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Cigarette Smoking and Its Risk Factors In Chinese Adolescents: A Biracial Comparison and A Descriptive Analysis By Acculturation Level

by

Jenny Yann-Jen Way

B.A. (Harvard University) 1995

A thesis submitted in partial satisfaction of the

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University of California, Berkeley

Spring, 1998

Cigarette Smoking and Its Risk Factors
In Chinese Adolescents:
A Biracial Comparison and A Descriptive Analysis
By Acculturation Level

Copyright 1998

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Jenny Yann-Jen Way

Abstract

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Jenny Yann-Jen Way

Master of Science in Health and Medical Sciences

University of California, Berkeley

Professor Henrik Blum, Chair

Objectives. This study investigated patterns of and risk factors for cigarette experimentation and regular smoking among junior and senior high adolescents in five San Francisco middle schools. White and Chinese adolescents were compared, and high and low acculturation-level Chinese adolescents were compared in order to determine how race and acculturation level affect smoking behavior, and whether these variables influence that relative importance of other risk factors.

Methods. In late spring of 1992, anonymous questionnaires were administered to a total of 1381 students from two public middle schools and three public high schools in the San Francisco Unified School District. The self-report inventory was patterned after the Youth Attitudes and Practices Survey but also included questions specific to Chinese acculturation. The selection of schools and classrooms within each school to participate

in the study was not random, but was based on a variety of practical considerations including minimal disruption of class instruction time.

Results. Approximately 27% of the White adolescents and 5% of the Chinese adolescents smoked at least a few times a month. There was not a statistically significant difference in this measure of smoking for high and low acculturation Chinese adolescents. Approximately 70% of White adolescents and 29% of Chinese adolescents had ever tried smoking; the rate was 33% for high acculturation Chinese adolescents and 26% for low acculturation Chinese adolescents. Among those who had ever smoked, Chinese adolescents were more likely than White adolescents to have tried to quit, and to have quit successfully. There was not a significant difference among smoking rate between White males and females, but Chinese male adolescents were far more likely than Chinese female adolescents to use cigarettes regularly and to have experimented with cigarette smoking. White adolescents attributed more benefits to smoking than did Chinese adolescents; within each group, the number of benefits attributed to smoking was correlated with both smoking experimentation and regular smoking, but the relationship was stronger for regular smoking. A number of other risk factors were assessed. In general, the difference between White and Chinese adolescents was far more striking and significant than the difference between high and low acculturation Chinese adolescents. In each group, the association between risk factors and regular cigarette use was far stronger than the association between risk factors and smoking experimentation.

Conclusions. Gender differences in smoking prevalence among Chinese adolescents are larger than those among White adolescents, while most of the risk factors for smoking are similar. The low acculturation Chinese group seems to be the most

neutral in terms of having positive or negative feelings or knowledge about smoking; thus smoking prevention and information initiatives among this group may be particularly valuable.

Abstract approved by:

Henrik Blum MD 5-8-98

Professor Henrik Blum, Chair

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I. Introduction and Background

Tobacco use is one of the leading causes of morbidity and mortality in the world today (U.S. Department of Health and Human Services, 1982). Every 10 seconds, another person dies as a result of tobacco use. It was thought to be responsible for 390,000 preventable deaths per year in the U.S. in the late 1980's (US Department of Health and Human Services, 1989), and 3 million preventable deaths per year, worldwide, in the early 1990's (World Health Organization, 1997). If current trends continue, cigarette smoking is expected to cause 10 million deaths per year by the 2020s or early 2030s. It is estimated that in California alone, cigarette smoking was responsible for 42,207 deaths in 1989 (Rice and Max, 1992). Smoking deaths have typically occurred in middle and older-aged individuals after years of smoking. It has been clearly linked to cancers of lung, lip, larynx, mouth, esophagus, pharynx, cervix, and bladder, and has been shown to be a contributing factor in pancreatic and stomach cancers. Smoking has also been associated with a variety of cardiovascular problems (heart disease, stroke) and pulmonary disease (bronchitis, emphysema). Each death attributed to smoking translates to a loss of 15 potential life years and an additional estimated cost to the community of more than $100,000 (Rice and Max, 1992).

Smoking is Addictive

In 1988, the United States Surgeon General classified nicotine as an addictive substance for the first time, comparable to heroin and cocaine (U.S. Department of Health and Human Services, 1988). The Report on Nicotine Addiction noted that cigarette

smoking is characterized by highly controlled or compulsive use, as with other addictive drugs. Nicotine produces stimulating psychoactive or mood-altering effects in the smoker, so that each cigarette smoked reinforces the behavior, making it even harder to quit. As a result, those addicted usually continue to use cigarettes even when well-informed about the adverse physical, psychological, and social consequences of their habit. Smokers who attempt to quit often suffer from intense cravings that peak during the first weeks of abstinence, of such magnitude that they frequently impair the social and emotional functioning of the abstainer. This results in an enormous number of unsuccessful attempts to quit smoking (Burns and Pierce, 1992; U.S. Department of Health and Human Services, 1990).

In 1993, daily smoking prevalence among adults (age 18+) was 20.4%; the California figure is similar (World Health Organization, 1997). Half of these adults reported that they had tried to quit during the previous year. Of those who had tried to quit, 90% failed. More than 50% of the failures occurred during the first 5 days after quitting, the period during which nicotine withdrawal symptoms are the most severe. Smoking cessation has been a major target of efforts to reduce morbidity and mortality in at-risk populations; the United States Public Health Service has set a goal that smoking prevalence in the United States be reduced to 15% by the year 2000 (Public Health Service, 1991). However, given the difficulty of quitting once addicted, public health officials have focused increasingly on prevention in order to reach individuals before they establish nicotine dependency. An understanding of the reasons and risk factors for smoking initiation and development is critical in designing early interventions to control smoking and decrease disease.

Importance of the Adolescent Years in Smoking Habit Formation

Studies (mostly from Western countries) show that most smokers start smoking during their adolescent or early adulthood years, and that the younger persons are when they start to smoke, the more likely they are to become regular smokers as adults (Escabedo *et al.*, 1993; US Department of Health and Human Services, 1989). Kandel and Yamaguchi (1987) found that the risk of initiating smoking increases steadily from age 12 to 16 years and then begins to decline; if a person is still a nonsmoker at age 20, he or she is unlikely to begin (World Health Organization, 1983). Given this impact of adolescent smoking, it is alarming to note that while adult smoking has decreased from the 1970's to early 1990's (*e.g.* average daily smoking prevalence declined from 22.3% in 1992 to 20.4% in 1993), teenage smoking prevalence has been on the rise in the early 1990's.

The WHO estimates that 17.2% of United States high school seniors smoked in 1992, but by 1995, the figure had risen to 21.6% (World Health Organization, 1997). Data from the 1992 National Health Interview Survey of Youth Risk Behavior (NHIS-YRBS) revealed that among youth aged 12-21, 29% of males and 26% of females were current smokers, while another 28% of males and another 30% of females had experimented with cigarettes, but had never smoked regularly (Willard and Schoenborn, 1995). Once addicted, half of adolescent smokers will not quit successfully for at least 16 to 20 years (Pierce and Gilpin, 1995), and half who have not quit by this median interval (one-quarter of all newly addicted adolescent smokers) will die from a smoking-related disease (Doll *et al.*, 1994). Since those who start to smoke as young adolescents

are among the heaviest tobacco users during adolescence and adulthood and thus experience higher mortality from smoking-related diseases, public health workers have repeatedly stressed the importance of preventing tobacco use among young people (U.S. Department of Health and Human Services, 1991).

Tobacco Sales to Minors

Minors' access laws prohibiting the sale of tobacco products to persons under 18 years of age exist in all 50 states. However, these laws are rarely enforced, and most people in the U.S. who become addicted to smoking do so before their high school graduation (U.S. Department of Health and Human Services, 1992; Centers for Disease Control, 1991). Studies have consistently shown that minors often buy their own cigarettes at retail outlets across the country (Centers for Disease Control, 1992). In a study of the Austin, Texas area, Arday *et al.* (1997) found that 61.5% of attempts by minors to purchase tobacco products were successful. Though legally required, only 25.3% of stores posted warning signs about underage tobacco purchase, and these stores were no less likely to sell to minors than stores without signs. Less than 10% of underage attempts to buy cigarettes succeed when buyers were questioned about age, as compared to over 95% when buyers were not questioned about age. In 1991, an estimated 255 million packs of cigarettes were sold illegally to minors, and U.S. teenagers spent $962 million on cigarettes (Cummings *et al.*, 1994). These figures clearly reflect that lack of enforcement of laws prohibiting sale of tobacco to minors contributes tremendously to current adolescent smoking practices.

Predictors of Adolescent Smoking

Past research has identified a variety of predictors of adolescent cigarette smoking. These include stress and family conflict; poor school attendance, grades, and expectations for future academic achievement; involvement in extracurricular activities; rebelliousness and risk-taking tendencies; the belief that smoking promotes a mature appearance; anger, depression, and anxiety; being left alone to care for oneself after school without adult supervision; parental attachment; smoking among parents and peers; and attitudes regarding the negative and positive consequences of smoking (Landrine *et al.*, 1994; Reimers *et al.*, 1990).

The causal relationships in adolescent smoking are complex and not fully understood. It is not simply a lack of knowledge of health risks; in one study, 90% of adolescents were aware that smoking was a health hazard, but few believed that smoking was a threat to their own health (Johnston *et al.*, 1984). Thambypillai (1987) also found that high awareness of the health risks of smoking did not seem to be a strong enough deterrent to cause current smokers to quit, despite reports that concern about health was a major reason to think about smoking cessation. In countless studies, peer influence has emerged as the most powerful predictor, and has figured prominently in the major theories of adolescent smoking including problem behavior theory (Jessor and Jessor), socialization theory (Kandel), the social-learning model (Akers), and peer cluster theory (Oetting and Beauvais). The peer cluster theory argues (and has provided some evidence to support the view) that peer influence is not only the most powerful but also the only direct predictor of adolescent smoking and substance use, with all other psychosocial factors having lessor and indirect effects. In light of these data, adolescent smoking

prevention efforts have been focused primarily on teaching them to resist peer influences to smoke, while also improving their social competence and general coping skills.

Ethnic Differences in Correlates of Smoking

Bry *et a.l* (1982) state that drug use is best understood as a general coping mechanism, and, as a result, the quantity of risk factors rather than any unique combination predisposes adolescents to drug use. However, Newcomb *et al.* (1987) note that people are not exposed to the same number of risk factors, and that "the likelihood of manifesting drug use may vary according to various characteristics of the individual and their environment." Logically, ethnic/ racial groups may be exposed differentially to risk factors, and the number or pattern of factors required to significantly increase risk may differ by group as well.

For example, while having friends who smoke appears to be the best predictor of smoking among White adolescents, this is not the case for Blacks. Headen *et al.* (1991) found that smoking among peers more than doubled the risk of smoking for White adolescents but did not increase smoking among Blacks. Five other studies have similarly reported that peer influence is not a predictor of smoking among Black adolescents (Farrell and Danish, 1993; Hunter *et al.*, 1983; Newcomb and Betler, 1986; Sussman *et al.*, 1987; Vega *et al.*, 1993). Landrine *et al.* (1994) found that peer smoking accounted for 23% of White smoking, 15% for Latinos, 9.6% for Asians, and not at all for Blacks; these results suggest that prevention programs that focus primarily on resisting peer influences (*e.g.* Drug Abuse Resistance Education) may not be the best for certain ethnic-cultural minority adolescents.

Other well-known risk factors, derived from studies of white samples, also do not predict smoking among Black adolescents. These include family conflict, stress, and parental smoking (Castro *et al.*, 1987; Newcomb and Bentler, 1986; Vega *et al.*, 1993), as well as poor school achievement, low self-esteem, problem behavior in the classroom and improvement of self-image via smoking (Sussman *et al.*, 1987). Instead, risk-taking tendencies alone seem to best predict smoking among Black adolescents, while accounting for little of the variance in smoking among White youth (Castro *et al.*, 1987; Headen *et al.*, 1991; Hunter *et al.*, 1982; Presson *et al.*, 1984; Sussman *et al.*, 1987). The only other population sample for whom risk-taking has been found to be the best predictor of smoking is very young children (Landrine *et al.*, 1994). Studies have shown that children who begin smoking very young tend to exhibit early maturity and frequent risk-taking, while being invulnerable to peer influences and to resistance-training interventions. Inner-city Black adolescents may be similar because adjustment to harsh environments may require both early maturity and frequent risk-taking. To support this theory, the studies reporting that risk-taking (rather than peer influence) best predicts smoking among Black adolescents tend to involve samples from inner-city neighborhoods such as South Central Los Angeles (*e.g.*, Sussman *et al.*, 1987; Farrell and Danish, 1983).

The predictive factors for smoking among Latinos is less clear. Castro *et al.* (1987) reported that peer influences, stress and family conflict were strong predictors of smoking for White, but not for Mexican-American youth. However, Sussman *et al.* (1987) found that improvement in self-image by smoking, peer smoking, and achievement in school (respectively) were powerful predictors of smoking among

Mexican-American adolescents. The role of peer influence in smoking among Latino youth has been reported as minor (Castro *et al.*, 1987), moderate (Sussman *et al.*, 1987), and major (Dusenbury *et al.*, 1992). These inconsistent findings are thought to reflect differences in the population of Latinos studies (*e.g.*, Puerto Rican versus Cuban versus Mexican-American), as well as in level of acculturation of the subjects. Adolescent smoking may be more prevalent among, and predicted by peer influences for, highly acculturated Latinos (who may be similar to whites) but not for less acculturated Latinos (Haynes *et al.*, 1990). Because most studies have not controlled for level of acculturation (*e.g.* by assessing language spoken at home), the predictors of smoking among Latino youth remain unclear.

Why Study Asians?

While there has been an extensive body of research examining the development of smoking during adolescence in White, African American, and even Hispanic populations, much less is known about the extent and patterns of smoking development among Asian populations in the United States. Studies of the predictors of smoking among Asian-American youth are extremely rare (Castro *et al.*, 1987; Sussman *et al.*, 1987). Castro *et al.* reported that peer influences, family conflict, and stress were relatively poor predictors of smoking among this group. Likewise, Sussman *et al.* (1987) reported that the predictors of smoking for this population are low self-esteem, poor achievement in school, adult smoking, problem behavior at school, and peer smoking, respectively, with peer smoking playing a minor role. In one of the largest studies to date, including 759 Asian-American adolescents, Landrine *et al.* (1994) found that a school-related issue,

playing hooky, was the best predictor of smoking and accounted for 17.3% of the variance in smoking. Other significant predictors were smoking by peers, and drinking by significant adults, with drug context at school, poor grades, amount of self-care, risk-taking, and mother smoking accounting for minimal variance. The role of other risk factors (*e.g.* self-care after school, anxiety, anger, depression, family conflict) has not been investigated. No U.S. study to date has separated Asian-Americans into their various populations (*e.g.*, Chinese, Korean), nor addressed the role of acculturation in smoking behavior among Asian-American youth.

Just as studies with Latino youth have resulted in inconclusive findings because of a lack of consideration of the diversity of the population and the effect of acculturation, the "Asian" designation has been problematic, as it encompasses a variety of ethnically, culturally, and linguistically diverse populations. The paucity of research on health status, utilization, and behavior of Asian-Americans in general has been exacerbated by the tendency of survey-makers to lump all Asians and Pacific-Islanders into a single statistical group, despite the fact that the 1990 Census categorizes 17 different Asian ethnicities and 8 Pacific Islander groups (Lee, Evelyn). The "lumping together" of these different groups may lead to inconsistent findings as well as an inability to apply any given finding to any one specific group. Studies which address cultural diversity by investigating a large sample of youth from a variety of ethnic groups, analyzing the data for the sample as a whole, and generalizing across groups may tell us much about the generic adolescent but little about any specific one, and so may obscure more than they elucidate. Tailoring interventions for specific ethnic groups will necessitate a body of

evidence on each group, which highlights the specific predictors of smoking for each group.

In a population-based study of smoking behavior among children (grades 4 through 6) in China, Zhu *et al.* (1996) found similar risk factors for smoking as those identified in Western studies, despite the vast political, social, economic, and cultural differences. Significant risk factors identified included peer pressure; lower parental socio-economic status; having parents, siblings, or teachers who smoked; buying cigarettes for parents; poor academic performance; and not believing that smoking is harmful to health. The students in this study were very young, risk factors may be different for adolescents (who are at an older age when there is more exposure to cigarettes in the outside environment). Also, these results do not address different levels of acculturation to Western lifestyle, and may not reflect the unique experience of less acculturated Chinese youth living in the United States.

The lack of a wide body of research on the health of Asian Americans is unfortunate, as the United States census report identifies Asians and Pacific Islanders as America's fastest growing minority group. California is home to roughly 40 percent of the nation's A/PI population (California Department of Health Services, 1992). Between 1980 and 1990, the A/PI population in California more than doubled (grew 127%), so that as of 1992, A/PI's composed nearly 10% of the state's total population. A large proportion of the growth of the A/PI population was due to immigration. Growth among A/PIs is expected to continue as immigration laws favor keeping families together and give priority to individuals possessing work skills projected to be in demand.

The diversity of the A/PI population cannot be overlooked. The national A/PI population encompasses approximately 60 ethnic groups and subgroups. Within these groups there exists a wide range of socioeconomic status, levels of acculturation, and linguistic capability. For example, less than 1 percent of Hawaiians and over 81% of Cambodians speak a language other than English at home. This diversity in culture, language and dialects, time and condition of immigration, residency status, country of origin, educational level and socioeconomic status are critical to consider when addressing issues affecting conceptions of health and illness, and health behavior (California Department of Health Services Health Promotion Section, 1992).

Tobacco use among California's Asian/Pacific Islander populations demands increased attention. Several factors necessitate directing additional focus on tobacco use for A/PI's. First, there exists little information and data regarding A/PI tobacco use and associated diseases. The few studies available indicate that: (1) some A/PI's know little about the risks and disease associated with tobacco use, (2) smoking is highly prevalent, especially among males and newer immigrants, (3) smoking activity begins during the early teen years, (4) tobacco use is high among A/PI's, and (5) smoking often continues after immigration to the U.S.

China offers an example of the prevalence of the smoking problem in many A/PI communities. It is the world's largest consumer and producer of tobacco (produced 31.0% of world total), and tobacco is the top revenue earner for the government. However, although China gained about US$ 4.9 billion in 1993 from tobacco sales, medical costs for smoking-related disease combined with the costs of fire damage cost the country a total of US$ 3.5 billion (World Health Organization, 1997). The most

current prevalence survey (1984) indicated that 61% of males and 7% of females (total prevalence 34%) were daily or occasional smokers. Smoking was lowest among students (27%) and highest among male workers (86%). In 1989 Beijing, 68% of male physicians were smokers (compared to 3% in the U.S.). The high prevalence of smoking in China is alarming in itself, but especially when one considers the context that in 1990, a pack of 20 cigarettes in China cost 25% of average daily income. Thus it becomes important to understand the risk factors behind smoking in this group, and to what extent this behavior is carried over to the United States after immigration.

