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Multiple health behavior clusters among female college students

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Abstract

Objective—To examine prevalence of multiple unhealthful behaviors and detect clusters of unhealthful behaviors among college women.

Methods—Women ages 18–22 enrolled full-time at an urban university located in the Northeastern United States were invited to complete an online survey, which assessed maintenance behaviors: fruits/vegetables, physical activity, cervical screening and at-risk behaviors: frequent drinking, smoking, and non-use of protective measures during sexual intercourse. Of 4774 invited, complete data is available for 1463 participants (1463/4774 = 30.6%).

Results—Nearly 65% had two or more unhealthful behaviors. Three distinct clusters were defined: cluster one included women who were lower in health maintenance and higher in at-risk behaviors; cluster two included women who were lower in health maintenance and lower in at-risk behaviors; and cluster three included women who were higher in health maintenance and intermediate in at-risk behaviors.

Conclusion—These clustering patterns suggest health programs directed at college students address multiple behaviors simultaneously.

Practice implications—Programs targeting multiple behaviors should consider activities for those seen within and outside of the context of health services.

Keywords

College students; Female; Multiple behaviors; Cluster analysis

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Conflict of interest

The authors do not declare any sources of financial support or conflicts of interest in the conduction of this study.

1. Introduction

Healthy People 2010 objectives identify a number of lifestyle-related behavioral targets for adolescent populations, including overweight, alcohol, tobacco, physical activity, and sexual practices. These objectives underscore the role of multiple behaviors in the prevention of chronic disease. Accordingly, there is an expanding literature indicating the co-occurrence of unhealthful behaviors among adolescent populations [1–3].

Given this literature, there is a need to focus on adolescents transitioning into young adulthood, because this period is marked by changes in residence, school attendance, and identity exploration, all of which involve pressure to conform to social norms associated with new physical and social environments [4]. While some behaviors, such as high-risk drinking tend to peak in young adulthood and decline thereafter [5], other behaviors, such as low levels of physical activity, can become established during adolescence and remain low into adulthood [6]. Therefore, the college period has implications for establishing behaviors in mid-adulthood and beyond. Research using the Behavioral Risk Factor Surveillance Survey [BRFSS] has also demonstrated that college women report more physically and mentally unhealthy days compared to men [7], indicating multiple behavior interventions may be particularly applicable to college women.

An in-depth understanding of unhealthful behavior co-occurrence would provide important insights for designing effective interventions in the college setting. Thus, study objectives were to (1) examine prevalence of multiple unhealthful behaviors and (2) detect clusters of unhealthful behaviors among college women.

2. Methods

This cross-sectional, web-based survey collected information on six health behaviors from a convenience sample of female college students.

2.1. Sample and procedures

Data were collected from women between the ages of 18 and 22 who were enrolled full-time in a 4-year private U.S. urban northeastern university, as part of a larger study on women's health, in winter 2006. Female students were invited to complete the survey through electronic mail (with two follow-up reminders), flyers, and postings on websites. Participants were required to view and acknowledge understanding of informed consent information online prior to proceeding to the survey. Participants were entered into a drawing for gift certificates worth up to \$100.

2.2. Measures

Using adapted standardized measures, six behaviors were assessed, three maintenance behaviors: fruit and vegetable intake [8]; physical activity [9]; and receiving cervical cancer (Pap) screening [9] and three behaviors with potentially adverse consequences ['at-risk behaviors']: frequent drinking [9], smoking [9], and non-use of protective measures during sexual intercourse [10]. Each behavior variable was dichotomized to reflect the presence of

the unhealthful level consistent with Healthy People 2010 guidelines [11]. Participants had 0–6 unhealthful behaviors.

2.3. Statistical analyses

The analytic objective was to describe the prevalence of six health behaviors and to construct distinct groups of behaviors by cluster analysis. Clusters were identified using Euclidean distances with the FASTCLUS procedure in SAS (SAS Institute, Cary, NC). The behavior variables were standardized (mean = 0, variance = 1). Because cluster analysis is extremely sensitive to outliers, observations >3 SDs from their mean were excluded [12]. Data was examined to determine possible cluster assignments between 2 and 8 clusters that also circumvented small participant membership. Cluster selection was aided by two methods, the cubic clustering criterion (CCC), to provide evidence that the cluster solution deviates from the no cluster situation [13] and the Pseudo *F* statistic, a measure of the tightness of the clusters [14]. Every participant belonged to one and only one cluster. To test differences in behaviors between clusters, Kruskal–Wallis tests for continuous/ordinal variables and Pearson chi-square tests for categorical variables were performed. Participants with complete data are presented.

