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# Assessing Teen Smoking Patterns: The Weekend Phenomenon

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## Abstract

**Background—**Adolescent cigarette smokers may have more daily variability in their smoking patterns than adults. A better understanding of teen smoking patterns can inform the development of more effective adolescent smoking cessation interventions.

**Methods—**Teen smokers seeking cessation treatment ($N$ = 366) reported the number of cigarettes smoked on each day of a typical week. A paired t-test was used to examine differences between weekday (Sunday-Thursday) and weekend (Friday-Saturday) smoking. Main effects and interactions for race/ethnicity and gender were assessed using a 2-way ANOVA for the following variables: typical weekly smoking, average weekday smoking, average weekend smoking, and difference between weekday and weekend smoking. Scheffé post hoc tests were used to analyze any statistically significant differences.

**Results—**There was significantly more weekend smoking compared to weekday smoking, $p < .001$. The difference in weekday versus weekend smoking levels was larger for females than for males, $p < 0.05$. Hispanics reported less typical weekly smoking, $p < .001$, less weekday smoking, $p < .001$, and less weekend day smoking, $p < .01$, compared to Caucasians and multi-racial teens. There was no difference in weekend day versus weekday smoking by race/ethnic background.

**Conclusions—**Using a more detailed assessment of smoking quantity captures patterns of adolescent smoking that may lead to more effective smoking cessation interventions.

### Keywords

adolescent smoking; cigarettes per day

## 1. Introduction

Adolescents' smoking patterns may be more variable than those of adults. However, most studies with adult and adolescent smokers measure only average or global levels of



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consumption, which fail to capture variability in daily smoking patterns. Qualitative studies reveal that teens have difficulty in answering seemingly straightforward queries about cigarette consumption because many report differences between the amounts smoked on weekdays versus weekends (Nichter et al., 2002). Such findings have important clinical and research implications, as current measures may miss the heterogeneity of teen smoking patterns.

Three studies have provided quantitative data on variability in daily smoking patterns among high school aged teens. Using time-line follow-back (TLFB), Lewis-Esquerre and colleagues (2005) found variability in teen smoking patterns that would not have been detected with a global measure of average cigarettes per day. Thus, although the teen participants smoked an average of 10 cigarettes per day, the average standard deviation for 30-day data was 3.7. Further, although TLFB variables and the cigarettes per day variable were correlated, the differences in estimates of cigarettes per day obtained from the global measure versus TLFB ranged from −7.7 to 25 cigarettes. No data were provided regarding differences between weekend and weekday smoking patterns.

Grimshaw and colleagues (2003) found two distinct groups of smokers in a sample of 15 to 19 year old teens who smoked at least one cigarette everyday: 1) those who smoked less during the week and smoked more than 1.5 times the weekday consumption on weekends, and 2) those who smoked more or less the same number of cigarettes over a 7-day period. It should be noted that this data was collected from non-treatment seeking adolescents and the survey response rate was relatively low (30%).

Finally, as part of a study designed to examine adolescent nicotine dependence and smoking cessation outcomes among 14 to 19 year old adolescents, Horn et al. (2003) found that the teens reported smoking about 1.5 times more cigarettes per weekend day than per week day (16.89 on weekends vs. 11.17 on weekdays). It was not reported if this difference was statistically significant.

More accurate descriptions of teen smoking patterns could lead to the development of more targeted cessation interventions. For example, if teens smoke more on weekends, knowledge of the specific triggers associated with “weekend smoking” (e.g., alcohol use or boredom on the weekends) could guide treatment program development, and pharmacotherapy could be prescribed or adjusted based on daily consumption levels. Further, if demographic differences in these patterns exist, future research should examine the etiology of these differences.

In this paper, we examine both the variability in day-to-day smoking patterns reported by teen smokers seeking cessation treatment and whether consumption patterns differ by weekday versus weekend. Our diverse sample of teens also allowed for investigation of interactions of both race/ethnicity and gender on consumption patterns. To our knowledge, this is the first study to examine whether patterns differ by gender and/or race/ethnicity in treatment-seeking adolescent smokers. Although recent national data suggest that males and females are similar in overall cigarette consumption levels, it is unknown if they differ in their daily smoking patterns (Johnston et al., 2009; Substance Abuse and Mental Health Services Administration, 2010). These datasets have reported racial/ethnic differences in overall cigarette consumption, but we are not aware of studies that have assessed whether there are also racial/ethnic differences in daily smoking patterns.