Theoretical Background

Several frameworks have been developed to describe the stages of smoking acquisition; these divide the period of smoking uptake into successive and progressive changes based on the level of cigarette consumption and the regularity of smoking. Flay (1992) has suggested five consecutive periods in smoking acquisition: preparation, initiation, experimentation, regular smoking, and nicotine dependence and addiction. The preparatory phase involves the formation of beliefs, knowledge, and expectations about smoking. Initiation is characterized by trying cigarettes one or two times. Experimentation involves irregular use over an extended period of time. During the regular smoking stage, adolescents begin to smoke more frequently and regularly. The final stage of nicotine dependence is characterized by psychological and physical dependence. I will use Flay's framework as the basis to examine differences in the factors associated with smoking initiation/ experimentation and regular smoking. However, it is recognized that smoking may not be the result of a steady progression and

that adolescents may achieve high levels of consumption without reaching the addiction stage.

Several complementary theories of the determinants of health behaviors among youth have been used to predict adolescent smoking initiation. Jessor and Jessor's "Problem Behavior" model (1991) suggests that adolescent smoking is part of a problem behavior syndrome that includes a variety of other adolescent problematic behaviors, including high-risk sexual behavior, marijuana use, alcohol consumption, antisocial behavior, and academic failure (Biglan *et al.*, 1995). Adolescents experiment with these problem behaviors for a variety of reasons. Thus, it is important not to focus on smoking in isolation, but to determine the underlying risk factors for the whole syndrome, so that appropriate prevention programs can be designed and implemented early enough to discourage experimentation and habit formation.

Psychosocial models for smoking draw heavily on Bandura's (1977) social learning theory, which asserts that behavior is shaped by one's observations of others (*e.g.*, parents, peers, role models in the media). In fact, perceptions of social norms (use by similar others and belief in social sanctions from using drugs) have consistently been shown to be strong predictors of drug use onset (U.S. Department of Health and Human Services, 1994). Ajzen's theory of planned behavior (1985) hypothesizes that intention to behave in a certain way (smoke) can be predicted from the attitudes and the norms surrounding these behaviors and the perceptions of ease or difficulty of performing the behavior (self-efficacy). Prevention programs in this approach would rely on peers, families, and communities in which behaviors can be modeled, drug use norms can be

clarified, and resistance and social competence skills can be taught, practiced, and reinforced.

The motivation to experiment with/use drugs may also be developmentally relevant. Erickson's stage theory of development suggests that adolescents use drugs because this represents adult behavior and can therefore serve as a sign of independence (Johnson *et al.*, 1988). Those youth who are more lacking in self-esteem and self-image might be particularly susceptible in this respect.

The models discussed above provide a theoretical framework both for smoking initiation and continued use of cigarettes. In addition, regularly smoking adolescents tend to be less successful in school; do not participate in school-related activities; have increased antisocial behavior; and have inadequate parental monitoring due to family conflict and lack of parental involvement (Biglan *et al.*, 1995; Cohen *et al.*, 1994). As a result, previous investigators have proposed that adolescents who smoke are more likely to be dissatisfied with traditional forms of socialization (*e.g.*, school and family), and tend to form relationships with deviant peers who also participate in less conventional forms of behavior (Krohn *et al.*, 1986). More effective interventions for preventing cigarette smoking among adolescents may require attention to other factors which precede an affiliation with cigarette smoking peers (peer influence), such as attention to disruptive or stressful family environments in addition to attention to any existing deficits in stress-coping skills, and to certain aspects of personality such as nonconformity/ rebelliousness (Castro *et al*, 1987).

Theories About Cigarette Smoking and Stress

Past research suggests that stress contributes to risk behavior (Tonkin, 1987). From a stress-coping perspective, the major factors which can contribute to the onset and maintenance of cigarette smoking among adolescents can be classified as: (1) *potential stressors* (disruptive although not necessarily stressful life events) and (2) *stress appraisal*, the subject's evaluation (appraisal) that these events are indeed stressful. Personal response to these stress factors can, in turn, be mediated by (3) *personality traits or dispositions* (internal mediators) and by (4) *social factors* (external mediators) (Castro *et al.*, 1987). Disruptive life events, including family problems such as parental conflict or divorce, financial instability, may serve as early antecedents in a chain of events which lead to cigarette smoking. Cigarette smoking might be a behavior that the adolescent associates with coping and relaxation. Cognitive or personal factors (internal mediators) previously observed as antecedents of cigarette smoking include low school achievement, negative expectations for future achievement, a short future-time perspective, believing that smoking promotes a sophisticated or mature self-image, believing in one's invulnerability to chronic disease, rebelliousness, risk-taking tendency. Major social influences (external mediators) on cigarette smoking among adolescents include role modeling by parents, by peers, and by mass media advertising which sells the "chic look" associated with smoking [see above, Bandura's social learning theory].

The stress-coping model is supported by Lowry *et al.*'s findings (1996) that cigarette smoking was most prevalent among adolescents from families in which the responsible adult had completed less than four years of high school and total family income was less than $20,000. Education may impart knowledge of healthy behavior

patterns along with positive social, psychological, and economic skills and assets, while income provides access to healthy environments. Those in lower socio-economic strata may thus experience greater potential stressors (*e.g.*, dirty and unsafe neighborhoods), which is exacerbated by a lower sense of self-esteem and self-efficacy. They are also likely to have greater opportunity to associate with peer groups that also have more negative attitudes about health.

Ethnicity and Stress

In the heterogeneous U.S. population, ethnicity can be an important moderator variable for identifying relatively homogenous subgroups of individuals with similar cultural beliefs and habits. Many adolescents from a given ethnic minority group are raised in a family system that may differ in several respects from mainstream American family values and lifestyles. Many such ethnic minority families are guided by "old country" cultural rules and expectations about parent-child relationships, patterns of religious belief, rules of conduct, and appropriate behavior in a given situation. Arnett (1992b) uses the term 'narrow socialization' to describe a culture (such as the traditional Chinese) in which children and adolescents are socialized very strongly into believing in one particular ideology that serves as the moral basis for behavior; a culture in which adherence to the standards and expectations of the community is among the highest values, and individual autonomy and nonconformity are viewed with suspicion and contempt. This can be contrasted to the 'broad socialization' of mainstream America—a culture with no guiding, commonly held belief system to serve as a moral basis for acceptable behavior, in which independence and self-expression of the individual is

considered a higher value than conformity to the standards of the community. For an ethnic adolescent maturing in the U.S., there is likely to be both conflict between the dependence and independence of the two lifestyles, and also partial assimilation of cultural/ familial beliefs and standards as that adolescent establishes his or her own attitudes and standards for appropriate conduct. Thus, among ethnic adolescents, drug use behavior, including the acceptability of cigarette smoking, is influenced in part by these culturally based beliefs, attitudes, and values (Ajzen *et al.*, 1980).

Understanding the relationship of ethnicity and culture on cigarette smoking may provide more specific information on how general interventions to prevent cigarette smoking among adolescents should be "fine-tuned" by taking into account the unique conflicts and potential stressors faced by various ethnic minority adolescents. Newcomb and Bentler (1986) and Maddahian *et al.* (1986) found that ethnicity was an independent predictor of habitual adolescent drug use, in addition to income and ease of drug acquisition. Additionally, they found that various ethnic subgroups differed in the specific pattern of antecedents/ risk factors associated with cigarette smoking. Thus, a single preventive strategy or program designed for the general population of adolescents might not yield a desired outcome or might be entirely ineffective for members of a given subgroup of adolescents who are motivated by a different set of beliefs, attitudes, and values from those which motivate white nonminority adolescents.

On the basis of the literature, I would expect that the predictors of smoking among less acculturated Chinese (e.g., those who speak only Chinese or Chinese and English at home) would be predicted by difficulties at school [as Sussman *et al.* (1987)

found], such as poor grades, as well as by other psychosocial factors, with peer smoking playing a minor role. This would be explained by the fact that the Chinese families place an extremely high emphasis on academic success; poor academic performance would be far more of a stressor for Chinese, as opposed to White adolescents, and may result in greater likelihood of smoking initiation as a coping response. Cultural differences in primacy of family (with more distrust for "outsiders") may be involved in ethnic differences in power of peer influence; peers would be expected to exert less influence over adolescents more entrenched in the Chinese culture where the family is primary, conformity to family norms is the rule, and the needs and desires of the family take priority over those of individuals. Landrine *et al.* (1994) found that the predictors of smoking for more acculturated Latino groups were similar to those of Whites, while the predictors for Spanish-speaking-only Latinos were more similar to those of Asians and Blacks. Similarly, I would hypothesize that for more highly acculturated Chinese (*e.g.*, those who speak only English at home), the predictors of smoking should be more similar to those for Whites. Regardless of acculturation level, the number of risk factors to which adolescents are exposed should be linearly related to tobacco use. While several different factors may eventually lead to cigarette smoking, exposure to multiple risk factors should increase likelihood of use.

Objectives

There are several objectives to this study:

1) To describe the pattern of smoking behavior of Chinese adolescents and compare this to the pattern of the much more studied white adolescent group.

To date, there has not been a published study describing the smoking behavior of Asian adolescents, much less that of Chinese adolescents. Included in this objective will be an examination of the similarities and/or differences in smoking by the adolescents' family and friends.

2) To describe the similarities and differences in smoking behavior of Chinese adolescents of high and low acculturation. To date, there has been at least one study examining the effect of acculturation on smoking behavior in Hispanic adolescents (Landrine *et al.*, 1994), but no studies examining whether a difference exists in Asian (or Chinese) adolescents.
3) To examine the adolescents' beliefs about smoking and health, and to compare the prevalence of these beliefs across race (Chinese versus White) and acculturation levels (high versus low acculturation Chinese).
4) To examine the media exposure to cigarettes (mode of exposure and cigarette brand) and to compare this exposure across race (Chinese versus White) and acculturation levels (high versus low acculturation Chinese).
5) To examine whether the correlates and therefore possible causes of regular adolescent smoking are the same for Chinese and Whites, and also for Chinese of high and low acculturation levels.

II. Method

Sample (Subjects)

This work is based on a survey administered to San Francisco secondary school youth in early 1992 under the direction of Marion Lee, PhD., in an effort to study smoking patterns in Chinese Americans.

One thousand three hundred eighty-one male and female students (grades 6 to 12) from two public middle schools and three public high schools in the San Francisco Unified School District participated in the study. Of the 1376 subjects who indicated their race, there were included 93 Whites (6.8%), 69 Blacks (5.0%), 59 Hispanic (4.3%), and 1151 Asian-American adolescents (83.6%). The breakdown of the Asian American adolescents was as follow: 740 Chinese (53.8% of all respondents), 100 Mixed Chinese (7.3%), 83 Filipinos (6.0%), 91 Vietnamese/ Cambodian/ Laotian (6.6%), and 137 other Asian (10.0%).

The secondary schools represented were Francisco Middle School (grades 6-8 science classes; 505 students), Marina Middle School (grades 6-8 ESL classes; 170 students), Lincoln High (grades 10-12 English classes, 453 students), Lowell High (grade 10 driver's education, 107 students), and George Washington High (grades 9-12 advanced math, 146 students). [A description of how this sample was recruited and chosen follows in the Survey section.] A copy of the distributions of the students surveyed by grade and class within each selected school is attached in Appendix C. The distribution of respondents by race is as follow:

Table 2.1

Breakdown of Respondents By Race

Race	Freq	Percent of Subjects	# smokers[1] (%)	# smokers[2] (%)
White	93	6.76	25 (27)	14 (15.1)
Black	69	5.01	8 (12)	2 (2.90)
Chinese	743	54.00	42 (5.6)	26 (3.50)
Mixed Chinese	100	7.27	5 (5)	1(1.00)
Japanese/ Korean	48	3.49	8 (17)	3 (6.25)
Filipino	83	6.03	5 (6)	2 (2.41)
Viet/ Camb/ Lao	91	6.61	10 (11.1)	6 (6.59)
Hispanic	59	4.29	4 (6.8)	2 (3.39)
All Others	90	6.54	10 (11.1)	7 (7.78)
Total	1376	100.0	117 (8.5)	63 (4.58)

[1] smokers defined to be a few times/ month or more
[2] smokers defined to be a few times/ week or more.

The Chinese and mixed Chinese groups were combined into one category since they are likely to share many of the same cultural characteristics. The White group was chosen for comparison with the Chinese since this group has been the most extensively studied and would probably serve as a good basis for comparison. Also, the paucity of subjects and/ or smokers in the other racial groups leaves more room for chance/ error, and would significantly reduce the power of the analysis to detect differences between the groups, if they exist.

The average age and gender distributions of the White and combined Chinese groups are as follow:

Table 2.2

Overview of Sex and Age Distribution of White and Combined Chinese groups

Race	Freq	Av age	SD	Av grade	SD	# female (%)	# male (%)
White	93	15.5[1]	1.63	10.13	1.70	34 (40)	52 (60)
Chinese (all)	843	14.6	2.05	9.00	2.11	405 (48)	438 (52)
High accult*	393	15.0[2]	2.05	9.49	2.07	189 (48)	204 (52)
Low accult*	437	14.3	2.06	8.60	2.06	213 (49)	227 (51)

* see below for description of how Chinese adolescents were divided into high and low acculturation groups.
[1] difference in average age and grade between White and Chinese significant at the 0.0005 level.
[2] difference in average age and grade between high and low acculturation Chinese significant at the 0.0005 level.

Survey

The self-report inventory was patterned after the Youth Attitudes and Practices Survey but included questions specific to Chinese acculturation (e.g. length of residency in the U.S., celebration of Chinese and Western holidays, consumption of Western/ Chinese food, and primary language(s) used for reading, thinking, and thinking. The questionnaire was revised according to suggestions provided by a focus group consisting of 10 sixth graders from Lincoln Elementary School in Oakland. A copy of the Youth Health Survey is attached in Appendix A.

The study was approved in April 1992, after long and complicated procedures with the San Francisco Unified School District. It was previously proposed to survey 4 high schools and 7 middle schools within the San Francisco Unified School District. However, due to the willingness of the teachers to participate, an attempt to minimally disrupt classroom instruction time, and other practical considerations, the study plan was revised to include only the schools named above.

A sampling method of randomly selecting classrooms within each grade (as originally hoped) was not feasible due to different constraints at the various schools. Project staff and school officials worked together to select classrooms within each grade each of the selected schools with minimum disruption of classroom time. A passive parental consent form with Chinese translation was distributed to parents before the survey was administered. A copy of the parental consent form is attached in Appendix

B. Training sessions were provided for the teachers in order to prevent inconsistencies in conducting the survey and to assure the students of the confidentiality of their responses. No parents refused to let their child participate in the study. Each student in each of the selected classes completed a survey. This method of filling out a confidential questionnaire was thought to be have the potential of producing more truthful responses than the alternative of sampling adolescents in households using random digit dial telephone surveys, as in the 1990 and 1992 California Tobacco Surveys, and the National Health Interview Surveys. Adolescents might be more willing to supply honest answers when removed from the "risk" of having a responsible adult (*e.g.* parent) overhear them on the telephone. With surveys administered in a class setting, there is typically a higher response rate than with telephone surveys. Finally, there is good evidence that self-reported smoking data from community surveys generally do not provide biased estimates of the prevalence of smoking (Pierce, 1987).

Measures

The following information was collected: (1) social and demographic data; (2) cultural background; (3) smoking status and behavior; (4) beliefs about smoking and health; (5) cigarette smoking by family and friends; (6) media exposure to cigarettes; (7) school performance and job participation; (8) alcohol use.

Smoking status and behavior were measured using a series of scales that addressed ever having smoked; age at first use; current frequency of use; total use in previous month, previous week, previous 24 hours; ever having tried to quit.

Many risk factors that had been identified as correlates of adolescent smoking in prior research were selected for study. Jessor and Jessor (1977) identified four major systems, each comprised of constructs that hypothetically promote the adoption or rejection of smoking. These systems include: social environment, perceived environment/ norms, personality, and behaviors. Risk factors for smoking based on the conceptual models above can be assigned to these systems.

a) Social Environment System. Includes basic descriptors of the respondents, including demographic characteristics, level of acculturation, and smoking-related indicators.

Social and Demographic Data. Questions to obtain information about the respondents' grade, age, sex, ethnic group, age at immigration, and country of birth (if not born in U.S.).

Acculturation. Acculturation is reflected both by language and customs. A more acculturated subject would tend to better be able to speak and understand English, and to be more entrenched in American customs and traditions (e.g., eating more Western food, celebrating Christmas). Accordingly, an acculturation index was developed, placing equal weight on each of the two aforementioned components. Subjects' responses to the following questions (first four assessing English fluency, last four assessing cultural Westernization were averaged: (1) language usually spoken at home; (2) language subject usually thinks in; (3) language subject usually reads; (4) language subject usually speaks with friends; (5) receiving presents at Christmas, (6) eating turkey on Thanksgiving; (7) receiving pocket money in a red envelope during Chinese New Year;

(8) type of food eaten mostly at home. Responses were scaled from 1 to 5, with '1' being least acculturated, and '5' being most acculturated. An artificial line was drawn at the mean acculturation score, dividing the Chinese into high and low acculturation groups.

Smoking-related. Exposure to advertising and media about cigarette smoking, what brands the subject saw advertised; whether the school allows students to smoke on school property, whether the student has taken a class or course in which health risks of smoking discussed.

Peer Influences. Peer influence is a major predictor of adolescent smoking. The survey assessed the number of best friends who smoke, the attitudes of best friends towards subject's smoking, and whether friends feel subject should quit smoking.

Family Influences. Studies have found positive correlations between parental and child smoking. The survey assessed how many and which family members smoke, as well as the subject's attitude towards smoking by family members.

b) Normative influences. Focuses on the individual's perceptions of his/her environment especially with respect to the expectations of others regarding smoking. The survey assessed normative influences on smoking behavior from three spheres: best friends, general peer group, and parents. The subjects were asked to indicate whether they felt each group would react favorably or unfavorably to their own (the subjects') smoking and/ or to smoking in general.

c) Personal Influences and Personality. Assesses the individual's values, orientation towards self and society, and expectations and beliefs regarding smoking.

Motivations. Assess educational aspirations and value placed by adolescents on independence. Educational aspirations have been found to be positively related to healthy behaviors. A high value placed on independence has also been found to be related to greater propensity for high risk behaviors. The survey questioned respondents about grades received in school, educational aspirations, whether they have a paying job and amount of free spending money (to assess independence from parental control).

Personal beliefs. Measure subjects' understanding of risks of smoking, value of quitting smoking to health, general beliefs about smoking; probability of smoking cigarettes in the future.

Personal control. Those with high levels of personal control are less likely to be influenced by others. This will be assessed by subject's tolerance of risky health behaviors (ever asked anyone not to smoke?), and whether the subject would smoke if his/her best friend offered a cigarette.

Emotional support. Those individuals who feel isolated from society may be more inclined to engage in risky behavior and conform less to society's norms and standards. The survey assessed the subject's perception of the availability of emotional support by asking who/ how many people subject felt he/she could talk or go to for help if he/she had a serious problem.

d) Behaviors. Assesses individual's involvement in conventional protective behaviors such as school attendance and extracurricular activities that may deter smoking.

Extracurricular (societal involvement). Assess subject's Involvement with paying job, involvement in team sports and other extracurricular.

Involvement in other risk-taking behavior. This was assess by asking whether the subject drinks alcohol, and whether he/she has ever tried, or is now using, chewing tobacco or snuff.