3. Results

Of 4774 female students invited to participate, 1899 (39.8%) completed some portion of the survey. Of these 1899, complete data was available on all variables used in these analyses for 1463 participants ($1463/4774 = 30.6\%$). Our sample was predominately White (82.6%) and non-Hispanic (91.2%). Compared to the overall female undergraduate population at this college, our sample under-represents Black students (4.3% vs. 7.7%). Class standing was evenly distributed between 1st year (23.6%), 2nd year (25.4%), 3rd year (22.8%), and 4 or more year (28.2%) students.

The most prevalent unhealthful behavior was eating <5 fruits and vegetables per day (84%). In addition, 34% of participants did not meet physical activity guidelines. Prevalence of unhealthful levels of other behaviors is presented in Table 1.

Our data revealed three optimal clusters that met all our criteria for cluster selection (Table 2). Cluster 1 included women who reported lower levels of maintenance behaviors, but higher levels of at-risk behaviors, including the highest reported levels of frequent drinking and current smoking. Women in this cluster also had the highest percentage of reporting ever having had sexual intercourse and Pap screening. Cluster 2 also includes women with lower levels of maintenance behaviors, however compared to cluster 1, these women had lower levels of smoking and drinking. Cluster 3 includes women with higher levels of maintenance behaviors and intermediate levels of at-risk behaviors, reflecting levels of drinking and smoking between those reported in clusters 1 and 2.

4. Discussion and conclusion

4.1. Discussion

We found that unhealthful behaviors co-occurred in this female college student population, with nearly 65% reporting 2 unhealthful behaviors and through the identification of three unique behavior clusters.

Many studies focusing on multiple behaviors have been conducted in college populations, for example how multiple behaviors predict a particular behavior [15,16] and associations between pairs of behaviors, for example alcohol drinking and smoking [17]. Fewer studies have included an analysis of how unhealthful behaviors co-occur among college students. Thus the present study is one of the first to include both protective measures during sexual intercourse and Pap screening with drinking, smoking, diet, and physical activity to discern patterns of behavior co-occurrence in female college students.

Our results indicated nearly 65% reported 2 unhealthful behaviors. This is lower than data among medical college students (87.5%) [18], but much higher than data from college students included in the BRFSS (14.5%) [7]. However, direct comparisons are limited by the different behaviors included. For instance, the BRFSS analysis did not include fruit and vegetable intake, which was the most prevalent unhealthful behavior in our study [7].

While the use of cluster analysis to examine patterns of co-occurrence provided information unique to our data and thus may not be generalizable to women in colleges with different characteristics, the identification of distinct clusters may aid in uncovering specific groups with higher risk behavior profiles [19]. This may have accompanying implications for health promotion, described in Section 4.3.

Findings are limited in generalizability by the inclusion of only one 4-year college. All data are self-reported which may be less accurate than objective measures, i.e. objective instruments may more accurately capture physical activity dose compared to self-reported questionnaires [20]. Survey questions may have resulted in socially desirable responses, but this likelihood is diminished by the anonymous nature of web-based administration without a physical interviewer [21]. In addition, our definition of ‘frequent drinking’ is consistent, although not completely aligned with high-risk drinking as defined in the Healthy People 2010 objectives, which sets the high-risk drinking benchmark at 7 drinks/week. Strengths of this study included a large number of participants and the inclusion of six behaviors.

4.2. Conclusion

This study revealed multiple unhealthful behaviors co-occurred in this sample of young college women.

4.3. Practice implications

For providers of university health services, these findings highlight the importance of addressing both health maintenance and at-risk behaviors. For those in cluster one, who reported the highest percentage of Pap screening, a routine gynecological well visit may be an opportune time to also assess drinking and smoking behaviors. A practically designed

single screening instrument consistent in question format and time frame may be optimal to capture multiple behaviors prior to appointments, possibly administered through web-based technology [22].

While university health services provide on-going health care access to college women, not all women in our sample are recommended to undergo cervical cancer screening. U.S. guidelines generally stipulate beginning screening within 3 years of sexual activity or age 21 [23] and European guidelines generally stipulate starting screening at age 25 [24]. Thus, students who have not yet had a Pap screening, such as those in cluster 2, may be going to health services less frequently, therefore additional college-wide outreach should be in place. Some possible approaches include health fairs, distribution of educational material through popular electronic media (i.e. FaceBook, MySpace), and modifications to the campus environment, such as providing affordable fruits and vegetables in the cafeteria.