## 2. Methods

### 2.1. Participants

Data were obtained from adolescent smokers who were screened for eligibility to participate in a randomized clinical trial designed to examine the efficacy of extended cognitive behavioral treatment for smoking cessation. Participants were recruited from continuation high schools and one comprehensive high school in the San Francisco/San Jose Bay Area through classroom presentations and informational tables set up during the school day. Those who were interested in quitting smoking and smoked at least one cigarette on at least one day of the past week were included in the current analyses. The study was approved by the Stanford University Administrative Panels on Human Subjects in Medical Research.

### 2.2. Measures

**2.2.1. Demographics—**Gender and race/ethnicity were reported by the participants and the following categories were used in analyses: Caucasian, Hispanic, Non-Hispanic minority, and Multi-racial. Due to low numbers of certain races, the Non-Hispanic minority category was comprised of the following races: American Indian/Alaska Native, Asian, Black/African American and Native Hawaiian/other Pacific Islander.

**2.2.2. Typical day of week smoking—**Typical day of week smoking was assessed with the query "How many cigarettes do you smoke on each day of a typical week?" Teens were asked to respond with one number for how many cigarettes they smoked on a typical Monday, a typical Tuesday, etc. If the teen provided a range of values, he or she was prompted to provide one number. Teens were asked to count any part of a cigarette smoked, even a puff, as one cigarette. The responses to this question were used to generate the following variables:

**2.2.3. Typical weekly smoking—**Calculated as a sum of the number of cigarettes reported for each day of a typical week.

**2.2.4. Average weekday and weekend smoking—**"Weekday smoking" is defined as Sunday-Thursday and "weekend smoking" refers to Friday-Saturday. We used this definition of "weekend smoking" based on Colder and colleagues finding that among college freshmen that were low-level smokers, the highest rates of smoking were on Fridays and Saturdays, with Sunday resembling weekday smoking patterns (Colder et al., 2006; Tiffany et al., 2007) and our previous clinical work with teens who reported the most difficulty with smoking abstinence on Fridays and Saturdays.

**2.2.5. Difference between weekday and weekend smoking—**The difference between the average numbers of cigarettes smoked on weekend days (Friday-Saturday) and weekdays (Sunday-Thursday).

### 2.3. Data Analysis

Averages were calculated to determine the amount smoked on each day of a typical week. A paired t-test was used to determine the statistical significance of differences between weekday and weekend smoking. Main effects and interactions for gender and race/ethnicity were assessed using a 2-way ANOVA for the following variables: typical weekly smoking, average weekday smoking, average weekend smoking, and difference between weekday and weekend smoking. Scheffé post hoc tests were used to analyze any statistically significant differences.

# 3. Results

## 3.1. Participants

A total of 366 treatment-seeking teen smokers were included in the analyses. The sample consisted of 148 females and 218 males with an average age of 16.8 years. The ethnic distribution of the sample was 22% Caucasian, 40% Hispanic, 20% Multi-Racial, and 18% Non-Hispanic minority.

## 3.2. Typical Day of Week Smoking and Weekday versus Weekend Smoking

The number of cigarettes smoked on each day of the week varied, with a statistically significant difference between weekday (Sunday-Thursday) and weekend (Friday-Saturday) smoking, $t$ (365) = 14.8, $p < .001$. Daily cigarette consumption on Sunday to Thursday ranged from 7.8 to 8.3 with an average of 8.0 ± 5.8 cigarettes per day. In contrast, daily consumption reported for Friday and Saturday increased to 11.7 and 11.1, respectively, with an average of 11.4 ± 7.9 cigarettes per day. Figure 1 shows the typical day of week smoking by gender.

## 3.3. Gender and Race/Ethnicity Differences

A main effect for gender was found between average weekday versus weekend smoking. Females reported a larger difference between average weekday smoking versus average weekend smoking compared to males, $F$ (1, 358) = 4.4, $p < .05$. Females reported smoking an average of 7.6 ± 5.4 cigarettes per day during the typical weekday and an average of 11.5 ± 7.9 on weekend days whereas males reported an average of 8.3 ± 6.1 and 11.3 ± 7.9, respectively. There were no main effects for gender on the other variables.

There was a main effect for race/ethnicity for typical weekly smoking, $F$ (3,358) = 6.4, $p < .001$, average weekday smoking, $F$ (3,358) = 6.5, $p < .001$, and average weekend smoking, $F$ (3,358) = 4.8, $p < .01$. Scheffé post hoc tests revealed that Hispanics reported smoking fewer cigarettes than Caucasian and multi-racial teens (see Table 1).

There was no significant race/ethnicity X gender interaction for any of the variables assessed.