III. A Comparison of Smoking Behavior Across Race and Acculturation: Experimentation, Regular Smoking, and Other Substance Use

This chapter is a descriptive analysis of similarities and differences in various measures of smoking and other substance use behavior among White and Chinese groups, and among the high and low acculturation Chinese groups.

Racial and Acculturation Differences in Smoking Behavior

Table 3.1 compares patterns of smoking between White and Chinese adolescents. The results show that there is a much higher prevalence of both regular cigarette use (smoking at least a few times/ month, smoked 100 cigarettes in lifetime) and experimental smoking (ever tried smoking) among White, as compared to Chinese adolescents. There was about a five-fold higher rate on both indications of regular cigarette use in White adolescents, and over a two-fold higher rate of experimentation with cigarettes. There was also a much higher rate of moderate and heavy cigarette smoking over the whole sample, defined as a few times a week or more and 1+ pack/day or more, respectively. It appears as if the White smokers smoke more heavily, since a higher proportion of smokers are in the moderate and heavy smoking range; however, this was not statistically significant ($0.2 < p < 0.3$). Among smokers of both races, there was a comparable percent who have smoked over 100 cigarettes total. In addition, the Chinese smokers have a statistically significant higher likelihood of attempting to quit, and quitting successfully. Almost half of the smokers of each race thought they would still be smoking next year. While the White adolescents seemed to smoke more, it was

interesting that the average age at which a Chinese experimented with cigarettes was almost two years younger than the age at which a White adolescent did so (10.8 versus 12.5). The nonsmokers of both races seemed quite resistant to starting smoking—hardly any thought they would be smoking in the next year, and 1% or less of each race thought they would smoke if a friend offered them a cigarette.

Table 3.1

Summary of Smoking Behavior Between White and Chinese

Smoking Measure	White (%)		Chinese (%)	White (freq)	Chinese (freq)
Smoke at least a few times/ month[1]	39.1		5.7	25/ 64	42/ 736
Smoke at least a few times/month [2]	26.9		5.0	25/ 93	42/ 840
Smoke at least a few times/week or more[3]	12.9		1.7	12/ 93	14/ 838
Smoke at least a few times/week or more[4]	48.0	*	33.0	12/ 25	14/ 42
Smoke at least 1+ pack/ day or more[3]	4.3		0.4	4/ 93	3/ 838
Smoke at least 1 + pack/ day or more[4]	16.0	*	7.1	4/ 25	3/ 42
Ever tried smoking	69.9		29.4	65/ 93	247/ 840
Quitters among those who had smoked	53.7		70.8	29/ 54	102/ 144
Age smoked first whole cigarette	12.5		10.8		
Smoked 100 cigarettes in lifetime[5]	44.0	*	42.9	11/ 25	18/ 42
Smoked 100 cigarettes in lifetime[6]	11.8		2.1	11/ 93	18/ 840
Tried to quit smoking in past 6 months [7]	50.0		73.0	7/ 14	19/ 26
Contemplation to smoke next year					
- smokers now	44.0	*	46.3	11/ 25	19/ 41
- nonsmokers now	0.0	*	0.9	0/ 68	6/ 690
Would nonsmokers smoke if friend offered cigarette?	2.6	*	0.9	1/ 39	6/ 690

* Difference not significant at 0.05 level.

[1] Former smokers who had quit were excluded from this analysis (This is of the people who have never quit smoking).

[2] Former smokers who had quit were not excluded from this analysis (Freq of regular smokers in total population)

[3] Among all smokers

[4] Among those who smoke a few times/ month or more

[5] Among regular smokers.
[6] Among everyone in group.
[7] Among those who consider themselves to actually smoke enough to think about quitting.

Table 3.2

Summary of Smoking Behavior Between Chinese of High and Low Acculturation

Smoking Measure	High (%)		Low (%)	High (freq)	Low (freq)
Smoke at least a few times/ month[1]	6.8	*	4.9	23/ 340	19/ 390
Smoke at least a few times/month [2]	5.8	*	4.3	23/ 393	19/ 439
Smoke at least a few times/week or more[3]	2.1	*	1.4	8/ 390	6/ 440
Smoke at least a few times/week or more[4]	34.8	*	31.6	8/ 23	6/ 19
Smoke at least 1 + pack/ day or more[3]	0.5	*	0.2	2/ 390	1/ 440
Smoke at least 1 + pack/ day or more[4]	8.7	*	5.3	2/ 23	1/ 19
Ever tried smoking	33.3		25.7	131/ 393	113/ 439
Quitters among those who had smoked	68.5	*	72.5	50/ 73	50/ 69
Age smoked first whole cigarette	9.6		12.0		
Smoked 100 cigarettes in lifetime[5]	42.9	*	64.3	9/ 21	9/ 14
Smoked 100 cigarettes in lifetime[6]	2.3	*	2.1	9/ 393	9/ 439
Tried to quit smoking in past 6 months [7]	73.3	*	72.7	11/ 15	8/ 11
Contemplation to smoke next year					
- smokers now	45.6.	*	47.4	10/ 22	9/ 19
- nonsmokers now	0.6	*	1.1	2/ 315	4/ 369
Would nonsmokers smoke if friend offered cigarette?	1.0	*	0.8	3/ 314	3/ 370

* Difference not significant at 0.05 level.
[1] Former smokers who had quit were excluded from this analysis (This is of the people who have never quit smoking).
[2] Former smokers who had quit were not excluded from this analysis (Freq of regular smokers in total population)
[3] Among all smokers
[4] Among those who smoke a few times/ month or more.
[5] Among regular smokers.
[6] Among everyone in group.
[7] Among those who consider themselves to actually smoke enough to think about quitting.

Table 3.2 presents the smoking behavior among high and low-acculturated Chinese adolescents. In every aspect of smoking behavior, the two groups were very similar. The only statistically significant differences were the percentage of adolescents who had ever tried smoking; the highly acculturated group had a higher rate, more like that of the White population. However, the average age at which adolescents tried cigarette smoking was a statistically significant 2+ years younger for the highly acculturated group. In this respect, the high acculturation Chinese group was less like the White group than were the low acculturation group.

Since age and sex are likely to affect smoking behavior, and the age and sex distribution across the racial (age and sex) and acculturation groups (age only) are different, these variables are possible confounders.

The age distribution of the subjects in the sample was skewed so that there was a disproportionate number of white adolescents in grades 10 and 12, and a disproportionate number of Chinese adolescents through grade 10. This accounts for the higher average age of White adolescents. [Refer to Methods section. There were statistically significant differences in the mean ages of the White and Chinese groups of 0.9 year (15.5 versus 14.6, respectively), and differences in the mean ages of the Chinese high and low acculturation groups of 0.7 year (15.0 versus 14.3, respectively).] The higher rate of smoking in White adolescents thus could be due to the possibilities that (1) the White adolescents smoke more at all ages, or (2) that the White group encompasses more older adolescents, who have had more years in which to have experimented or to pick up the

smoking habit. To explore these possibilities further, I repeated the same analyses after stratifying each group by grade (9^{th} and below, 10^{th} and above) so that the average age within each grade group was comparable across races. The actual numbers were slightly different, but there was not much of a change in the relationships between the groups discussed earlier. The results are not presented.

To explore the possibility of confounding by sex, chi-square analyses were done to determine the association between sex and some of the different measures of smoking. There was no detectable difference between White male and female smoking patterns (even at the $\alpha = 0.10$ significance level; results not presented here). This could be due to the fact that there really is no difference, or that there were too few regular smokers or experimenters in the White sample for any differences to be detectable. The latter possibility is more likely; with only 25 total white "regular" smokers and after stratification by smoking level and sex, some cells were left with only 1 or 2 observations, not enough for a useful analysis. The results are not presented, as some of the cell counts seem spurious. In the Chinese group, however, sex was significantly associated (at the $\alpha = 0.05$ level) with certain of the smoking measures. The sex differences are presented in Table 3.3.

The results in Table 3.3 show that Chinese female adolescents smoke far less than their male counterparts. They were significantly less likely to have ever tried smoking, and those who did try smoked their first cigarette 0.8 years later (albeit not significant). They were about 3.5 times less likely than the males to smoke at least a few cigarettes a month. Their numbers were even more under-represented at higher levels of smoking—

they were at least six times less likely than the males to smoke at least a few times a week, or to have smoked a total of 100 cigarettes. The sex difference is much more dramatic than that for white adolescents, and in close agreement with the World Health Organization (1997)'s finding that in 1984 China, nearly 20% of adolescent males (ages 15-19) smoked, as compared to less than 2% of adolescent females.

Table 3.3

Selected Smoking Behaviors in Chinese Adolescents (By Gender)

Smoking Measure	Male (%)		Female (%)	Male (freq)	Female (freq)
Smoke at least a few times/ month[1]	9.2		2.4	33/ 360	9/ 376
Smoke at least a few times/month [2]	7.6		2.2	33/ 433	9/ 405
Smoke at least a few times/week[3]	4.2		0.7	18/ 433	3/ 405
Smoke at least a few times/week[4]	54.5	*	33.3	160/ 436	3/ 9
Ever tried smoking	36.7		21.5	131/ 393	87/ 404
Quitters among those who had smoked	68.9	*	76.3	73/ 106	29/ 38
Age smoked first whole cigarette	10.6	*	11.4		
Smoked 100 cigarettes in lifetime[5]	63.6	*	33.3	21/ 33	3/ 9
Smoked 100 cigarettes in lifetime[6]	4.8		0.7	21/ 434	3/ 404

* Difference not significant at 0.05 level.

[1] Former smokers who had quit were excluded from this analysis (This is of the people who have never quit smoking).

[2] Former smokers who had quit were not excluded from this analysis (Freq of regular smokers in total population)

[3] Among all smokers

[4] Among those who smoke a few times/ month or more.

[5] Among regular smokers.

[6] Among everyone in group.

Sources of Cigarettes

Given that laws exist in all 50 states prohibiting the sale of tobacco products to minors, yet nearly 40% of White adolescents and 6% of Chinese adolescents smoke at

least a few times/ month, the question arises as to whether the laws are effective in controlling adolescent smoking. Previous studies have shown that these laws are not enforced, and that many adolescents get their cigarettes from retail outlets (Centers for Disease Control, 1992); these studies were done on primarily White adolescent populations. Any attempt to control adolescent smoking must deal with the source of cigarettes, and since the source of cigarettes may differ by race, culture, and acculturation level, an understanding of similarities and differences in this aspect will be important in the design and implementation of race / culture specific smoking intervention strategies. This information was elicited in the survey by asking the smokers where they usually get their cigarettes, and requesting that they indicate all sources which apply.

Table 3.4

Where Do Adolescents Get Their Cigarettes?

	Percent			
	White (n =40)[1]	Chinese		
Source:		Overall(n=78)	Hi Accult(n=42)	Lo Accult(n=36)
Friends	80.0	61.4	61.8	57.6
Relatives	20.0	16.5	17.6	15.3
Home	35.0	29.1	27.9	28.8
Vending machines	25.0	10.2	10.3	8.5
Small Store (eg 7-Eleven)	47.5	31.5	33.8	28.8
Large store (eg supermarket)	38.5	11.8	10.3	13.6
Free mall samples	7.7	3.9	7.4	0.0
Free mailed samples	5.1	3.9	7.4	8.5
Ave # of cigarette sources	2.575	1.685	1.791 *	1.551
Ever been offered cigarettes[2]	80.7	30.6	39.4	22.6

[1] n = number of smokers = total number of people in racial group – number of self-described (in this question) nonsmokers.

[2] of total number of subjects in the indicated race/acculturation group (includes both smokers and nonsmokers).

* the difference in number of cigarette sources between high and low acculturation Chinese is not significant.

Chinese adolescents have 0.9 fewer sources of cigarettes than their White counterparts; out of the 8 possible sources given, the White adolescents had 2.6 and the Chinese adolescents had 1.7. Despite this difference, the actual sources from which most White and Chinese adolescents do get their cigarettes is very similar. Over half the smokers of each group get their cigarettes from friends. A large portion (almost 50% for Whites, around 30% for Chinese) in each group get their cigarettes from small stores, which include 7-Elevens and gas stations (despite the existence of minor access laws). A significant portion also get their cigarettes from home. This pattern was also very similar to that observed for Chinese of both high and low acculturation. In all groups, 20% or less of adolescents got their cigarettes from relatives, and less than 10% got their cigarettes from free mall samples or free mailed samples. The most obvious differences seem to indicate the increased resourcefulness of White adolescents in obtaining cigarettes. 38.5% of them get their cigarettes from large stores as compared to only 11.8% for Chinese, and 25% of them get cigarettes from vending machines, as compared to only 10.2% for the Chinese.

White adolescents also have a much higher rate of being offered cigarettes than do Chinese adolescents. Although there is no way to test this, it seems reasonable to assume that the White adolescents probably have more White friends (this group has a higher rate of smokers) who would offer them cigarettes. The Chinese adolescents may have more Chinese friends who smoke less, and therefore have a lower chance of being offered cigarettes. The data for the Chinese high and low acculturation groups show the more acculturated group being offered more cigarettes (significant 39.4% versus 22.6%). Again this is not testable, but it is possible that the more acculturated adolescents felt

more comfortable around White adolescents (culture and language-wise) than did the less acculturated Chinese, so had more White friends, came in contact with more smokers, and were therefore offered more cigarettes (just from being around more White smokers.)

The effect of age was not assessed in this survey due to the small number of subjects in the White sample and the small percentage of Chinese smokers, but it should be noted that one study (Gilpin *et al.*, 1997) found that youth 12 to 14 years of age who currently smoked were the most likely to report use of coupons for free samples, 43.5 +/- 27.6% compared to 15.7 +/- 7.6% for smokers 15 to 17 years of age.

Racial and Acculturation Differences in Other Substance Use

Adolescents who experiment with cigarette smoking in adolescence often engage in a variety of other risk-taking, or "problem" behaviors. I looked at the rates of two of these other "problem behaviors," the use of chewing tobacco/ snuff and the use of alcohol, which was assessed in the survey. The results are presented below.

Table 3.5

Prevalence of Chewing Tobacco Use

		Percent		
	White (n=92)	Chinese		
Measure:		Overall (n=837)	Hi Acculturation(n=391)	Lo Acculturation(n=436)
Ever tried chewing tobacco/ snuff	15.2	2.0	2.8 *	1.4
Regular user of chewing Tobacco/ snuff	1.1 *	0.7	1.3 *	0.2

* not significant at $\alpha = 0.05$ level. Comparisons were between White and overall Chinese, and between high and low acculturation Chinese.

The prevalence of ever tried chewing tobacco/ snuff is much higher in Whites than in Chinese (statistically significant 15.2 compared to 2.0 percent). It seems that the highly acculturated Chinese have a slightly higher rate of having tried chewing tobacco/ snuff, and that the White and high acculturation Chinese adolescents were more likely than the low acculturation Chinese to be regular users of chewing tobacco/ snuff. However, the prevalence rates for ever tried chewing tobacco in the Chinese groups and for regular use in all groups was so low that there was not enough statistical power in the analysis to indicate if the differences detected above were significant.

Tables 3.6 and 3.7 present the prevalence of alcohol use among the adolescents in the study. Among White and Chinese adolescents, there was a very significant difference in prevalence of alcohol use, both clinically and statistically. The Pearson chi^2 statistic which compares the distribution across smoking levels had a p-value of < 0.0005 for both lifetime alcohol use and past month alcohol use prevalence. In terms of lifetime prevalence, the median for White adolescents was at approximately 10 drinks. The median for Chinese adolescents was at just sips. 74% of Chinese adolescents had never had a drink or only had sips, at the time of this survey, compared to only 30% for White adolescents. 50% of white adolescents had had over 11 drinks in a lifetime, as compared to only 8.4% for the Chinese. The difference among the two racial groups for smoking in the last month was also very dramatic. 54.4% of the White adolescents had only sips or did not drink alcohol in the preceding month, as compared to 82.2% of the Chinese adolescents. 36.7% of White adolescents had 2 or more drinks in the past month, compared to only 4.8% of Chinese adolescents. To determine if these large differences could be accounted for by the fact that the White adolescents were older, on average, than

the Chinese adolescents, the two groups were divided into strata by age—the large differences persisted, but were not statistically significant (lack of power due to the small number of individuals within each strata); the results are not presented.

Table 3.6

Prevalence of Lifetime Alcohol Use

Percent

	White (n=90)	Chinese		
Measure:		Overall (n=816)	Hi Accult (n=383)	Lo Accult (n=427)
Never had a drink	11.1	44.0	37.6	49.9
Only sips	18.9	29.8	33.9	26.0
Part/all of 1	6.7	9.0	9.7	8.4
2-10	6.7	9.0	10.4	7.5
11-20	16.7	3.1	2.6	3.3
21+	33.3	5.3	5.7	4.9

Pearson chi2 analysis for white versus Chinese: $p < 0.0005$
Pearson chi2 analysis for high versus low acculturation Chinese: $p = 0.003$

Table 3.7

Prevalence of Alcohol Use in the Past Month

Percent

	White (n= 90)	Chinese		
Measure:		Overall (n= 816)	Hi Accult (n= 380)	Lo Accult (n= 429)
Never had a drink	43.3	82.2	81.8	83.0
Only sips	11.1	7.0	7.4	6.5
Part/all of 1	8.9	6.0	5.3	6.5
2-10	26.7	2.9	3.4	2.3
11-20	5.6	1.0	0.8	1.2
21+	4.4	0.9	1.3	0.5

Pearson chi2 analysis for white versus Chinese: $p < 0.0005$
Pearson chi2 analysis for high versus low acculturation Chinese: $p = 0.610$ (not significant)

There was a significant difference between high and low acculturation Chinese adolescents in the level of lifetime alcohol use, but not in the prevalence of alcohol use during the preceding month. Again, these differences persisted (but were of slightly

smaller magnitude once the difference in age was taken into account; results not shown). The lower acculturation group had slightly less lifetime alcohol consumption than the more highly acculturated group. 71.5% of the highly acculturated group had only had sips or less of alcohol in their lifetimes, compared to 75.9% for the less acculturated group. Though the high acculturation group resembles the profile of the white group more than the low acculturation group resembles the White group, the Pearson chi^2 test statistic between the Chinese highly acculturated and White groups was also extremely small, and the high acculturation group still resembles the Chinese low acculturation group more than it does the White group.

Summary of Findings and Discussion

White adolescents engage in far more substance use than their Chinese counterparts. This was demonstrated by significantly higher levels of regular cigarette consumption, lifetime cigarette consumption, and rate of experimentation with cigarettes and smokeless tobacco/ snuff in White adolescents. They obtained their cigarettes from more sources than did the Chinese adolescents, and they were significantly less likely than Chinese adolescent smokers to have quit or to have attempted to quit smoking. In addition, the White adolescents were more likely to have consumed alcohol (lifetime and in the past month) than Chinese adolescents. Those White adolescents who did consume alcohol also consumed more than the Chinese adolescents who drank.

