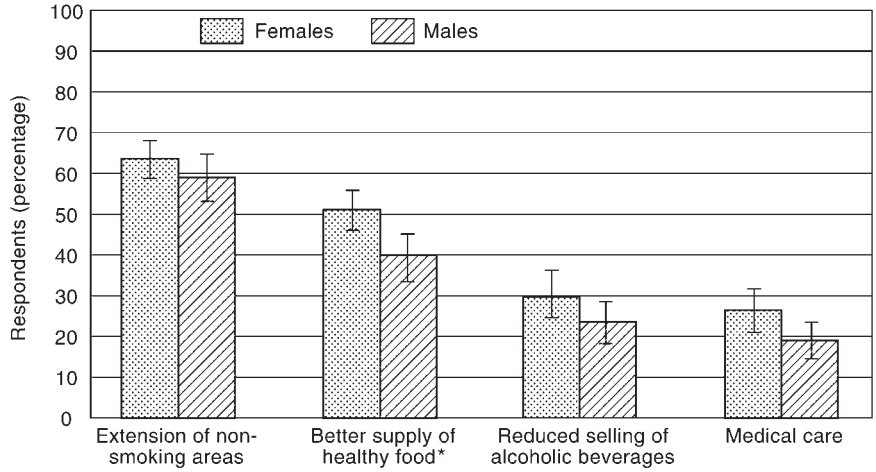

Fig. 1: Percentages of respondents agreeing to health-oriented environmental changes on the campus in the fields listed. Percentages of the two highest categories of agreement were summed up. On the *x*-axis, results from logistic regression analyses are shown for effects of gender, adjusted for faculty with $*p < 0.01$.

the sale of alcoholic beverages at the campus was wanted by 26.8% of students (23.3% males versus 29.3% females; $p = 0.21$). One in four respondents (23.1%: 19.0% males versus 26.3% females; $p = 0.18$) would like the offer of medical care by a university physician.

A high proportion of students (79.5%) would like to attend at least one health-oriented group program when offered at the university. The request was highest in exercise programs (41.9%: 28.5% males versus 44.0% females; $p < 0.001$), back school (38.6%: 35.4% males versus 41.4% females; $p = 0.12$), relaxation techniques (37.2%: 28.0% males versus 44.2% females; $p < 0.001$) and stress management (31.6%: 23.9% males versus 37.9% females; $p = 0.001$). One-quarter of respondents was interested in a healthy nutrition program (28.5%: 19.8% males versus 35.6% females; $p < 0.001$) and 15.8% (13.3% males versus 18.0% females; $p = 0.11$) would like to hear lectures on health themes. Among those students who were regular smokers ($n = 162$), 23.9% (27.1% males versus 21.3% females; $p = 0.42$) were interested in attending a smoking cessation program. In most of the group programs, with the exception of the back school, lectures and smoking cessation program, the interest was significantly higher in women than in men.

Students' interest in individual counseling based on the categories high or very high interest is represented in Figure 2. One-quarter of respondents (24.3%) had a high or very high interest in counseling regarding stress management, with women showing a significantly higher interest than men (30.8 versus 16.3%, respectively; $p < 0.001$). One-fifth of students (19.3%) showed a need for counseling about healthy nutrition and 13.0% had an interest in counseling regarding eating disorders. In healthy nutrition as well as in eating disorders, the request was higher in female than in male students (23.8 versus 13.5%, respectively, $p = 0.009$; and 18.0 versus 6.4%, respectively, $p < 0.001$). A relatively high proportion of students (18.2%)—almost equally men and women—were interested in counseling referring to the themes of sexuality, contraception and/or prevention of STDs. Only a very small proportion of students (3.0% of respondents without substantial gender difference) were interested in counseling regarding alcohol consumption.