These findings lend additional support to research that focuses on development of intervention strategies targeting multiple behaviors among college students (e.g. [25]). These programs may be highly valued by college administrators. For example, a web-based multiple behavior program that pools technical support and personnel resources may be most cost-effective, an issue which is usually at the forefront of decisions about whether or not to offer a program [26]. There are several stakeholders who could be brought together to develop programs targeting multiple behaviors at individual and organizational levels, for example personnel from health services, student services, food services, and recreational facilities.

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Table 1

Prevalence of unhealthful behaviors.

Individual behaviors	<i>n</i>	% (SD)
Fruit/vegetables servings/day, mean (SD)	1432	3.1 (1.9)
Moderate–vigorous physical activity min/day, mean (SD)	1432	31.5 (26.4)
Cervical (Pap) screening ever	876	61 (1.3)
Days w/at least 1 drink in past 30 days		
0	68	5 (0.6)
1–2	230	16 (1.0)
3–5	356	25 (1.1)
6–10	488	34 (1.3)
11+	290	20 (1.1)
Smoking		
Not current smoker	1261	88 (0.9)
Current smoker	171	12 (0.9)
Sexual intercourse		
Never had intercourse	510	36 (1.3)
Last intercourse with protective measure	859	60 (1.3)
Last intercourse without protective measure	63	4 (0.5)
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Number of unhealthful behaviors ^a	<i>n</i>	%
0	78	5 (0.6)
1	426	30 (1.2)
2	537	38 (1.3)
3	320	22 (1.1)
4	59	4 (0.5)
5	10	1 (0.2)
6	2	<1 (0.1)

Note: Numbers are *n* and %, unless otherwise noted.

^aUnhealthful levels for each behavior were fruit and vegetable intake: <5 servings per day; leisure-time moderate and vigorous physical activity: < a combined total of 150 min of moderate activity/week or 60 min of vigorous activity/week; cervical screening: never having had a Pap test; frequent drinking: drinking on 11 or more days in the past 30 days that they had at least one drink; smoking: those who had ever smoked a cigarette and currently smoke every day or occasionally; and sexual intercourse: indicating neither she nor her partner used any method to prevent pregnancy or sexually transmitted infections the last time she had sexual intercourse. Sexual intercourse was defined as activity involving vaginal or anal penetration.

Table 2

Characteristics of three health behavior clusters ($n = 1432$).

	Cluster 1	Cluster 2	Cluster 3
Maintenance behaviors^a:	Lower	Lower	Higher
At-risk behaviors^b:	Higher	Lower	Intermediate
<i>n</i> (%)	622 (43)	509 (36)	301 (21)
Fruit/vegetable servings/day, mean (SD)	2.41 (1.14)	2.48 (1.30)	5.61 (1.74)
Moderate–vigorous physical activity min/day, mean (SD)	27.2 (21.3)	22.1 (21.1)	56.1 (28.7)
Cervical (Pap) screening ever, % (SD)			
Yes	69 (1.9)	51 (2.2)	61 (2.8)
Days w/at least 1 drink in past 30 days, % (SD)			
0	0 (0.0)	13 (1.5)	1 (0.6)
1–2	0 (0.0)	37 (2.1)	14 (2.0)
3–5	0 (0.0)	50 (2.2)	33 (2.7)
6–10	59 (2.0)	0 (0.0)	41 (2.8)
11+	41 (2.0)	0 (0.0)	11 (1.8)
Smoking, % (SD)			
Current smoker	20 (1.6)	5 (1.0)	9 (1.6)
Sexual intercourse, % (SD)			
Never had intercourse	28 (1.8)	46 (2.2)	33 (2.7)
Last intercourse with protective measure	68 (1.9)	49 (2.2)	63 (2.8)
Last intercourse without protective measure	4 (0.8)	5 (1.0)	4 (1.1)

Note: Differences between clusters were statistically significant for each behavior variable, $p < 0.0001$.

^aThe maintenance behaviors are fruit and vegetable intake, physical activity, and cervical screening.

^bThe at-risk behaviors are frequent drinking, smoking, and sexual intercourse without a protective measure.