In most of the analyses of this chapter, I did not separate the adolescents by age or sex. This could be a potential confounding factor, since there is up to a one-year average

age difference between the White and overall Chinese groups, and between the high and low acculturation Chinese groups. Since smoking rates increase with age, and older adolescents tend to have more friends who smoke, more money with which to buy cigarettes, are less controlled by parents, etc., the increased rates of smoking seen with the Whites versus the Chinese could reflect the increased age of the White group as well as and/ or instead of higher prevalence of smoking in White adolescents at each age level. Gender has also been shown to affect smoking and substance use prevalence rates in adolescents. The ideal solution would be to stratify the analyses by age and sex. However, this was not a viable option because of the small number of White adolescents in the sample, and also because of the paucity of smokers in the Chinese sample. My attempts at stratification by age and sex, (and acculturation level in the Chinese) resulted in breaking the few smokers into so many groups that the power to detect any changes was lost, and the frequencies and percents in each cell tended to reflect random variations rather than any real trends.

IV. Beliefs About Smoking And Health Across Race and Acculturation

Currently, social learning theory dominates the field of smoking initiation research and is the basis of most current research (Pierce *et al.*, 1993). Social learning theory posits that the individual's susceptibility to perform a particular behavior is based on expectations of the costs and benefits of performance; these expectations are then influenced by other factors (personal influences, environmental influences, normative influences, behavior), which interact with each other in complex ways.

Since adolescents' beliefs about smoking play a significant role in determining whether they smoke/ eventually start smoking, it is important to have an idea of the extent to which adolescents hold these beliefs (many of them false). An awareness of how these beliefs vary across race and acculturation level, if they do at all, can help immensely in designing smoking intervention programs targeted to high-Chinese populations.

The beliefs in this survey can be divided into three categories: 1) Benefits attributed to smoking, 2) Perceived safety of experimentation with cigarettes, and 3) Social acceptability of smoking. The results are presented in Table 4.1. Adolescents were asked to indicate the extent to which they agreed or disagreed with the statements that cigarette smoking conferred the indicated benefits. Any type of agreement constituted a positive response in this analysis.

Benefits Attributed to Smoking

Table 4.1

The Benefits Adolescents Attribute to Smoking

Percent

	White (n = 92)	Chinese		
Measure:		Overall (n=832)	Hi Accult (n=392)	Lo Accult(n=439)
Reduce stress	31.5	17.2	20.4	13.9
More comfortable at parties/ other social situations	27.2 *	20.9	23.0 *	18.9
Relieve boredom	18.5 *	16.1	13.3	18.7
Look more grown-up	13.0 *	10.7	8.4	12.8
Keep weight down	13.0 *	13.9	12.0 *	15.5
Help relax	41.3	21.9	24.0	19.6

* the difference was not significant at the $\alpha = 0.05$ level.

Table 4.2

Number of Benefits Adolescents Attribute to Smoking

Percent

	White (n = 92)	Chinese		
Quantity:		Overall (n=832)	Hi Accult (n=392)	Lo Accult(n=439)
None	41.9	55.2	55.0	55.0
1	18.3	18.5	17.8	19.1
2	16.1	10.1	10.7	9.8
3	8.6	7.6	7.6	7.7
4 or more	15.8	8.9	8.9	8.4
Average # benefits (SD)	1.4 (1.6)	1.0 (1.4)	1.0 (1.4) *	1.0 (1.4)

* difference was not significant at the $\alpha = 0.05$ level.

The adolescents' perceptions of the benefits attributed to smoking are presented in Table 4.1. Significantly, many more "Westernized" adolescents attributed to cigarette smoking the ability to help reduce stress and to relax. This effect was seen in comparing White to Chinese adolescents as a group, and also highly acculturated to less acculturated Chinese youth. Even among the more acculturated Chinese youth, however, far fewer

held these beliefs than among the White youth. There were no significant differences across race and acculturation in the prevalence of the perception that cigarettes could help in weight loss/ maintenance, and in achieving comfort in social situations.

There were more significant differences in attitudes and beliefs between Chinese of different acculturation levels than between Whites and Chinese as a whole. Significantly more of the lower acculturation Chinese group thought that cigarette smoking could help relieve boredom or to help them look more grown-up.

The three most common benefits attributed to cigarette smoking among White adolescents: help relax (41.3%), reduce stress (31.5%), and more comfortable in social situations (27.2%) were also the same three most common benefits that highly acculturated Chinese adolescents attributed to smoking (24%, 20.4%, and 23%). The low acculturation Chinese group didn't attribute as much help from cigarettes to reducing stress, but relieving boredom was one of the more commonly held perceived benefits of smoking (18.7%).

Table 4.2 shows that 58% of White adolescents and 45% of Chinese adolescents thought that there was at least one benefit to smoking. Overall, the White adolescents thought that smoking provided 1.4 (of 6 total) benefits, while the Chinese adolescents thought that smoking provided 1 benefit. Despite the different pattern of benefits the high and low acculturation groups perceived to be provided by cigarette smoking, both groups believed that there was an average of 1 benefit to smoking. In each survey question that assessed the benefits attributed to cigarette smoking, there was a significantly higher rate of Chinese than White adolescents, and also a higher rate of low

acculturation versus high acculturation Chinese adolescents who answered "don't know" (results not shown.)

Perceived Harm of Cigarette Smoking

Table 4.3

Adolescents' Perceived Safety of Cigarette Experimentation

		Percent perceiving smoking as safe		
	White (n=93)	Chinese		
Measure:		Overall (n=843)	Hi Accult (n=393)	Low Accult (n=440)
If I started to smoke regularly, I could stop smoking anytime I wanted[1]	23.7	31.3	109	154
There is no harm in having an occasional cigarette.[2]	24.7	12.5	58	45

Percents based on those who answered that they agreed, or strongly agreed with the statements above.
[1] A large number of respondents didn't know. Whites: 19.8%, Overall Chinese: 26.3%, High accult: 26.7%, Low accult: 26.0%
[2] Those who don't know: Whites: 4.4%; Chinese: 16.3%; High accult: 11.0%; Low accult: 20.8%.

Table 4.4

Adolescents' Perceived Degree of Harm to Cigarette Experimentation

	White (n=93)	Chinese		
Measure:		Overall (n=843)	Hi Accult (n=393)	Low Accult (n=440)
Average degree of harm (SD)	3.2 (1.8)	3.2 (1.6)	3.3 (1.6)	3.2 (1.5)
% who feel smoking has no harm or addictiveness	14 %	6.2 %	7.6 %	4.1 %

The scale was obtained from subjects' responses to the two questions from Table 4.3, and measured from 0-6. The response to each question in Table 4.3 was scored from 1-3. 3 for strongly disagree, 2 for disagree, 1 if the subject did not know, and 0 if the subject agreed with the statement.. A higher number in this question indicates a higher perceived degree of harm.

As a whole, the adolescents in the study thought cigarettes were moderately harmful. On a harm scale of zero to six[1], the average of the groups' perception was 3.2 (this was about the same for all four groups). The same average degree of harm

[1] The harm scale was defined as based each subject's response to the criteria presented in Table 4.3. The total harm score (zero to 6) was the sum of the score for each component (zero to 3). A score of zero indicated that the subject thought cigarette smoking had absolutely no harm and was not addictive. A score of three on either criteria indicated that the subject strongly disagreed with the statements that smoking a

attributed to cigarette smoking across the four groups obscures the observation that a significantly larger proportion of White adolescents (14% compared to 6.2% for Chinese) who actively agree that there is no harm or addictiveness to cigarette smoking (as opposed to not knowing).

Though quantitatively, there was no significant difference in the overall perception of the harmfulness of cigarette smoking between the White and overall Chinese groups, the pattern of where they saw the harm differed significantly. For example, 31.3 % of Chinese thought that cigarettes were not addictive, as compared to only 23.7% of the White adolescents. On the other hand, 24.7% of whites thought that there was no harm in smoking an occasional cigarette, while only 12.5% of the Chinese thought so. So, the Chinese youth seem to think that cigarettes are not as addicting, but that even occasional cigarettes may be harmful, while the White youth think that cigarettes are addicting, but that an occasional cigarette may not be too harmful.

In terms of where they see the harm of smoking, the pattern between high and low acculturated Chinese adolescents reflects the pattern seen between the White and overall Chinese groups. The less acculturated Chinese youth perceive an occasional cigarette as being more harmful than do the more acculturated youth (Table 4.3), while the more highly acculturated Chinese youth seem to have a better sense of the addictiveness of cigarette smoking.

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cigarette was no harmful, or that someone smoking an occasional cigarette could stop anytime he/she wanted to.

Perceived Social Acceptability of Smoking

Table 4.5

Adolescents' Perceived Social Acceptability of Smoking

		Percent perceiving smoking as acceptable		
	White (n=93)	Chinese		
Measure:		Overall (n=843)	Hi Accult (n=393)	Low Accult (n=440)
I would rather date nonsmokers[1]	19.4 *	14.6	10.2	18.4
When I am older my parents won't mind if I smoke[2]	41.9	28.4	27.7 *	29.1
I personally don't mind being around people who are smoking[3]	32.3 *	24.8	21.1	28.0
Kids do not want their friends to smoke[4]	55.9	37.6	38.4 *	36.8

[1] perceive smoking as acceptable if no opinion or disagree with the statement "I would rather date nonsmokers."
[2] perceive smoking as acceptable if no opinion or agree with the statement "When I am older my parents won't mind if I smoke."
[3] perceive smoking as acceptable if no opinion or agree with the statement "I personally don't mind being around people who are smoking."
[4] perceive smoking as acceptable if no opinion or disagree with the statement "Kids do not want their friends to smoke."
* not significant at the $\alpha = 0.05$ level.

Table 4.6

Adolescents' Average Perception of Social Acceptability of Smoking
based on criteria in Table 4.5. Scale 0 – 4 with 0 unacceptable in all areas, and 4 acceptable in all areas

	White	Chinese		
Measure:		Overall	Hi Accult	Lo Accult
Average (SD)	1.13 (1.03)	0.94 (1.05)	0.84 (0.97)	1.02 (1.11)

* not significant at $\alpha = 0.05$ level.

White adolescents found smoking significantly more socially acceptable than did Chinese adolescents overall. Whereas it might be expected for more acculturated Chinese youth to resemble the White group, the less acculturated Chinese adolescents actually found cigarette smoking more acceptable than the highly acculturated Chinese (and in this aspect, they resemble the White group more than do the highly acculturated Chinese group). A significantly larger proportion of White adolescents thought that kids

don't mind if their friends smoke (55.9% versus around 36% - 39% for Chinese), and also that their parents won't mind their smoking once they get older (41.9% versus 27 to 30% for Chinese).

It was interesting that even though there were lower rates of ever tried smoking (statistically significant) and smoking at least a few times/ month (statistically insignificant) among less acculturated Chinese adolescents (Table 3.2), fewer low acculturation Chinese adolescents, as compared to high-acculturation Chinese adolescents, found it offensive to date smokers or to be around people who smoke. Also in this regard, the percent of adolescents holding these perceptions are closer to that of the White group (with higher rates of smoking experimentation and regular smoking), and in fact, are not significantly different from that of the White group.

Summary of Findings

1. White adolescents attribute more benefits to smoking than do Chinese (1.4 versus 1.0 benefits), and the more Westernized the adolescents were, the more they attributed to cigarette smoking the ability to help reduce stress and to relax (White >> high acculturation Chinese > low acculturation Chinese). Low acculturation Chinese were more likely to think that cigarette smoking could help relieve boredom or to help them look more grown-up.

2. There was no difference in the average degree of harm attributed to smoking by White and Chinese adolescents (of both acculturation subgroups), but there were

differences in the perception of where the harm resides. More "Westernized" adolescents tended to have a greater awareness of the addictiveness of smoking, while low acculturation adolescents were more likely to perceive even an occasional cigarette as being potentially harmful.

3. White adolescents perceived smoking to be more socially acceptable than Chinese adolescents. However, lower acculturation Chinese adolescents thought smoking more acceptable than their higher acculturation counterparts did. Lower acculturation Chinese tended not to mind smoking as much by family members, and did not care as much about dating nonsmokers.

4. White adolescents were the most likely to have well-defined opinions about smoking (either agreeing or disagreeing with statements about its harm or benefits). Low acculturation Chinese adolescents more the most likely to not know or not have an opinion.

Discussion

An individual's perception of the benefits, harms, and social acceptability of smoking is likely to play a large role in whether he/she experiments or begins regular use of cigarettes. Intervention programs based on general "risk factors" identified across a large, heterogeneous population tend not to be as successful as those designed specifically to address the needs of a target population.

The results presented in this chapter indicate clearly that there is a difference in the quantity and distribution of the perceptions of smoking benefits, harms, and social

acceptability across race and acculturation level (within a given race). It seems logical to propose that smoking intervention programs designed for use in areas with high Chinese adolescent populations (*e.g.* San Francisco Chinatown) take these differences into consideration. Given the limited time and resources available for many intervention programs, it might be wise to focus specifically on areas that are more "high yield." For example, intervention programs designed for use with lower acculturation Chinese groups might focus more on smoking's addictiveness, while intervention programs in White or higher acculturation Chinese groups might focus more on the fact that even smoking an occasional cigarette could have negative health effects.

In general, the Chinese adolescents, and especially the low acculturation group, seem to be more naïve, or to have no opinion, about matters related to smoking than their White counterparts. This may be a reflection of the culture's emphasis that individuals conform to the standards and expectations of the community, and where self-expression is often discouraged. Many of the Chinese adolescents are exposed to smoking in family members—30% of their fathers smoke, yet their parents send a clear message that they do not approve of smoking in their children. This may account for the seemingly paradoxical observation that the low acculturation youth (who smoke the least) don't mind smoking in others as much as their high acculturation counterparts. The low acculturation group may be the most entrenched in the cultural ideal of conformity to their parents' expectations, so they smoke the least. The low acculturation group may also be the group least likely to think for itself, or form its own opinions about smoking—since the adolescents are exposed to smoking from parental (authority) figures, they do not form negative attitudes about its social acceptability as readily as the

higher acculturation Chinese group, who have been exposed more to the Western ideals of individual autonomy and who are probably more likely to form their own opinions about the acceptability of smoking.

V. Media Exposure to Cigarette Smoking Across Race and Acculturation

The relationship between tobacco advertising and consumption has been the subject of much research. In recent years, a number of countries have introduced a total ban on tobacco advertising (Norway in 1975, Finland in 1977, Canada in 1989, Australia in 1990, and New Zealand in 1990). Evidence from these countries found that elimination of tobacco advertising was associated with a significant decline in tobacco consumption (Department of Health, 1992).

Cigarette advertising was banned on broadcast media in 1971, but this has hardly stopped the tobacco industry from spending money on marketing. From 1992 to 1993, the tobacco industry increased its marketing budget by $800 million to a total of over $6 billion (Federal Trade Commission, 1995; Gilpin *et al.*, 1997). The increase in marketing expenditures has also been accompanied by a shift in the tactics. In the early 1970's, almost two-thirds of tobacco marketing budgets were spent on traditional advertising in print media, billboards, and in and around mass transit. By 1993, 42% of the marketing budget ($2.5 billion) was spent on sales promotion activities, up from 20% of the marketing budget ($426 million) in 1993 (Federal Trade Commission, 1995). Traditional advertising builds brand image and promotes brand recognition and loyalty; sales promotion encourages product trial and increases purchase volume. Sales promotion includes such strategies as coupons, product giveaways, and distribution of specialty items such as clothing and accessories emblazoned with brand names and logos, which in and of themselves, become walking advertisements. The extent of adolescent

exposure to and involvement in these activities could very well lead to smoking experimentation and regular use. While those who redeem coupons (for cigarettes or promotional items) or send in for free samples must indicate that they are old enough to purchase cigarettes, there is no mechanism to verify their ages. In 1992, a school study found that some adolescents purchased Camel cigarettes specifically to get Camel Cash coupons (to obtain promotional items featuring the Camel brand of cigarettes) (Richards *et al.*, 1995).

Though the tobacco industry claims to target only adults, and not those under 18 years of age, the content and emphasis of most marketing activities seem designed to appeal to the youthful groups of the population. For example, the successful campaign for the Camel brand featured the cartoon character Joe Camel, who became widely recognized even among young children (Fischer *et al.*, 1991). A recently leaked confidential RJ Reynolds memorandum from 1971 indicated the essentiality of capturing the "age 21 and under" market, outlining characteristics of the "beginning" smoker that it might "exploit" in future product development and marketing (Gilpin *et al.*, 1997; Teague CE Jr.) A survey conducted by the advertising industry found that the majority of children from 8 to 13 years were able not only to name cigarette brands, but could also describe how these brands were advertised (e.g. with a camel and a cowboy and not with other images like dolphins or clowns) (Levin, 1992).

This chapter presents a descriptive analysis of the impact of tobacco advertising on adolescents, by looking at brand recognition, mode of exposure to information, and the association between exposure to advertising and the perceived benefits of smoking. It

also compares and contrasts the degree to which White and Chinese adolescents have been affected by tobacco advertising. Because there were no questions on the 1992 Health Survey which asked about involvement in smoking promotion activities (e.g. collecting memorabilia), I was able to assess only the exposure and effect of the advertising component of the tobacco industry marketing efforts.

Awareness of Cigarette Advertising

In the Youth Smoking Survey, adolescents were asked to name any cigarette brand that they knew had been advertised. Table 5.1 shows which cigarette brands were most often recalled as advertised by race and acculturation level. Over 90% of White adolescents recalled seeing Marlboro advertisements, followed very closely by 83.5% of the overall Chinese group. Camel, Virginia Slims, and Newport all had ad recall rates of 40% or greater in both racial groups surveyed. For the most part, this pattern applied to both Chinese acculturation groups also, with higher percentages for the high acculturation group (resembling the White group more), and lower percentages for the low acculturation group. One glaring exception was the Kent cigarette brand. Only 9.6% of White adolescents recalled seeing a Kent advertisement, as compared to over 40% for each Chinese acculturation group.

Table 5.2 presents the number of advertised brands recalled by adolescents of each racial and acculturation group. White adolescents recalled advertisements by slightly more (0.1 more) cigarette brands than Chinese adolescents, but the lumping together of the Chinese into one group hides the fact that the highly acculturated Chinese remembered nearly 0.7 more advertisements than did the White group, and the low

acculturation Chinese remembered about 0.7 fewer advertisements than did the White group. The fact that over a quarter of respondents within each group remembered "recent" (the survey did not specify how recent was "recent" though the preceding question asked about exposure to cigarette advertising in the previous week) advertisements for five or more cigarette brands provides strong evidence that the impact of tobacco advertising definitely reaches the very susceptible adolescents in our society.

Table 5.1

Recall of Advertising for Most Recalled Cigarette Brands

		Percent		
	White (n=92)	Chinese		
Brand:		Overall (n-832)	Hi Accult (n=392)	Lo Accult (n=439)
Marlboro	91.6	83.5	88.5	78.0
Camel	78.3	75.9	83.6	68.0
Virginia Slims	56.6	51.6	64.1	39.2
Newport	48.2	46.1	53.2	39.2
Winston	24.1	37.9	40.8	35.6
Salem	28.9	35.3	43.1	27.9
Kool	22.9	22.3	26.7	18.1
Kent	9.6	42.6	41.1	44.5

Table 5.2

Number of Brands Whose Advertising Was Recalled

	White (n=92)	Chinese		
Quantity:		Overall (n-832)	Hi Accult (n=392)	Lo Accult (n=439)
None (%)	8.6	18.6	9.9	26.1
1 (%)	8.6	11.9	8.7	14.8
2 (%)	14.0	8.8	8.1	9.3
3 (%)	23.7	12.2	13.2	10.7
4 (%)	12.9	12.0	14.5	10.7
5 + (%)	32.2	36.1	45.5	28.4
Average (SD)	3.74 (2.61)	3.65 (3.04)	4.39 (2.97)	3.03 (2.98)

Mode of Media Exposure to Cigarette Smoking

Adolescents were asked to recall whether they had seen or heard anything good or bad about smoking cigarettes within the past week, and if so, through which media (television, newspapers/ magazines, radio, billboards/ posters) they had been exposed. There was no way to divide those who had been exposed to positive from those who had been exposed to negative "information" about smoking.