Predictors of students' interests in health counseling

Table 3 shows predictors for the interest in health counseling regarding stress management, healthy nutrition, STD prevention and alcohol consumption. Psychosocial stress was strongly correlated with counseling interest in stress management in females and explained 14% of variance of this variable. A higher CAGE score strongly predicted the interest in alcohol counseling in men, explaining 15% of variance. Health awareness

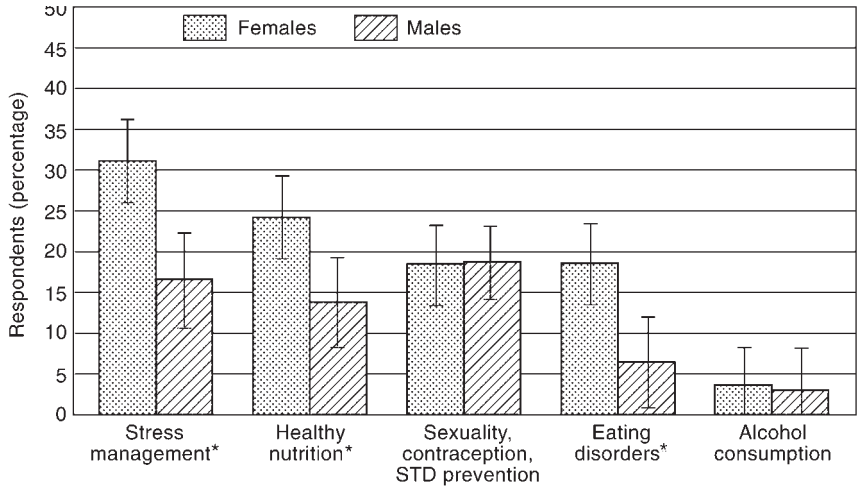

Fig. 2: Respondents reporting a high or very high interest in health counseling regarding the topics listed. On the *x*-axis, results from logistic regression analyses are shown for effects of gender, adjusted for faculty with $*p < 0.001$.

Table 3: Predictors of students' interests in health counseling regarding stress management, healthy nutrition, STD prevention and alcohol consumption

	Males				Females			
	Stress management	Healthy nutrition	STD prevention[a]	Alcohol consumption	Stress management	Healthy nutrition	STD prevention[b]	Alcohol consumption
Health awareness		0.25[c]				0.22[c]		
Psychosocial stress					0.38[d]		0.21[c]	
CAGE score (risk of alcoholism)		0.26[c]	0.18[e]	0.39[d]				
Low-fat diet			–0.28[c]		–0.17[e]			
Adjusted R^2 [f]	n.s.	0.13[d]	0.09[d]	0.15[d]	0.16[d]	0.06[c]	0.04[c]	n.s.

Represented are significant regression coefficients of multivariate linear regressions.
[a]Males who already had sexual intercourse ($n = 199$).
[b]Females who already had sexual intercourse ($n = 255$).
[c]$p < 0.05$.
[d]$p < 0.01$.
[e]$p < 0.001$.
[f]Significance of *F*.
n.s., not significant.

was positively associated with the interest in nutrition counseling in both genders, and in STD prevention counseling in male students. A low-fat diet was negatively associated with the interest in STD prevention counseling in men and with the interest in stress counseling in women. Smoking, level of physical activity, condom use with a new partner, and a conscious effort towards achieving healthy nutrition were not predictive for the interest in any of the health themes.

DISCUSSION

This study examined students' health behaviors and investigated whether students were attracted by campus health-promoting programs that empower them to adopt healthy behaviors. The survey did not only focus on health hazards like drug-taking behaviors and psychosocial stress, but also addressed health potentials and personal resources such as health awareness and preventive

health behaviors. Underlying this was the idea that health promotion should not only be directed towards decreasing educational and behavioral deficits, but also towards strengthening and supporting positive health practices and personal and/or psychosocial resources.

The main findings were the striking gender differences, with women reporting overall better health behavior and a greater interest in health-promoting programs and activities. Women were characterized by a greater conscious effort to achieve healthy nutrition, a higher engagement in low-fat diet, a higher frequency of toothbrushing and a lower frequency of alcohol consumption and cannabis use. In addition, the BMI was substantially lower in women than in men, which is likely to be related to more healthy nutrition. Similar gender differences indicating better health practices and preventive behavior in female students have been reported previously in other countries like Great Britain (Wardle and Steptoe, 1991), Sweden (Näslund and Frederikson, 1993) and the USA (Oleckno and Blaconniere, 1990; Courtenay, 1998). This gender difference is also present in other age groups and populations (Dean, 1989; Reddy *et al*., 1992). Better health practices in women corresponded to a better knowledge of factors related to health in Swedish students (Näslund and Frederikson, 1993) and may contribute to the higher life expectancy of women.