# 4. Conclusion

Several results merit attention. First, variability in daily smoking among treatment-seeking adolescent smokers was identified, with a significant difference in the amount consumed on a typical weekday (Sunday through Thursday) versus weekend day (Friday and Saturday). This finding indicates that a more detailed assessment of smoking behavior can capture unique patterns of smoking that could be targeted to increase the effectiveness of smoking cessation interventions. For example, focusing on the triggers that are associated with the increased smoking rates on weekends could increase abstinence rates in teen smokers. Some researchers have hypothesized that higher weekend smoking could be due to boredom and more alcohol consumption on these days (Dappen et al., 1996; Nichter et al., 2010; Stromberg et al., 2007), both of which could be targeted in smoking cessation interventions. Having support available (i.e., via telephone, internet, or texting) on the weekends when teens are exposed to these triggers might also aid in reducing cigarette consumption. These findings also have implications for the use of pharmacotherapy for smoking cessation in teens. If teens' smoking patterns vary depending on the day of week, use of pharmacotherapies that provide consistent levels of nicotine (i.e., the nicotine patch) might not be warranted. Rather, if teens are smoking in response to specific triggers on certain days (i.e., weekend party situations), these teens might benefit more from ad libitum use of

nicotine gum or lozenges to cope with cravings due to triggers. Finally, one study (Rubinstein et al., 2007) found evidence that length of time from waking to first cigarette on a weekend was more highly correlated with cotinine than was time to first cigarette on a weekday in adolescent smokers, further highlighting the need for more detailed assessments of smoking patterns to understand nicotine dependence in teens.

It is possible that the differences between weekday and weekend smoking could be due to teens having time restrictions on smoking during school hours; however, the majority of the teens in our study (97%) were recruited from alternative schools that have abbreviated school days compared to more traditional high schools. Further, our finding that Friday smoking was higher than Sunday smoking counters this hypothesis. Our findings are consistent with Grimshaw et al. (2003) who also reported that differences in consumption could not be explained by differences in educational attainment or attendance in full or part-time education during the week. It should be noted that our definition of weekend smoking differed from the typical Saturday and Sunday definition used in the other studies that have examined adolescent smoking patterns. Future studies are warranted to further understand the nature of weekend versus weekday smoking and what factors influence the variability in smoking rates.

Second, our finding that the difference in weekday versus weekend smoking was significantly larger for females is unique to this study. Although quantitative data is limited, qualitative data from focus groups revealed that smoking was viewed as being less acceptable for females than males and parties provided a context where women were able to forgo their inhibitions and smoke as a “social smoker” (Nichter et al., 2006). Our findings are consistent with this hypothesis, as the significant difference in weekday versus weekend smoking by gender was due to lower weekday consumption by females compared to their weekend smoking. More research needs to examine gender differences in patterns and triggers to smoke to determine the etiology of these differences.

Finally, this is the first study to assess differences in patterns of teen smoking by race/ethnicity. Weekday versus weekend smoking did not differ by race/ethnicity. Our finding that Hispanic teens had lower levels of smoking compared to Caucasian teens is consistent with findings from national datasets (Johnston et al., 2009; Substance Abuse and Mental Health Services Administration, 2010). A significant strength of this study is the ethnic diversity of our sample, but it should be noted that we were not able to conduct separate analyses for certain races. We recognize that the racial groups that comprise the Non-Hispanic and Multi-racial groups likely are not homogenous in their smoking rates. Future studies should be conducted to investigate patterns of smoking behaviors by race/ethnicity.

In conclusion, the results of this study suggest that there is variation in smoking patterns among treatment-seeking teens, particularly in weekday versus weekend consumption. To design more effective treatment strategies for teen smokers, it may be important to understand these smoking patterns through use of measures that are able to capture this variability.