Table 5.3

How Are Adolescents Exposed to Information about Cigarette Smoking (in the past week)

	Percent answering "yes" of whole group[1] / Percent who had been exposed to the medium[2]			
	White		Chinese	
Medium:		Overall	Hi Accult	Lo Accult
Television	42.4/ 47.0	47.5/ 50.1	49.9/ 52.1	44.9/ 47.8
Newspapers/ magazines	50.0/ 52.9	35.4/ 41.4	39.0/ 43.4	32.1/ 39.4
Radio	26.4/ 27.9	19.1/ 22.7	23.6/ 26.4	14.8/ 18.6
Billboards/ poster	62.0/ 66.3	55.7/ 60.4	62.1/ 65.1	50.1/ 56.2

[1] number who had been exposed to information about cigarette smoking through the specified media/ total number in group.
[2] number who had been exposed to information about cigarette smoking through the specified media/ total number who had been exposed to that media.

Table 5.3 shows that across race and acculturation level, adolescents get media exposure to cigarette smoking primarily from billboards and posters (50% to over 60%). 50% of White adolescents also get exposed through newspapers/ magazines, while over 40% of adolescents across all groups get exposed through the television. Fewer than 30% of Whites, and fewer than 25% of Chinese get exposure from the radio.

Table 5.4a shows that there is a large discrepancy in the percentage of adolescents in the different racial and acculturation groups who are exposed to the various forms of media. Chinese adolescents read newspapers/ magazines and listen to the radio considerably less than their White counterparts, and this is partially related to acculturation. Only 5.4% of White adolescents did not read the newspaper/ magazine or listen to the radio in the past week, while about 10% of highly acculturated Chinese and over 18% of low acculturation Chinese were not exposed to these forms of media. Chinese adolescents watch TV slightly more than White adolescents, and the low-acculturation Chinese see billboards and posters slightly less than their White and highly acculturated Chinese counterparts.

Because of the large differences in the amount of exposure adolescents in each group get to each form of media, I felt that it was necessary, in Table 5.3, to also indicate the percentage of youth who had seen/ heard something about smoking through the various media from the total who had actually been exposed to that media form. For example, just by looking at the raw percents (percent of total members of group), it seems like there is an extremely large difference in exposure to smoking information through newspapers (15% between white and Chinese); however, once it is taken in to account that a large number of the Chinese (especially those of low acculturation) don't read newspapers, the difference is reduced to close to 10% between the two racial groups. Table 5.4a presents the prevalence of adolescents not exposed to each of the four media modalities assessed in this survey. The Chinese appear to watch television more than the White adolescents, but 3 to 4 times as many of the low acculturation adolescents, as

compared to White adolescents, did not read newspapers or magazines, or listen to the radio.

Table 5.4a

What is the Prevalence of Adolescents Not Exposed to Different Media

		Percent		
	White		Chinese	
Medium:		Overall	Hi Accult	Lo Accult
Television	9.7	5.2	4.3	5.9
Newspapers/ magazines	5.4	14.4	10.3	18.5
Radio	5.4	15.4	10.5	20.6
Billboards/ poster	6.5	7.7	4.6	10.9

Table 5.4b

Prevalence of Adolescents Exposed to Media Who Don't Know If They Heard About Smoking

		Percent		
	White		Chinese	
Medium:		Overall	Hi Accult	Lo Accult
Television	13.3	15.2	13.9	16.7
Newspapers/ magazines	9.2	16.8	13.4	20.1
Radio	11.6	20.7	16.7	24.7
Billboards/ poster	5.8	13.7	10.5	16.6

Table 5.4b shows that even of the adolescents exposed to cigarette smoking, a significant percentage of Chinese, in all media forms except television, don't know definitely if they heard anything about smoking. Within the Chinese group, the high acculturation group shows more similarity to the White group in remembering more whether they saw/ heard about smoking. The low-acculturation Chinese group has a 15% to 25% rate of not remembering if they saw/ heard anything about smoking. The low acculturation group is also the group which has the lowest rate of experimentation with cigarettes (see Table 3.2). It may be that their lack of other risk factors makes them less

interested in cigarettes in general, and so they pay less attention to smoking in the media. Alternatively, it may be that their lower proficiency with English makes it harder for them to understand and absorb all the information they are exposed to; the resulting lack of "absorbed" exposure to cigarette smoking information might then make them less inclined to try smoking. Since this was a cross-sectional study, it is impossible to tell these alternatives apart.

Does Exposure to Cigarette Advertisements Correlate With Perceived Benefits of Smoking?

Is the formation of beliefs about benefits of cigarette smoking a cumulative effect based on exposure to more than one cigarette advertisement? Tables 5.5 and 5.6 address this question by examining the relationship between the number of brand advertisements recalled and the perception that smoking confers benefits. Table 5.5 shows a linear relationship between the number of ads recalled and the average number of benefits perceived to be conferred by smoking, from zero to four ads recalled. The relationship is not as strong for the overall Chinese group or for either level of Chinese acculturation. For the Chinese, it seems that recalling at least one ad slightly increases the perception of the number of benefits that cigarette smoking confers, but the number of ads recalled does not have any relationship to the average number of benefits perceived.

This pattern is confirmed in Table 5.6, where the percent of adolescents who perceive any benefit of smoking is listed for the number of ads recalled. Again, for whites, there is a linear relationship, where an increase in the number of ads recalled results in an increase in the percentage of adolescents who perceive at least one benefit of

smoking. This relationship is less defined for the overall Chinese group and each of the acculturation subgroups. Consistent with the results from Table 5.5, recalling at least one ad increases the percentage of adolescents who perceive any benefit to smoking, but the number of ads recalled (after the first one) does not matter much. It seems reasonable to conclude that White adolescents are more susceptible, and Chinese adolescents (regardless of acculturation level) less susceptible, to the effects of multiple cigarette advertisements in forming beliefs about benefits of cigarette smoking.

Table 5.5

Perception of Average Benefits of Smoking by the Number of Advertisements Recalled

	Average Benefits Perceived (SD)			
	White	Chinese		
Number of Ads Recalled:		Overall	Hi Accult	Lo Accult
Zero	0.38 (0.74)	0.75 (1.15)	0.51 (0.79)	0.84 (1.25)
1 – 2	1.29 (1.71)	1.11 (1.51)	1.32 (1.75)	0.99 (1.35)
3 – 4	1.62 (1.62)	1.05 (1.44)	0.99 (1.35)	1.13 (1.53)
5 +	1.60 (1.52)	1.01 (1.44)	1.01 (1.39)	1.02 (1.50)

Table 5.6

Perception of Any Benefits of Smoking by the Number of Advertisements Recalled

	Percent Who Perceive Any Benefits of Smoking			
	White	Chinese		
Number of Ads Recalled:		Overall	Hi Accult	Lo Accult
Zero	25.0	39.5	35.9	48/115
1 – 2	47.6	47.1	47.0	50/106
3 – 4	64.7	46.6	45.0	46/ 94
5 +	66.7	45.1	46.4	54/125

Summary of Findings

1. White adolescents recall more brands of cigarettes being advertised than Chinese adolescents, with the rate for low-acculturation Chinese adolescents being particularly low.

2. Most adolescents are exposed to cigarette advertising through billboards, then newspapers/magazines, with less frequent exposure through television and radio. Marlboro and Camel were the brands most often recalled by adolescents in all racial/acculturation groups.

3. Increased exposure to (or at least recall of exposure to) cigarette advertising is associated with increased perception of the benefits of cigarette advertising. Because this is a cross-sectional study, it is difficult to attribute causality to these data. For example, increased media exposure could cause increased perception of benefits of smoking, or it could be that those who smoke or are thinking of smoking happen to think already that smoking confers many benefits, and that these are the same people who are more likely to remember cigarette advertisements.

4. A significantly larger number of Chinese adolescents (especially low acculturation Chinese adolescents) recall less advertising from each media form than higher acculturation Chinese adolescents or White adolescents. Part of this difference was accounted for by the fact that low acculturation Chinese adolescents have less acculturation to each media form than the other groups; it did not account for all the differences.

Discussion

The survey asked about whether the subjects had been exposed to information about cigarette smoking through different media forms, but did not differentiate between whether this information was good or bad. It would have been interesting to find out where adolescents are hearing about the smoking benefits and the harmful effects, and whether there is any difference across race and acculturation level. As in all cross-sectional studies, it is difficult to infer causality. There is no way to tell the difference between whether being exposed to smoking in the media causes adolescents to smoke more, or whether adolescents who smoke more (or are more susceptible to start) happen to pay more attention to and to recall information about cigarette smoking in the media.

Given that cigarette advertising through the different media explored in this survey is only a small portion of the tobacco industry's arsenal of tactics to entice adolescents to smoke, it would have been useful to know if the respondents had a favorite brand of cigarettes, if they had any free merchandise from cigarette companies, if they objected to cigarette advertising and whether this objection changes with increasing use of cigarettes. No questions on the 1992 Health Survey specifically addressed adolescent involvement in cigarette sales promotion activities (e.g. collecting memorabilia, etc). As a result, it is important to keep in mind that: 1) the number of adolescents exposed to propaganda by the tobacco industry and the effects of exposure to this propaganda may be higher than that described here for exposure to advertising only, and/ or 2) the results described here are confounded with the effects of receiving promotional items.

Gilpin *et al.* (1997) found that 17.9% of adolescents aged 15 to 17 years, and 6.5% of adolescents 12 to 14 had received cigarette company promotional items, and that receiving a promotional item was associated with susceptibility to smoking. Marlborough and Camel accounted for the majority of the brands of promotional items received. In 1993, Marlborough items were received more frequently than Camel (though Camel items were more popular). These findings are consistent with my results the data from the 1992 Youth Health Survey, presented above, which show Marlborough as the most commonly recalled cigarette brand for which recent advertising was seen, and Camel following closely behind. Promotional items like free samples or coupons may have a particularly large effect on young smokers who otherwise may not have access to many people who smoke, or may not have enough money to buy their own cigarettes.

Knowledge of the differences in media exposure to cigarette smoking and cigarette advertisements between race/ acculturation could be important in intervention efforts. For example, if public health officials wanted to broadcast a series of informational "ads" about the harmful effects of smoking on the radio, they might want to know that 21% of low acculturation Chinese adolescents were not "recently" exposed to the radio. Additionally, it would be useful to know the extent of involvement in tobacco industry promotional activities, and to see whether the parents' reactions to the adolescents' collection of smoking memorabilia differs by race and acculturation level. Since a disproportionate number of Chinese adolescents (of both acculturation levels) compared to White adolescents recall exposure to Kent advertising, it might be worthwhile to examine the pattern, content, and location of Kent advertising to understand this observation.

VI. Smoking by Peers and Family Across Race and Acculturation

The exposure to smokers in the social environment strongly influences an adolescent's attitude towards smoking. One of the strongest and most consistent findings in the smoking initiation literature is that teenagers who have family members or friends who smoke are more likely to smoke themselves (Flay *et al.*, 1994; Newcomb and Bentler, 1986). This effect could be mediated via role modeling, an increase in cigarette availability, or peer pressure (since most parents do not seem to actively try to get their children to try cigarettes).

It is important to obtain a sense of how exposure to smoking in the social environment is affected by race and, for the Chinese adolescents, by acculturation.

Smoking and the Peer Group

Figure 6.1

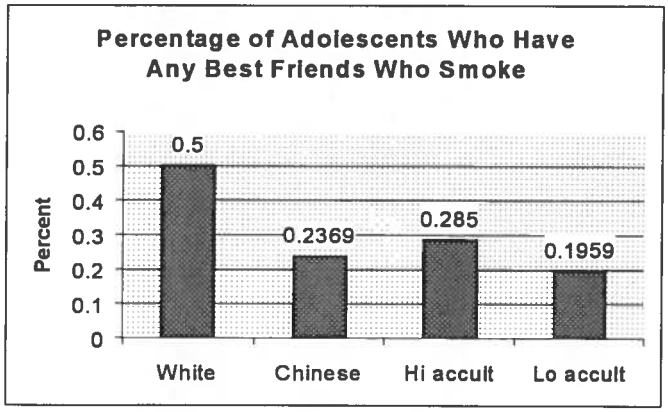


Figure 6.1 shows that many more White adolescents have at least one best friend who smoke, as compared to Chinese adolescents (statistically significant 50% versus

23.69%). More highly acculturated Chinese youth also have more best friends who smoke, as compared to less acculturated Chinese youth. Since White adolescents smoke more on the whole than Chinese adolescents, this pattern may reflect the fact that White adolescents often have more White friends, and therefore, a higher chance of having a best friend who smokes. More highly acculturated Chinese youth are probably more likely than less acculturated Chinese youth to have a White best friend, and therefore, a best friend who smokes.

Table 6.1 reinforces the pattern described in Figure 6.1. Not only do a higher proportion of White adolescents have at least one best friend who smokes, the average White adolescent also has more best friends who smoke, as compared to the average Chinese adolescent. Again, more highly acculturated Chinese adolescents have more best friends who smoke, as compared to less acculturated adolescents, which could reflect the fact that they have more White friends (who smoke more), or more Chinese friends who smoke. The number of best friends who smoke may not be the best indication of how "surrounded" by smokers an adolescent is, the figure for percent of best friends who smoke may perhaps be a better indicator of the number of smoking friends an adolescent is exposed to, relative to nonsmoking friends.

Table 6.1

Best Friends Who Smoke

Measure:	White	Chinese		
		Overall	Hi Accult	Los Accult
Number best friends who smoke	2.61	1.21	1.69	0.78
% of best friends who smoke	32%	13%	17%	10%

Table 6.2

Those Who Would Smoke If Best Friend Offered A Cigarette
(an examination of the responses of nonsmokers)

Percent

	White (n=39)		Chinese			
Measure:			Overall (n=690)	Hi Accult (n=314)		Low Accult (n=370)
Would smoke	2.6	*	0.9	1.0	*	1.0

* none of these results are significant.

Just knowing that an individual has a best friend who smokes does not necessarily mean that the individual will start smoking. Table 6.2 presents the willingness of nonsmoking adolescents to smoke if their best friend offered it to them. Although a higher percentage of White adolescents indicated that they would be willing to smoke (2.6% compared to 0.9% for Chinese), the difference was here was not significant across race, and in each group, most of the adolescents indicated that they would be extremely unwilling to smoke.

Smoking and the Family

Table 6.3

Who Smokes in the Family

Percent

	White (of 92)		Chinese			
Measure:			Overall(n=825)	Hi Accult(n=393)		Lo Accult(n=440)
No one	51.1		62.2	64.8	*	60.0
Mom	21.7		1.5	2.3	*	0.7
Dad	30.4	*	29.6	26.2		32.7
Either parent	42.4		30.3	27.5		32.9
Both parents	9.8		0.7	1.0	*	0.8
Any sibling	8.6	*	7.0	7.6	*	6.6

* not significant at $\alpha = 0.05$ level.

Table 6.3 presents the distribution of smokers in the families of adolescents across race and acculturation level (for the Chinese). Chinese adolescents are exposed to less cigarette smoking at home. 62.2% of the families of Chinese adolescents have no smokers, as compared to 51.1% for White adolescents. There is no difference in the smoking rate among fathers of White and Chinese families, but a dramatic difference in the prevalence of smoking by mothers. 21.7% of the mothers of White adolescents smoke, compared to only 1.5% of the mothers of Chinese adolescents. This striking sex difference among Chinese parents is comparable to WHO statistics which indicated that in 1984 China, 61.0% of adult (age 15 and over) men smoked, as compared to 7.0% of adult women (World Health Organization, 1997). While there is no significant difference in the rate of maternal smoking among high and low acculturation Chinese adolescents, the fathers of less acculturated youngsters tend to smoke more than the fathers of more acculturated youngsters (32.7% compared to 26.2%), and more than the fathers of White youngsters (30.4%). The highest rate of smoking among low acculturated adult men than White men is consistent with WHO statistics indicating over 30% smoking in White adult men in 1984, as compared to 61% of adult men in China (World Health Organization, 1997).

Table 6.4

How Adolescent Feels About Smoking By Members of Household
(in households where at least one member smokes)

	Percent			
	White	Chinese		
		Overall	Hi Accult	Low Accult
Approval or not care:	30.4 *	24.6	19.2	34.2

* not statitstically significant at $\alpha = 0.05$ level.

Table 6.4 presents results showing no significant difference in the rate at which White and Chinese adolescents don't mind smoking by members of their household. Significantly, a much larger percentage of low acculturation Chinese did not mind smoking by members of their household compared to that for highly acculturated Chinese. This is in spite of the fact that the same low acculturation Chinese group has the lowest prevalence of cigarette experimentation, and their regular use of cigarettes is not significantly higher than that of the high-acculturation group.

Table 6.5

Perceived Parental Response to Adolescent Lighting Up A Cigarette

	Percent Disapproving/ Tell to Stop			
	White		Chinese	
Measure		Overall	Hi Accult	Low Accult
Mother's reaction	75.0 *	80.0	82.8 *	77.7
Father's reaction	69.7 *	75.2	77.0 *	73.6

* the differences across race and acculturation level were not statistically significant at the $\alpha = 0.05$ level.

Table 6.5 shows how adolescents think their parents would respond if they (the adolescent) lit up a cigarette in front of either parent. Though none of the results are statistically significant, the general pattern that emerges is one in which mothers tended to disapprove more often of their children's use of cigarettes, maybe because fewer of the mothers themselves smoke. The low acculturation Chinese group and the White group seem to have lower disapproval rates. Again, while the comparisons are not statistically significant, the possibility is raised that there is less perceived disapproval in these families because a higher proportion of the parents themselves smoke. The smoking role-

modeling behavior by the parents as well as a perceived lack of disapproval would seem to encourage smoking among the youth, and indeed in the White adolescents, there is an increased rate of regular use of cigarettes, and experimentation. However, it is interesting that more of the low-acculturation Chinese adolescents do not take up the smoking behavior for the same reasons.

Summary of Findings and Discussion

1. About half of White adolescents have at least one best friend who smokes, compared to just under a quarter for Chinese adolescents. More highly acculturated Chinese adolescents have at least one best friend who smokes. The average White adolescent also has *more* best friends who smoke.

2. Most of the nonsmoking adolescents (in all race and acculturation groups) would be unwilling to smoke even if a best friend offered them a cigarette. White adolescents were slightly more willing (2.6% versus 1.0%), but this was not statistically significant. I had hypothesized that Chinese adolescents would be less susceptible to the influence of peer pressure than White adolescents, since Chinese culture stressed conformity to the standards of the family/ older generations rather than that of the peer group. The hypothesis does not seem substantiated by this result.

3. More White families have at least one smoker. Approximately 30% of fathers in White and overall Chinese groups smoke, but the smoking rate among fathers in the low acculturation group is the highest (2.3% above that of Whites). Over 20% of the mothers of White adolescents smoke, compared to less than 2% of the mothers of Chinese adolescents.