On the other hand, some health hazards were also identified as being specific for female students. Women had a considerably higher interest in counseling regarding eating disorders, and a high proportion (17%) of women with a BMI of <20 was identified. This may reflect restrictive eating habits oriented towards a slim body-image. In addition, women reported a higher level of psychosocial stress, although this was not found to be statistically significant. Furthermore, the interest of females in health promotion activities aimed at stress management (group program or individual counseling) was significantly higher than that of males. This corresponds to deficits with respect to stress management in female students compared with males as reported by others (Oleckno and Blaconniere, 1990).

The high frequency of drinking alcoholic beverages was the most striking health risk found in male students. A proportion of 9.4% reported a daily intake of alcohol. Accordingly, a similar proportion was diagnosed as alcohol dependent by the CAGE screening test and, additionally, 10.4% of male respondents were considered at risk of alcohol abuse. Heavy drinking, predominantly among male college students, was also reported in the USA (Engs and Hanson, 1990; Smiley *et al*., 1992; Fennell, 1997) and Canada (Matthieson *et al*., 1992). Only about one-quarter of respondents agreed to a policy reducing the availability of alcoholic beverages on the campus, indicating that the majority of students did not consider drinking at the university as a problem. Moreover, a high consumption of alcohol is likely to be linked to the students' lifestyle, associated with a normative pressure to drink from friends. College men reported greater peer-group pressure to drink than women (Budd and Spencer, 1994). Men also had a higher frequency of cannabis use than women. The reasons for cannabis use in men may be similar to those for alcohol, and peer attitudes play an important role in explaining this (Lo and Globetti, 1995).

In some health aspects, male students did not differ from their female colleagues. Men and women had the same habits of regular smoking. Similar rates of smoking in male and female students were also reported in other European countries (Wardle and Steptoe, 1991; Näslund and Frederikson, 1993). However, it is worth mentioning that the proportion of regular smokers were substantially lower in these countries (~15%) than in our sample (24.5%). Lower smoking rates than those found in German students were also reported in the USA (Oleckno and Blaconniere, 1990) and Hungary (Piko *et al*., 1996).

There was also no gender difference in the frequency of condom use with a new sexual partner, with regular use reported by 60% of respondents. In Swedish students, this rate was found to be 50% (Tyden *et al*., 1991). It is known that college students tend to underestimate the risk of acquiring an STD and have a low acceptance of condoms (Katzman *et al*., 1988; Goertzel and Bluebond-Langner, 1991; Caron *et al*., 1992). Since at least 18.2% of students reported a high interest in STD prevention counseling, the implementation of a health counseling program could help to enhance the acceptance of preventive sexual practices.

With respect to the predictors of interest in health counseling, it was found that in women, psychosocial stress was a predictor for the interest in stress and STD prevention counseling. In men, the CAGE score as a measure for alcohol abuse was associated with the interest in

nutrition and alcohol counseling. These findings indicate that in both sexes a striking health risk is predictive of the interest in counseling. One can assume that individuals at risk would benefit most from a counseling program. In addition, health awareness was a general predictor for the interest in health counseling in both genders, indicating that an increase in health awareness by addressing health issues at the campus, either within or outside the classroom, would probably enhance students' interest in individual counseling. However, it should be taken into account that only a small proportion of variance was explained by these variables and that other factors may also be associated with the interest in counseling.

We conclude from our study the following implications for campus health promotion and policies.