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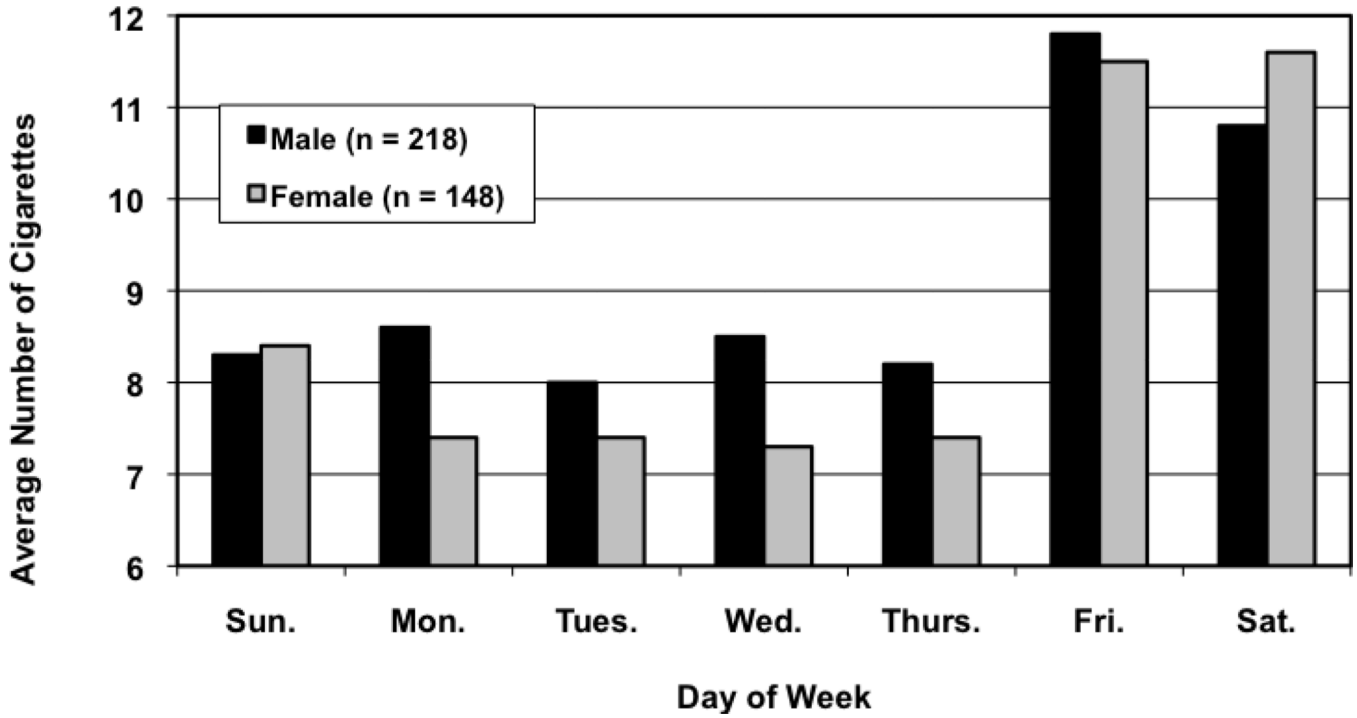


**Figure 1.**
Typical day of week smoking by gender.

**Table 1**

Means and Standard Deviations (in parentheses) for Smoking Patterns by Gender and Race/Ethnicity.

| | Caucasian (N = 80) | | Hispanic (N = 147) | | Non-Hispanic Minority (N = 67) | | Multi-Racial (N = 72) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Female N=32 | Male N=48 | Female N=63 | Male N=84 | Female N=23 | Male N=44 | Female N=30 | Male N=42 | |
| Typical weekly smoking (sum of Sunday-Saturday)[a] | 74.4 (37.4) | 71.7 (47.6) | 48.6 (35.5) | 56.0 (42.2) | 59.0 (32.3) | 61.2 (41.0) | 73.8 (54.1) | 75.6 (46.9) | Race/Ethnicity $F$ (3,358) = 6.4, $p < .001$<br>Gender *ns*<br>Gender X Race/Ethnicity *ns* |
| Average weekday smoking[a] | 9.3 (5.1) | 9.4 (6.6) | 5.9 (4.5) | 7.2 (5.8) | 7.2 (4.1) | 8.0 (5.7) | 9.5 (7.1) | 9.7 (6.2) | Race/Ethnicity $F$(3,358)=6.5, $p < .001$<br>Gender *ns*<br>Gender X Race/Ethnicity *ns* |
| Average weekend smoking[a] | 13.9 (7.7) | 12.3 (7.8) | 9.6 (7.1) | 10.0 (7.6) | 11.4 (7.1) | 10.7 (7.1) | 13.2 (9.6) | 13.5 (8.8) | Race/Ethnicity $F$(3,358)=4.8, $p < .01$<br>Gender *ns*<br>Gender X Race/Ethnicity *ns* |
| Difference between weekend and weekday smoking | 4.6 (5.8) | 2.9 (3.6) | 3.7 (4.0) | 2.8 (4.5) | 4.2 (4.9) | 2.7 (3.9) | 3.8 (3.8) | 3.7 (4.7) | Race/Ethnicity *ns*<br>Gender $F$(1,358)=4.4, $p< .05$<br>Gender X Race/Ethnicity *ns* |

[a] Hispanics different from Caucasians and Multi-Racial; *ns* = not significant