4. The Chinese low-acculturation adolescents least minded smoking by members of their household; White adolescents were close behind while highly acculturated Chinese adolescents minded the most. This result was very interesting, and comparable to the result in Chapter 4, where low acculturation Chinese adolescents also minded least smoking by their peers (despite the fact that this is also the group which smokes the least). In the discussion of Chapter 4, I brought up the possibility that this group may smoke the least because they are most likely to obey their parents (they are not as entrenched in the Western ideals of individual autonomy), yet they may also be least likely to object to smoking in others (especially their parents) because culturally, it is not accepted for those of the younger generation (especially when they are still adolescents) to speak out against their parents' behaviors. The higher acculturation Chinese adolescents tend to object the most to smoking in others, perhaps because they have adopted more of the Western ideal of self-expression and autonomy. The high acculturation group's markedly increased disapproval of smoking contrasts with their only slightly increased smoking behavior; the factors that determine which aspects of Western culture acculturated Chinese adolescents take up is interesting and probably merit further study.

5. Across all racial and acculturation groups, mothers tended to disapprove more than fathers of their children's use of cigarettes. There is most disapproval in the mothers and fathers of the high acculturation Chinese group.

VII. School/Extracurricular Environment and Involvement across Race and Acculturation

Numerous researchers have proposed that personal factors such as motivation (reflected by school performance and educational aspirations), and behavioral factors (such as involvement in extracurricular activities) are associated with the development of risk-taking activities. A lack of motivation is thought to make the adolescent care less about any potential harm that could be incurred through participation in the risky behavior, and increased involvement in sports, after-school activities, and job is thought to give the adolescent a greater sense of personal efficacy and belonging to the community; it also takes up some of the time that the adolescent might have spent on risky behavior.

This chapter shows how the distribution of these putative smoking risk factors varies across race and acculturation.

School Performance and Educational Aspirations

Table 7.1

School Performance

		Percent		
	White		Chinese	
Grades in School		Overall	Hi Accult	Lo Accult
Much above average	20.0	20.7	18.6	22.1
Above average	32.2	33.4	36.6	30.8
Average	37.8	38.4	39.2	38.1
Below / much below average	10.0	7.6	5.7	8.9

Chi-2 test for distributions: difference in distribution between any two groups not significant at $\alpha = 0.05$ level. Difference between Chinese high and low acculturation groups significant at $\alpha = 0.10$ level only.

Table 7.1 presents the distribution of school performance (measured by grades) across race and level of acculturation. There was no significant difference in the distribution of grades between White and Chinese adolescents. It appears that there is a slightly higher percentage of low acculturation Chinese adolescents who get much above average grades (as compared to high acculturation), but the difference in grade distribution between Chinese adolescents of high and low acculturation was significant only at the $\alpha = 0.10$ level.

Table 7.2 presents the adolescents' educational aspirations, again stratified by race and acculturation level. There is no significant difference between the educational aspirations of White versus overall Chinese, or White and high acculturation. The educational aspirations of high acculturation Chinese actually look very similar to that of the White group. However, the low acculturation Chinese group differed significantly from the White and high acculturation Chinese group. 20% fewer of this group were definitely planning on attending 4-year college (as compared to the White and high acculturation Chinese groups), and 5% more were planning only on completing high school, trade school, or 2-year college. Over a quarter of this group did not know or had no plans.

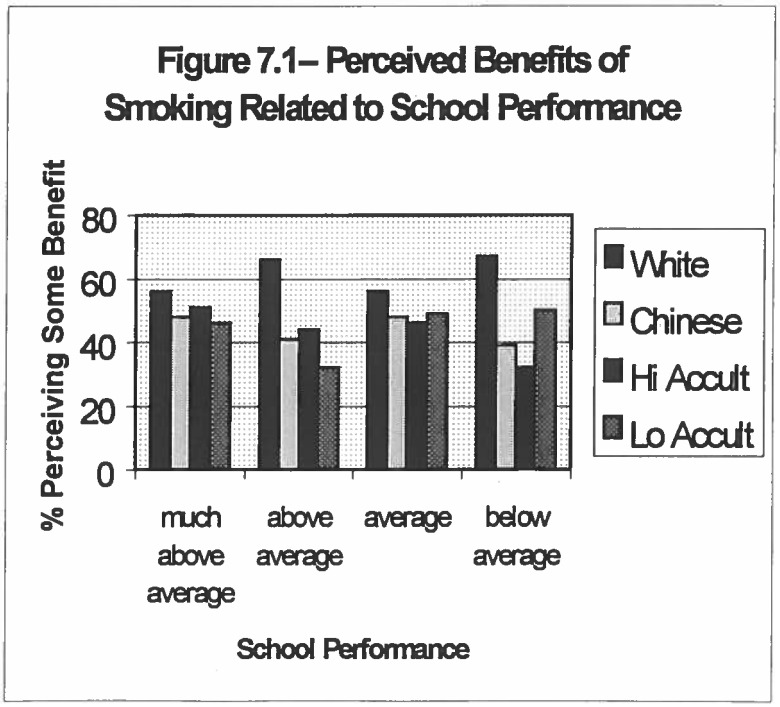
Table 7.2

Educational Aspirations

		Freq (%)		
	White		Chinese	
Educ Level Plan to Complete		Overall	Hi Accult	Lo Accult
HS /Trade School /2-yr college	7.0	9.6	6.5	11.9
4+ year college	79.0	70.4	81.6	61.2
Don't know/ no plans	14.0	20.1	12.0	27.0

Chi-2 test for distributions: no difference between White and Chinese ($p = 0.883$) or White and highly acculturated Chinese. Difference in distribution for high and low acculturation Chinese was significant ($p < 0.0005$).

Pierce *et al.* (1993) found some evidence that the perception of the advantages of smoking increased among adolescents doing less well in school. The analysis was repeated here, stratified by race and acculturation level. The results, presented in Figure 7.1, show no evidence of a relationship between school performance and perception of any benefit of smoking. Pierce *et al* had put forth the argument that teenagers who are failing to conform to conventional standards may become more favorably disposed to smoking, perceiving or projecting onto smoking such compensatory properties as stress reduction and social confidence. To test this further, the stress reduction component of the perceived benefit index was isolated, and its association with school performance was analyzed. The results are presented in Figure 7.2.



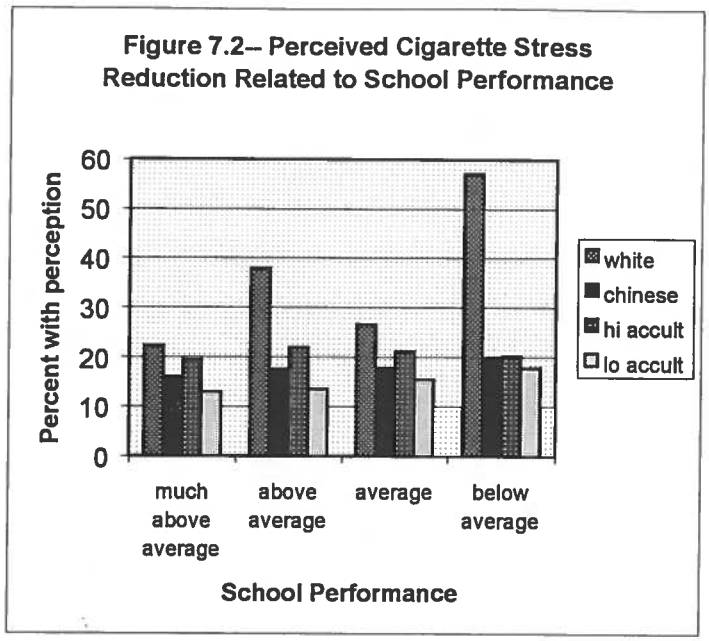


Figure 7.2 provides some support for the idea that poor school performance is associated, albeit not very strongly, with an increased prevalence of the belief that cigarette smoking helps to reduce stress. This relationship seems to be generally present in the White adolescent group, with a lot of variation; 22% of White adolescents with much above average grades thought that cigarette smoking helped to reduce stress, as compared to almost 60% of those with below average grades. The relationship is also present in the Chinese group; from the grades much above average group to the grades below average group, the percent with this perception increased from 16% to 20%. The increase is accounted for mostly by the low acculturation group, whose prevalence rates increased from 12% to 18%. Even though there is an increase, its low magnitude suggests that if Chinese adolescents who don't do well in school smoke considerably

more than those adolescents who do well in school, there are probably other factors involved in addition to the perception that cigarette smoking helps to relieve stress.

Involvement in Extracurricular Activities

Table 7.3

Involvement in Extracurricular Activities

		Percent Participating		
	White		Chinese	
Activity		Overall	Hi Accult	Lo Accult
Team sports	57.1	38.8	41.8 *	36.3
Other (student government, language, music, acting, etc.)	75.6	58.4	65.6	51.4
Job	37.0	26.0	31.2	21.4

* difference not significant at $\alpha = 0.05$ level.

Table 7.3 shows the adolescents' involvement in extracurricular activities. In team sports, job involvement, and other school and community activities, White adolescents had significantly more involvement than either of the Chinese groups. The low acculturation Chinese group had the least involvement in all activities. Though the difference in team sport involvement between high and low acculturation Chinese was not statistically significant, it is consistent with the general trend.

Spending Money

Table 7.4 presents the amount of free spending money at the disposal of each group of adolescents in this analysis. The distribution for the White and high acculturation Chinese groups are very similar with median free spending money per week in the $10 - $14 range (data not shown). The median amount of free spending money for

the low acculturation Chinese group was in the $5 - $9 range (not shown). 25% of the low acculturation group had no free spending money each week, compared to only 13.8% of high acculturation Chinese adolescents and 10.5% of White adolescents. These observations may be partially explained by the earlier results (Table 7.3) that White adolescents were most likely to have a job, and the low acculturation group least likely.

Table 7.4

Free Spending Money per Week

	Percent			
	White		Chinese	
Amount		Overall	Hi Accult	Lo Accult
None	10.5	20.0	13.8	25.1
Less than $10.00	29.1	32.3	28.1	36.5
$10.00 - $25.00	38.4	27.8	31.8	24.4
Over $25.00	22.1	20.0	26.4	14.0

Another analysis (not shown) comparing the percent of adolescents in each spending money strata who thought cigarettes were expensive showed no relationship between amount of spending money and perception of cigarettes as being expensive. This surprising result applied to all four race / acculturation groups in the analysis.

Social Support

Respondents in the survey were asked who they could talk to or go to for help if they had a serious problem. The list included 12 sources including parents, siblings, friends, other relatives, and teachers. The number of people an adolescent could turn to was used as an indication of the extensiveness of his/ her social support network. There was no significant difference across race or acculturation level. For all four groups

analyzed, the average number of sources of help listed was between 2.6 to 2.9, with standard deviations ranging from 2.1 to 2.4. Eight to 10% of the respondents in each group felt there was nobody they could turn to if they had a serious problem.

Table 7.5

Perception of Family and Friends As Significant Source of Social Support

	Percent			
	White	Chinese		
		Overall	Hi Accult	Lo Accult
Mom or dad	59.0	42.1	37.4	46.6
Friends	75.3	65.5	76.1	56.6
Siblings	36.6	35.3	39.6	31.8

Table 7.5 shows the percentage of adolescents in each group who felt they could talk to family or friends if they had a serious problem. There was a large difference of 17% between White and overall Chinese; 59% of White adolescents felt they could talk to their parents, compared to only 42.1% of Chinese adolescents overall. There was a marked difference also between that for high and low acculturation Chinese adolescents. In this case, the rate for low acculturation Chinese adolescents is closer to the rate for White adolescents. Only a little over a third of the high acculturation Chinese adolescents felt they could talk to their parents about a serious problem, compared to nearly 10% more (46.6%) in low acculturation Chinese adolescents. Approximately 20% more of the White and highly acculturated Chinese youth felt they could talk to their friends if they had problems, as compared to the low acculturation Chinese youth. The highly acculturated Chinese youth and the White youth also found it easier to talk to their siblings than did the low acculturation Chinese youth.

Summary and Discussion

1. There was no significant difference in the distribution of grades across race or acculturation level. This contradicts the "model minority" stereotype that all Asian adolescents are super-achievers academically.

2. There is no significant difference in educational aspirations between the White and high acculturation groups; however, among the low acculturation Chinese group, 20% fewer (61% compared to 80% average for the other two groups) planned on attending at least a four-year college. 15% more of the low acculturation Chinese group (27% compared to 12% for high acculturation) did not know or had no future educational plans. This lack of defined opinions / goals is reminiscent of the high rate of low acculturation Chinese adolescents who answered that they *did not know* if they had seen advertisements recently about smoking, or who did not remember if they had even been exposed to the various media forms.

3. There was no relationship between school performance and the perception of any (at least one) benefit to smoking for any race or acculturation subgroup.

4. There was a weak relationship between school performance and the perception that cigarette smoking reduces stress. This relationship was stronger for the White adolescents, weak for the low acculturation Chinese adolescents, and nonexistent for the high acculturation Chinese adolescents. Since exposure to stress has been linked to increased involvement in risk-taking behavior among adolescents, I had hypothesized that poor school performance might be a greater predictor of smoking

among Chinese adolescents than among White adolescents; the greater emphasis on academic performance placed by Chinese parents upon their children may create more stress in Chinese adolescents who don't do well in school. However, these results indicate that there is little link in Chinese adolescents between school performance and the perception that cigarette smoking helps to reduce stress. Cigarette smoking by actually be used more by White adolescents who are not doing well in school as a means to reduce stress.

5. Low acculturation Chinese adolescents had the least involvement in extracurricular activities. White adolescents had the most. This result is consistent with the general "apathy" noted for low acculturation Chinese adolescents in (2) above.

6. White adolescents were most likely to have jobs and had the most free spending money. Low acculturation Chinese adolescents were the least likely to have jobs, and also had the least amount of free spending money. The perception of cigarettes as being expensive was not correlated to the amount of free spending money the adolescents had had their disposal.

7. There was no significant difference in the number of sources adolescents in each group felt they could turn to for help if they had a serious problem. However, the most White adolescents felt they could turn to their parents, the least high Chinese adolescents had this perception. The low acculturation Chinese adolescents were least likely to turn to their friends or siblings. It is well-known that there are many, often severe, cross-cultural and cross-generational conflicts between Chinese immigrant adolescents and their parents (Joy Luck Club, personal experience). The difference between White and overall Chinese in being able to confide in their parents

may be at least partially accounted for by increased tensions in the parent-child relationship, stemming from different cultural backgrounds and different expectations. Because the less acculturated Chinese youth are less entrenched in Western culture, they might have less conflict with their parents, and therefore find it easier to confide in their parents than do their more highly acculturated counterparts. In addition, Chinese culture places a strong emphasis on respect and unconditional obedience to those of older generations. This "gap" might make it harder for Chinese youth to be able to confide in their parents. This is consistent with the findings in previous chapters that highly acculturated Chinese adolescents who don't smoke are more likely to disapprove of their parents' smoking, whereas less acculturated Chinese adolescents tend to be more accepting or not to mind.

VIII. Risk Factors Associated with Experimentation and Regular Use of Cigarettes, Across Race and Acculturation

In this chapter, many of the proposed risk factors for smoking (many described in earlier chapters) will be examined for their (univariate) association with cigarette experimentation and regular smoking. In particular, it is important to determine whether the risk factors differ, or have different degrees of association with the smoking behaviors, across racial and acculturation levels.

Measures of Smoking Behavior

Studies of the development of smoking addiction typically divide this period into a sequence of distinct behavioral stages based on regularity and frequency of smoking. According to this model, one who is initially experimenting with cigarettes may increase consumption consistently until he/she reaches a stable plateau (Stern, 1987; Chassin, 1990). It has been suggested that the period immediately after first experimentation serves as a learning stage in which the adolescent slowly develops a sense of the personal uses and pleasures of cigarette smoking, before accomplishing the transition to full-time smoking status (Salber, 1968; Pierce, 1992). As a consequence, different factors may be involved in experimentation and regular use of cigarettes.

It makes sense, therefore, that a single definitive measure of adolescent smoking prevalence is inadequate. In this study, I propose to use the following indicators of smoking prevalence:

a) Ever smoked a whole cigarette, to assess prevalence of experimentation.

b) Regular smoking, to assess the development of a smoking habit. There were possible ways in which to define "regular smoker." The prevalence using two of these alternatives is given in Table 2.1, in which "regular smoker" is defined as smoking a few times/week or more, or a few times/ month or more. I chose to use the more inclusive definition (a few times/ month or more) in this study. This is more consistent, although still slightly more stringent, than the definition adopted by numerous studies carried out using data from the 1992 National Health Interview Survey, in which "smokers" were defined as those who smoked cigarettes on 1 or more of the 30 days preceding the survey (*e.g.*, Lowry *et al.*, 1996). In addition, numerous researchers have demonstrated that regular adolescent smokers on the whole smoke far less than the regular adult smokers that they become, so that smoking scales for adolescents should be adjusted accordingly (Castro *et al.*, 1987).

Because the prevalence of smoking experimentation and regular smoking is likely to differ by age and sex, and the distributions of age and sex is not equal across the White and Chinese groups (Table 2.2), it would probably be more appropriate to compare the Chinese and White groups in stratified analyses. However, due to the small number of White adolescents in the sample, and the small percentage of Chinese regular smokers, I did not stratify across these variables, because there would then be too few smokers in each category to give meaningful results. Therefore, the possibility of confounding by age and sex exists in these analyses.

Putative Risk Factors / Influences on Smoking Behavior

The social learning theory will provide the framework under which potential risk factors for both experimentation and regular smoking will be grouped in this analysis. Social learning theory posits that the individuals' susceptibility to perform a particular behavior is based on three types of factors that often interact with each other in complex ways:

a) *Personal influences*, such as motivations, level of personal control, and personal beliefs about the costs and benefits of smoking, sense of isolation/ belonging to society.

b) *Environmental influences*, such as those in the individual's environment who model the behavior, societal norms and rules relating to the behavior, exposure to advertising, accessibility of the means to the behavior (eg accessibiltiy to cigarettes).

c) *Perceived social environment, normative influences.* Normative influences can come from parents, the general peer group, or the individual's best friends.

d) *Behavioral influences*, such as experimentation with other forms of risk-taking behavior (e.g. substance use), and involvement in jobs and extracurricular activity.

A. Personal Influences

The final decision to accept a cigarette, to experiment with it, or to start smoking regularly is a personal one made by the individual. While this decision may be primarily mediated by an adolescent's expectations of the advantages or disadvantages of smoking, other less immediate aspects of the adolescent's personal situation may enhance or distort their perceptions of smoking.