- Especially in female students, there should be a priority set in addressing stress reduction and stress management in health-promoting programs at the campus. Besides offering relaxation programs and individual counseling, universities should also reduce avoidable stressors by planning curricula carefully, by investing in the quality of teaching and by keeping the teacher:student ratio as high as possible.
- About one-quarter of smokers in our sample wanted to change their smoking habits and would like to attend a smoking cessation program. In addition, an extension of non-smoking areas in the university building was accepted by the majority of respondents. A health policy aimed at the reduction of smoking rates and of passive smoking should be developed that integrates behavioral and environmental aspects. Components of a non-smoking policy are a stepwise enlargement of non-smoking areas, banning the sale of cigarettes at the campus, and the offer of smoking cessation courses.
- The implementation of a health counseling program, either as a traditional counseling center or via interactive media, could help to enhance the acceptance of preventive sexual practices, to raise the awareness about the risks of drug use and high alcohol consumption, and to strengthen overall the health competencies of students.

There are some limitations to this study. Self-report was used to measure lifestyle variables, but physiological measurements were lacking in the total sample. However, in a subsample of students, some of the self-reported health data were validated by objectively measured data. The validation study showed that the sensitivity and specificity of self-reported smoking was in an acceptable range. Some studies found a similarly accurate reporting of smoking (Pokorski *et al*., 1994; Klebanoff *et al*., 1998), while others strongly recommended additional biochemical assessments (Patrick *et al*., 1994; Ford *et al*., 1997). An acceptable agreement between BMI based on self-reported weight and height when compared with BMI based on measured data was also demonstrated.

Another limitation of this study is that due to the broad range of questions covered by the questionnaire, only a limited number of standardized scales was used, resulting in a weakness of some measures. This was mainly true for the measures of nutrition and psychosocial stress, where no thresholds for dysfunctional levels can be defined from the items used. Since environmental conditions vary between universities, the respondents' priorities for environmental changes at the campus cannot be generalized to other settings. Furthermore, one has to consider that the self-reported interest in attending counseling or group programs does not necessarily reflect attendance, and in fact only a subset may actually attend. Further research in terms of trial interventions is needed to study the effects of intervention and actual attendance in the university setting.

Despite these limitations, this study provides an extension of previous research on students' health in Germany in comparison with other countries, and adds information on the link between health behaviors and the interest in health promotion programs. Especially with respect to the establishment of a WHO European network of health-promoting universities, a detailed knowledge of lifestyles and health needs in students is essential and may help to plan interventions in this setting more effectively.

ACKNOWLEDGEMENT

This study was supported by an educational grant from Merck and Co., Inc. (Whitehouse Station, NJ, USA).

Address for correspondence:
Christiane Stock
School of Public Health
Public Health Medicine
University of Bielefeld
P.O. Box 100 131
33501 Bielefeld
Germany
E-mail: cstock@hrz.uni-bielefeld.de

REFERENCES

Bender, R. and Grouven, U. (1998) Using binary logistic regression models for ordinal data with non-proportional odds. *Journal of Clinical Epidemiology*, **51**, 809–816.

Bland, J. M. and Altman, D. G. (1986) Statistical methods for assessing agreement between two methods of clinical measurements. *The Lancet*, **8**, 307–310.

Budd, R. J. and Spencer, C. P. (1994) Predicting undergraduates' intentions to drink. *Journal of Studies on Alcohol*, **45**, 179–183.

Caron, S. L., Davis, C. M., Wynn, R. L. and Roberts, L. W. (1992) America responds to AIDS, but did college students? Differences between March, 1987, and September, 1988. *AIDS Education and Prevention*, **4**, 18–28.

Courtenay, W. H. (1998) College men's health: an overview and a call to action. *Journal of American College Health*, **46**, 279–290.

Dean, K. (1989) Self-care components of lifestyles: the importance of gender, attitudes, and the social situation. *Social Science and Medicine*, **29**, 137–152.

Engs, R. C. and Hanson D. J. (1990) Gender differences in drinking patterns and problems among college students: a review of the literature. *Journal of Alcohol and Drug Education*, **35**, 36–47.

Ewing, J. A. (1984) Detecting alcoholism. The CAGE questionnaire. *Journal of the American Medical Association*, **252**, 1905–1907.

Fennell, R. (1997) Health behaviors of students attending historically black colleges and universities: results from the National College Health Risk Behavior Survey. *Journal of American College Health*, **46**, 99–101.