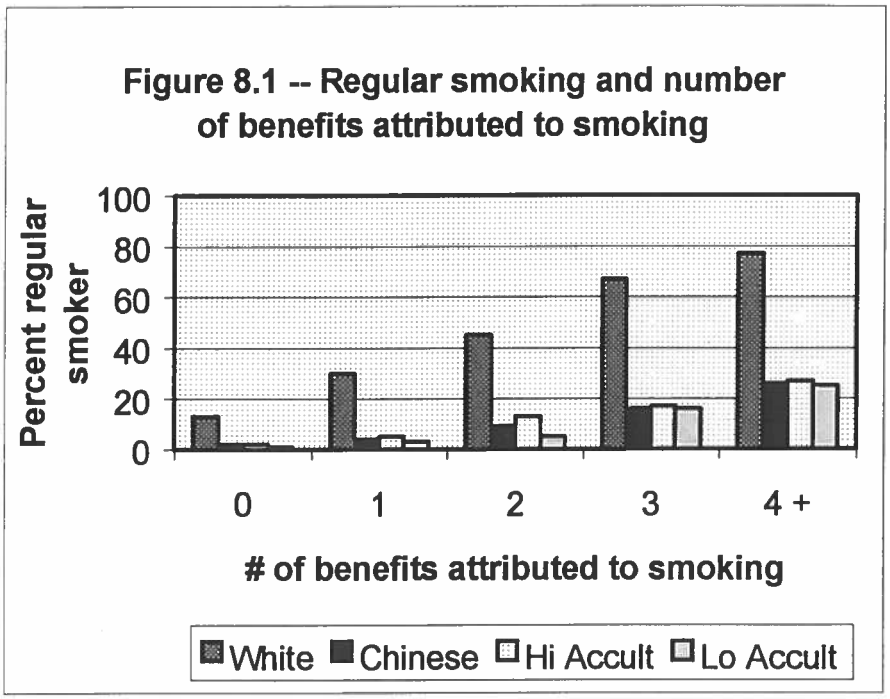
Developmentally, adolescence has long been acknowledged to be a particularly stressful and confusing time. During this period, individuals begin to take charge of their own lives and strive for autonomy, yet often do not have the cognitive and social resources to easily effect this transition. The transition may be especially difficult for Chinese adolescents who, additionally, must cope with the constraints of a culture that perceives individual autonomy as dangerous and a threat to tradition and to the stability of the community. This conflict often causes anxiety, depression, and a move towards "adult" behaviors that may help the adolescent to sustain an illusion of maturity. Since smoking is illegal for adolescents, it often falls into this "adult" behavior category.

Perceived Benefits of Smoking

The adolescent's cognitive appraisal of the costs and benefits of smoking, especially across race and acculturation level, have already been evaluated in Chapter 4.

Table 4.2 showed that 58% of White adolescents and 45% of Chinese adolescents of both high and low acculturation perceived some benefit to smoking. 16% of white

adolescents and nearly 9% of Chinese adolescents perceive four or more benefits to smoking. Figure 8.1 shows how perceiving advantages to smoking affects the regular use of cigarettes (defined as smoking more than a few times per month). The perception of benefits was strongly associated with the regular use of cigarettes. As the number of perceived smoking benefits increased from zero to three, the percentage of White adolescents smoking regularly increased five-fold from 15% to over 75%, and the number of Chinese adolescents smoking regularly increased nine-fold, from . Even among adolescents who saw only one advantage to smoking, there was over a two-fold higher rate of regular cigarette use as compared to those who saw no advantages; this increase applied to both White and Chinese adolescents.



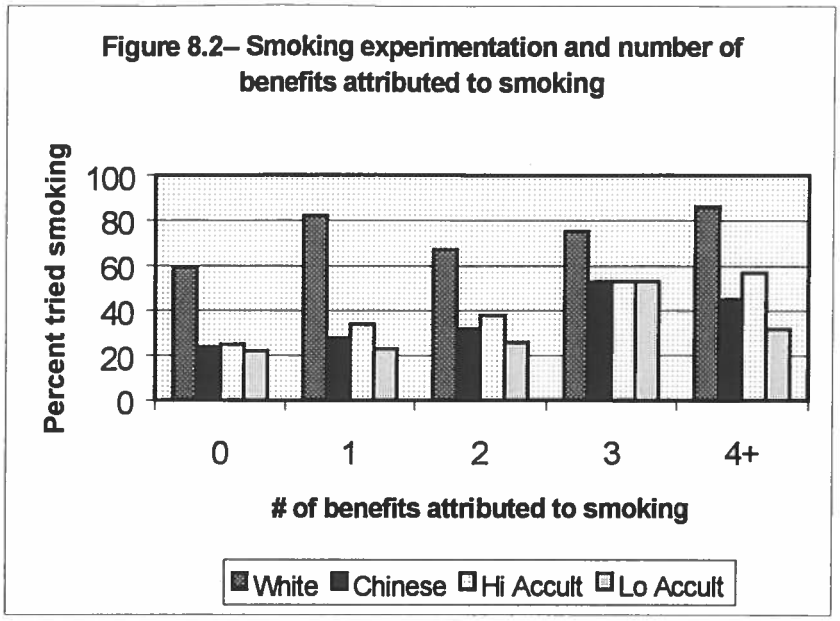
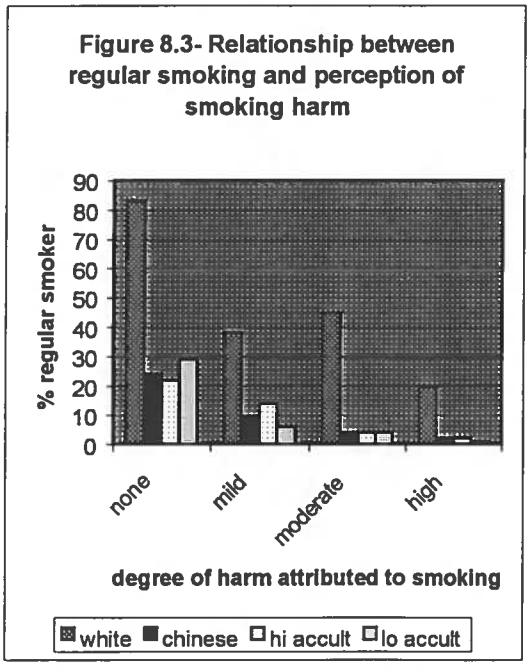


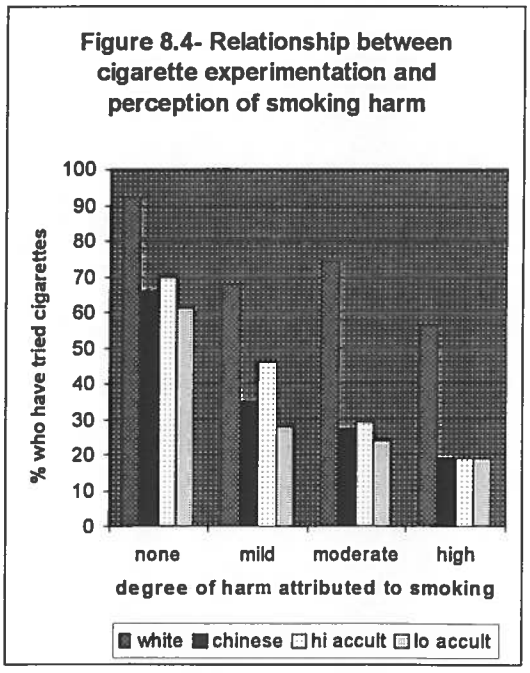
Figure 8.2 shows how the perception of advantages to smoking affects the number of adolescents who experiment with smoking. The perception of benefits is not as strongly associated with experimentation as it is with regular cigarette use. For White and Chinese adolescents of high and low acculturation, there is a general increase in the percentage who have tried smoking as the number of benefits attributed to smoking increases. The association is stronger for Chinese than for White adolescents. As the number of benefits attributed to smoking increased from zero to 3, the number of White adolescents who have experimented with smoking increased 1.3-fold from 60% to 77%, while the number of Chinese adolescents who have experimented increased 2.4-fold from 23% to 55%. At 3 benefits, it seems as if those who would experiment have already done so, and the percentage of experimenters has "maxed out." Increased perception of benefits past this point does not seem very strongly associated with increased experimentation; there is even a (possibly spurious) decrease seen on the graph. The

trend for high and low acculturation Chinese is similar, though at each number of benefits attributed to smoking, a higher proportion of the highly acculturated group has actually experimented with smoking.

Perceived Costs of Smoking: Safety of Experimentation

The youth survey showed that that 44% of white adolescents and 58% of Chinese adolescents were not aware that experimentation with cigarettes could lead to habituation. 40% of White adolescents and 27% of Chinese adolescents did not think that there was any harm in having an occasional cigarette. Figures 8.3 and 8.4 show as the knowledge of the harm and addictiveness of cigarette experimentation and smoking increased, the rate of both regular smoking and experimentation declined.





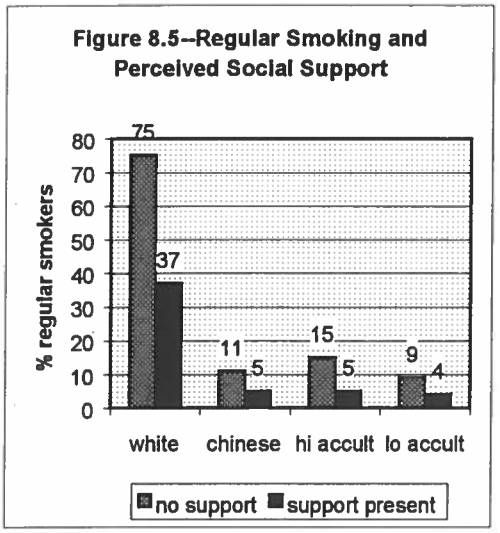
Degree of harm scale is the same as that used in Chapter 4. Scale runs from 0 –6
Mild harm : 1-2 degrees of harm
Moderate harm: 3-4 degrees
High: 5-6 degrees

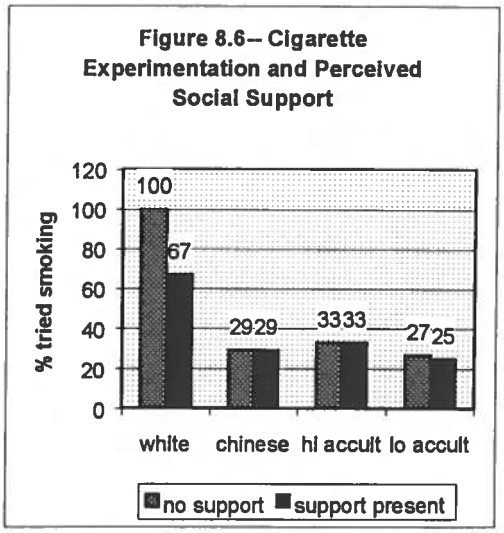
At each degree of harm attributed to smoking, there were more White regular smokers and experimenters than Chinese, reflecting the higher prevalence of White regular smokers cigarette experimenters in general. The reduction in smoking behavior was more regular and dramatic for Chinese adolescents (of either acculturation level), than for White adolescents. As the perception of harm increased from none to a high level, the percentage of White regular smokers dropped four-fold, from over 80% to just 20%. For Chinese overall, the percentage of regular smokers dropped ten-fold, from 24% to just over 2%.

Although an increased degree of harm was also associated with a lower rate of experimentation with cigarettes, the effect was not as great as that seen with regular smoking. This is in agreement with the results shown in Figures 8.1 and 8.2 above, in which increased perception of benefits attributable to smoking resulted in a more dramatic increase in regular use of cigarettes than in cigarette experimentation. For White adolescents, only 3/5 as many adolescents who thought cigarettes were very harmful had tried smoking, as compared to those who thought there was no harm in smoking. For Chinese adolescents, the effect was more dramatic—there was a 66% reduction in the rate of cigarette experimentation among adolescents who thought cigarettes were very harmful as compared to those who thought there was no harm.

Perceived Social Support

It has been proposed that those adolescents who feel more marginalized by society may be more likely to undertake "risky" or deviant behaviors, both because they feel less bound by conventional forms of socialization, and also because it may offer an escape or alternative release from their problems.





Social support was assessed in the Youth Survey by asking adolescents who they could turn to if they had a serious problem (see Chapter 4). Figures 8.5 and 8.6 show the relationship between regular cigarette use and experimentation, by whether the respondent felt he/she had any source of social support. For both White and Chinese adolescents, lack of any social support (or the perceived lack of a social support network) correlated with an increase in regular use of cigarettes. White adolescents with no social support had a two-fold increase in rate of regular cigarette use; this was comparable to the increase seen in low acculturation Chinese adolescents, but high acculturation Chinese adolescents had a three-fold increase in regular cigarette use when there was no social support network. Figure 8.6 shows that lack of a social support network was associated with cigarette experimentation for White, but not Chinese adolescents. All the

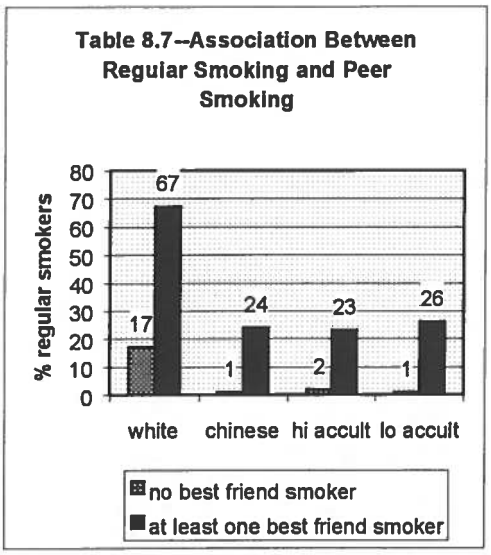
White adolescents with no perceived social support network had tried smoking, compared to only 67% who have at least one source of social support; there was no difference in the rate of cigarette experimentation for Chinese adolescents.

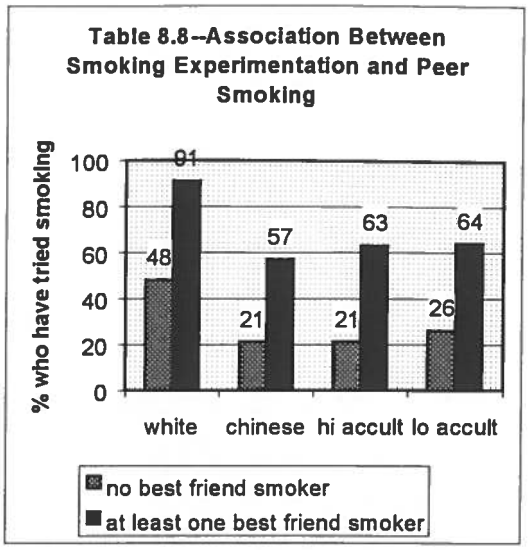
B. Environmental Influences

The Influence of Peer Smokers

Fifty percent of White adolescents, and 24% of Chinese adolescents have best friends who smoke. Peer smoking has been identified as one of the strongest predictors of adolescent smoking in White youth. It is important to determine whether this relationship holds true also for Chinese youth, and if acculturation level affects the impact of peer smoking on either/ both experimentation with or regular use of cigarettes.

Figures 8.5 and 8.6 show the influence of peer smokers on the adolescent regular use of cigarettes and experimentation with smoking, for each race and acculturation grouping. There was a marked increase of both regular smoking and experimentation when adolescents reported that their best friends smoked. Among adolescents who had best friends who smoked, there was a 4-fold increase in regular cigarette use among White adolescents, and a 10 to 20-fold increase in Chinese adolescents. There was also a marked, though less dramatic increase in the proportion of adolescents who have tried smoking. White adolescents who have a best friend who smoke have nearly double the rate of cigarette experimentation, and Chinese adolescents have 2.5 to 3 times the rate. There does not seem to be any significant difference in the amount of influence exerted by peers among high and low acculturation Chinese.

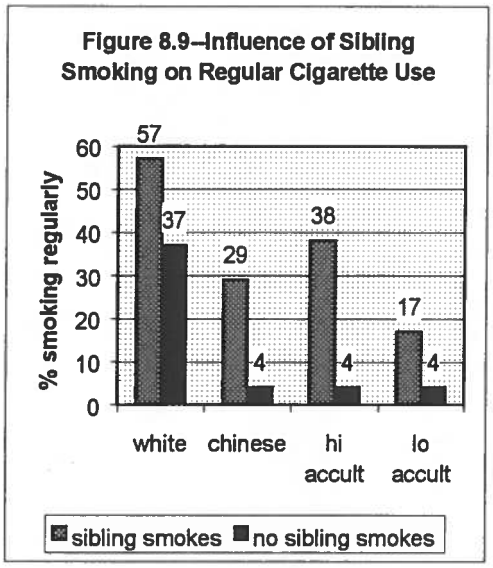


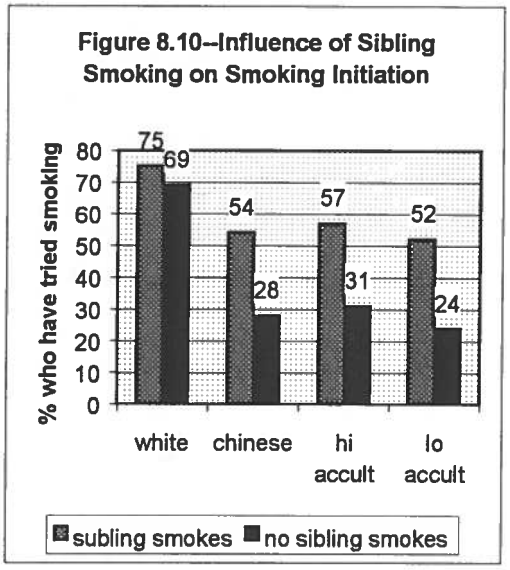


Due to the cross-sectional nature of this study, it is impossible to infer causality. There at least two ways to interpret the association between having a best friend who smokes and smoking behavior in the adolescent: 1) The adolescent is subject to peer pressure. Having a best friend who smokes makes the adolescent more likely to be put in a situation where he will be offered a cigarette, or feel pressured to smoke; or 2) The adolescent who smokes is more likely to associate with others who smoke, either because of a common interest or possibly for support. The two alternatives cannot be differentiated without a longitutidal cohort study. However, because many of the adolescents who have tried smoking did not continue on to become regular smokers (and therefore would be less likely to specifically seek out other smokers), alternative (2) presented above is probably less likely for the experimentation with cigarette group, and the association between cigarette experimentation and having a best friend who smokes is more likely to reflect peer pressure or influence.

Influence of Sibling Smoking

8.6% of White adolescents and 7% of Chinese adolescents have at least one sibling that smokes. Figures 8.9 and 8.10 demonstrate the influence of sibling smokers on adolescent regular smoking and experimentation with cigarettes.





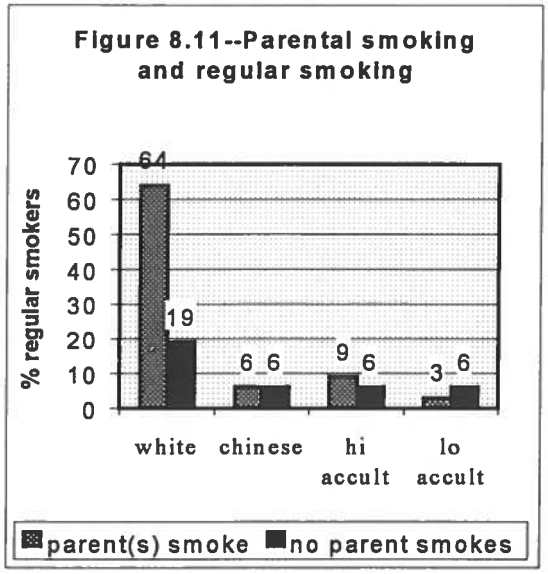
Adolescents were classified into two groups, those with a sibling smoker and those without a sibling or whose sibling did not smoke. As shown, both adolescent experimentation with and regular use of cigarettes increased significantly with exposure to sibling smokers. The rate of regular smoking increased 1.5 fold in White adolescents (from 37% to 57%), over 9-fold in highly acculturated Chinese adolescents (from 4% to 38%), and 4-fold in low acculturation Chinese adolescents (4% to 17%). The influence of a sibling smoker on regular smoking seems to be twice as great in highly acculturated Chinese as in low acculturation Chinese, and in either Chinese group, the effect is greater than that in White adolescents.