Ford, R. P., Tappin, D. M., Schluter, P. J. and Wild, C. J. (1997) Smoking during pregnancy: how reliable are maternal self reports in New Zealand? *Journal of Epidemiology and Community Health*, **51**, 246–251.

Goertzel, T. G. and Bluebond-Langner, M. (1991) What is the impact of a campus AIDS education course? *Journal of American College Health*, **40**, 87–92.

John, U. (1993) Standardisierte Verfahren zur Diagnostik der Alkoholabhdngigkeit. *Drogalkohol*, **17**, 3–12.

Katzman, E., Mulholland, M. and Sutherland, E. (1988) College students and AIDS: a preliminary survey of knowledge, attitudes, and behavior. *Journal of American College Health*, **37**, 127–130.

Klebanoff, M. A., Levine, R. J., Clemens, J. D., DerSimonian, R. and Wilkins, D. G. (1998) Serum cotinine concentrations and self-reported smoking during pregnancy. *American Journal of Epidemiology*, **148**, 259–262.

Lo, C. C. and Globetti, G. (1995) The effects of internal and external control factors on college students' marijuana use and cessation of use. *Journal of Alcohol and Drug Education*, **25**, 357–377.

Mathieson, C. M., Faris, F. D., Stam, H. J. and Egger, L. A. (1992) Health behaviors in a Canadian community college sample: prevalence of drug use and interrelationships among behaviors. *Canadian Journal of Public Health*, **83**, 264–267.

Näslund, G. K. and Frederikson, M. (1993) Health behavior, knowledge and attitudes among Swedish university students. *Scandinavian Journal of Psychology*, **4**, 197–211.

Oleckno, W. A. and Blacconiere, M. J. (1990) A multiple discriminant analysis of smoking status and health-related attitudes and behaviors. *American Journal of Preventive Medicine*, **6**, 323–329.

Patrick, D. L., Cheadle, A., Thompson, D. C., Diehr, P., Koepsell, T. and Kinne, S. (1994) The validity of self-reported smoking: a review and meta-analysis. *American Journal of Public Health*, **84**, 1086–1093.

Piko, B., Barabas, K. and Markos, J. (1996) Health risk behavior of a medical student population: report on a pilot study. *Journal of the Royal Society of Health*, **116**, 97–100.

Pokorski, T. L., Chen,W. W. and Bertholf, R. L. (1994) Use of urinary cotinine to validate smoking self-reports in USNavy recruits. *Addictive Behavior*, **19**, 451–454.

Reddy, D. M., Fleming, R. and Adesso, V. J. (1992) Gender and health. In Maes, S., Leventhal, H. and Johnson, M. (eds) *International Review of Health Psychology*. Wiley, Chichester, pp. 3–31.

Smiley, K., Johannessen, K., Marsh, K. and Collins, C. (1992) Surveying university of Arizona students' health. *Journal of American College Health*, **41**, 75–77.

Steinert, T. (1995) Risikoverhalten bei Medizinstudenten und -studentinnen. *Suizidprophylaxe*, **22**, 7–12.

Tsouros, A. D., Dowding, G., Thompson, J. and Dooris, M. (1998) Health promoting universities. WHO Regional Office for Europe, Copenhagen.

Tyden, T., Olsson, S. and Bjorkelund-Ylander, C. (1991) Female university students in Sweden: sex, contraception and STDs. *Advanced Contraception*, **7**, 165–171.

von Troschke, J. and Westenhoff, F. (1989) Einstellungen von Medizinstudenten in der Bundesrepublik Deutschland zum Rauchen. *Sozial und Präventivmedizin*, **34**, 119–123.

Wardle, J. and Steptoe, A. (1991) The European health and behaviour survey: rationale, methods and initial results from the United Kingdom. *Social Science and Medicine*, **33**, 925–936.

Weiderer, M. (1990) Psychosoziale Determinanten des Alkohol- und Nikotinkonsums bei Studierenden. *Zeitschrift für klinische Psychologie, Psychopathologie und Psychotherapie*, **38**, 352–361.