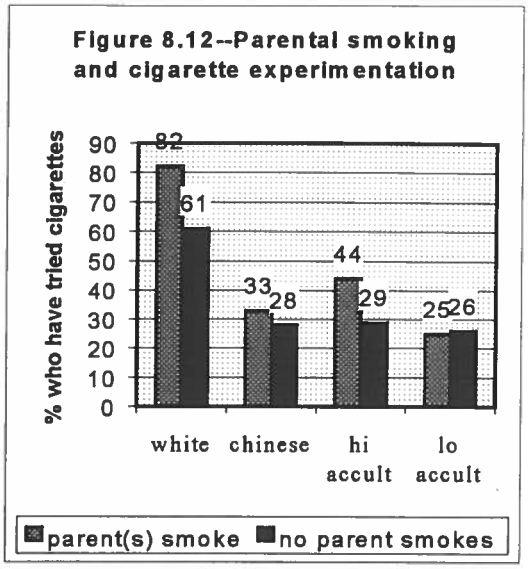
Consistent with the analyses of benefit and harm perception of cigarette smoking above, sibling smoking has a weaker association with cigarette experimentation than with regular smoking. There is not a significant effect for White adolescents, possibly because so many White adolescents with siblings who smoke have already tried smoking; most of the susceptible individuals may already have tried smoking. There is about a two-fold increase in rate of experimentation with cigarettes for those Chinese adolescents who have a sibling who smokes; there is not a significant difference across acculturation level.

Again, it is important to remember that due to the cross-sectional nature of this study, it is impossible to infer causality. An individual could experiment or smoke regularly because of influence from a sibling, but it is also possible that siblings respond similarly (use of cigarettes) to the same conflicts and tensions around them (e.g. in the family, in dealing with cross-cultural conflict, or the stress of acculturation).

Influence of Family Structure and Smoking By Parents

Figures 8.11 and 8.12 present the effects of parental smoking status (one or both parents smoke) on the percentage of adolescents engaging in regular use of cigarettes and on the percentage who have tried cigarettes. As shown, the presence of a parent who smoked significantly increased the chance that a White adolescent would become a regular smoker—the risk increased over 3-fold, from 19% to 64%. Having at least one parent smoke also increased the risk that the White adolescent would try cigarettes at some point, from 61% to 82%.

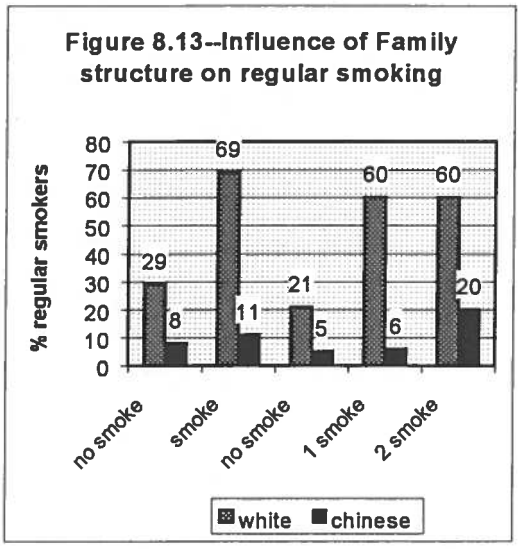


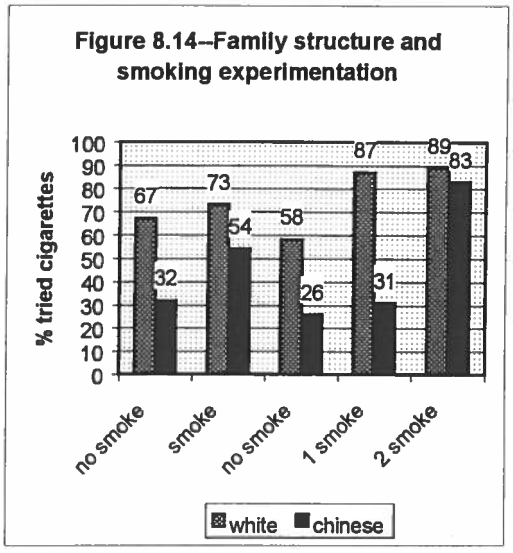


In marked contrast to the 20-fold increase in regular smoking rates seen in Chinese adolescents when a best friend smokes, or the 7-fold increase when a sibling smokes, parental smoking was significantly associated with only a modest 1.5-fold increase in regular smoking rates among highly acculturated Chinese youth (from 6 to 9%), but there was no significant association for the low acculturation group. Having a parent who smokes also significantly increased the proportion of those in the highly acculturated Chinese group who have experimented with cigarettes—again, this increase is more modest than the effect seen for peer or sibling smoking, and there was no significant effect seen for the low acculturation group.

Some studies of family influence have suggested that teenagers who come from single parent families are more likely to smoke than teenagers in two parent families, although the evidence for this effect has not been consistent (Hundleby *et al.*, 1987; Pierce *et al.*, 1993). To use the youth survey data to explore this possibility, and also the

possibility that youths exposed to families in which both parents are smokers may be more susceptible to smoking themselves, the data on regular smoking and experimentation were stratified by family structure, and within each family structure, by whether zero, one, or two parents smoke. The results are presented in Figures 8.13 and 8.14.





The data in figure 8.13 verifies the previous observation that having at least one parent who smokes increases the chance that the adolescent is a regular smoker or has experimented with cigarette smoking. For Chinese adolescents, the probability of being a regular smoker or having experimented with cigarettes increases as the number of parents who smoke increases. Family structure does seem to have an effect on adolescent smoking prevalence—with zero or one parent who smokes, there is a higher prevalence of both regular smoking and trying cigarettes in the single parent household group. However, the prevalence of both regular smoking and trying cigarettes increases markedly when both parents smoke in a two-parent household. The rate of regular

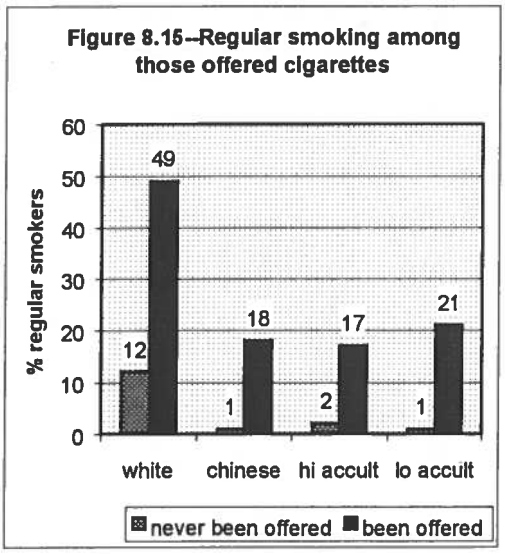
smoking increases from 6% to 20% from 1 to 2 parents smoking in a two-parent household, and the rate of cigarette experimentation increases from 31% to 83%. So when both parents smoke in a two-parent Chinese household, the effect on adolescent smoking is much greater than if the single parent in a single-parent household smoked.

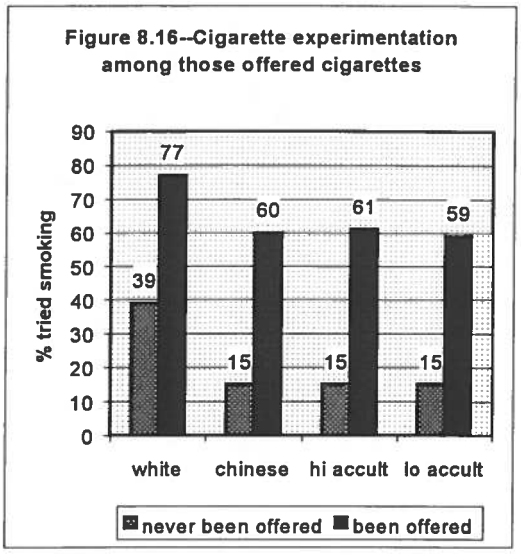
The data for White adolescents is less consistent. Having at least one parent smoke is definitely associated with an increase in the rate of regular smoking, but in two-parent households, whether or not the other parent smokes does not seem to have any significant effect either on prevalence of regular smoking or smoking initiation. This is in marked contrast to the extremely large effect exerted by the second smoker in two-parent Chinese households.

Ever Been Offered A Cigarette

Figures 8.15 and 8.16 indicate, by race and acculturation level, the association between ever having been offered a cigarette and the proportion of adolescents who became regular smokers and who have experimented with cigarette smoking. In each race and acculturation level, having been offered a cigarette was extremely predictive of smoking behavior. White adolescents who have been offered cigarettes were 4 times more likely to be regular smokers, and Chinese adolescents were 18 times more likely to be regular smokers. Again, as with the other risk factors studied, there is a weaker, but still significant association between having ever been offered a cigarette and experimentation with smoking. White adolescents who have been offered a cigarette were twice as likely to have experimented with smoking as Chinese adolescents. It is

important to keep in mind that the association between having been offered a cigarette and becoming a regular smoker or an experimenter may not be a causal one. For example, youth who are more susceptible to smoking and who don't have strong anti-smoking feelings in the first place may associate more with youth who smoke, and therefore put themselves in the situation to be offered cigarettes more often. There may be other, more complex relationships involved as well.





C. Normative Influences

Norms refer to the codes established by society to communicate to members which behaviors are acceptable to the group. Individuals are thought to respond to normative pressure either because of the social rewards available to those who conform to group standards, or because the norm has been internalized by the individual. Group norms for a behavior are manifested in various ways, most obviously through the

expression of disapproval or approval for the behavior. Parents and peers are held to be the key sources of health behavior norms for adolescents.

Adolescence is typically classified as a time of increasing conformity to peer norms and a reduction in the influence of family norms. However, the relative importance of peer and family norms is likely to vary with the behavior and across different subgroups of adolescents.

I decided to analyze the normative influence of three groups on adolescent smoking: best friends, general peer group, and parents. The strength of normative opposition to smoking among these three groups is presented in Table 8.1.

Table 8.1

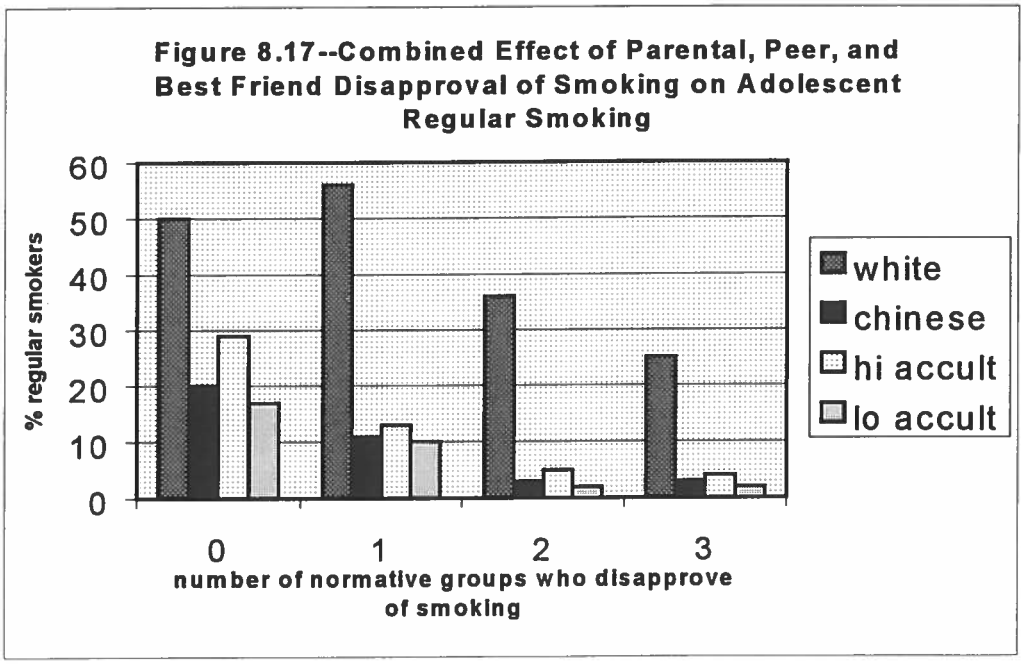
Prevalence Of antismoking norms among:

	Percent			
		Chinese		
	White	Overall	High Accult	Low Accult
Best friends	78.2	79.2	83.5	76.1
Peer group	43.0	61.5	61.1	62.5
Parents	53.8	62.0	65.1	59.0

Best friend norms were assessed by asking adolescents how their best friends would feel about their smoking, and if any of friends who smoke ever say they should quit smoking. A response of "they would not approve" for the first question, or "Yes" for the second question was taken as an indication of some antismoking norm among best friends.

General peer norms on smoking was assessed by asking whether the adolescent agreed with the statement "Kids do not want their friends to smoke." An agreement constituted perception of an antismoking norm among the general peer group.

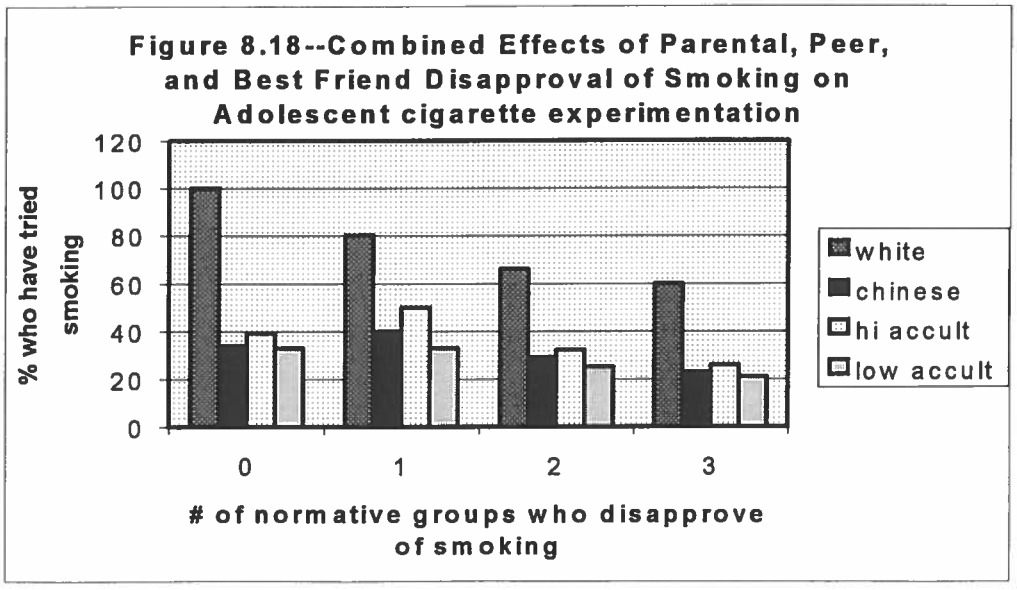
Parental norms on smoking was assessed by asking the adolescent: 1) whether parent(s) would be upset if he/she lit up a cigarette in front of him/her/them, and 2) whether the parents would mind if the child smoked when he/she got older. A response of disapprove/tell the child to put out the cigarette to the first question or disagreement to the second question (the parents would mind) was interpreted as perception of an antismoking norm among parents.



Altogether, 22/93 (23.7%) of White adolescents surveyed were able to report that neither their parents, nor their best friends, nor their peers in general would approve if they smoked. 3/ 93 (3.2%) reported a lack of disapproval among all three groups.

Among the Chinese overall, 312/ 843 (37%) reported that none of the three normative groups would approve if they smoked. A slightly higher than the White 3.2% but statistically insignificant 7% reported a lack of disapproval among all three groups.

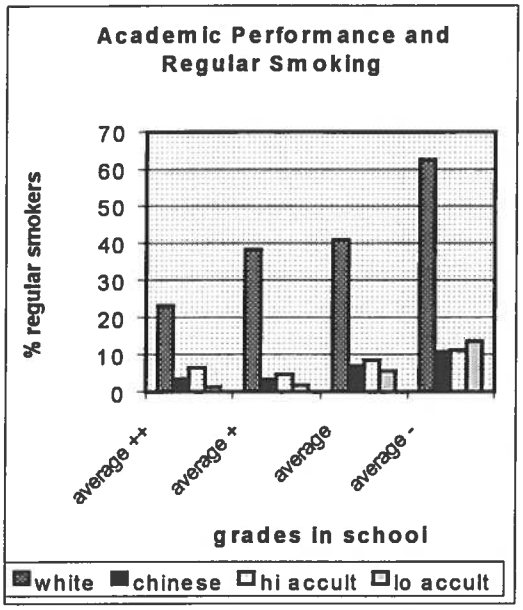
The combined effect of parental norms, general peer norms, and best friend norms on adolescent regular smoking and experimentation with smoking is presented in Figures 8.17 and 8.18. When there is no normative support for smoking (all three groups disapprove), only 25% of Whites and 2.8% of Chinese adolescents were regular smokers. When all three groups had norms that were somewhat supportive of smoking, then 50% of White adolescents and 20% of Chinese adolescents became regular smokers. The pattern among high and low acculturation Chinese is similar, though at each normative disapproval level, a higher number of highly acculturated Chinese smoke. The same general trend is observed for experimentation with cigarette smoking.

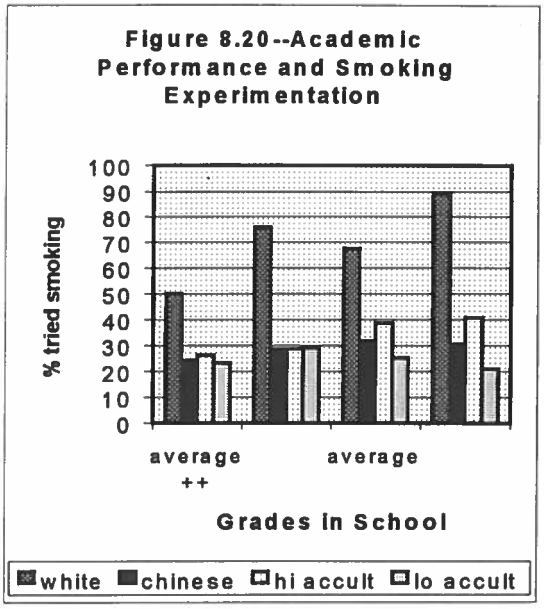


D. Behavioral Influences

Academic Performance

Poor academic performance has been identified in previous studies as risk factors for both smoking experimentation and regular cigarette use. It is thought that those who do not perform as well in school may turn to cigarette smoking for stress relief because they would like to be doing better, or because they are not motivated to succeed in "conventional" ways—and turn to cigarette smoking just because it is "different," risky, or not as acceptable.





Average ++ : much above average grades
Average + : above average grades
Average : average grades
Average -- : below average grades or much below average grades.

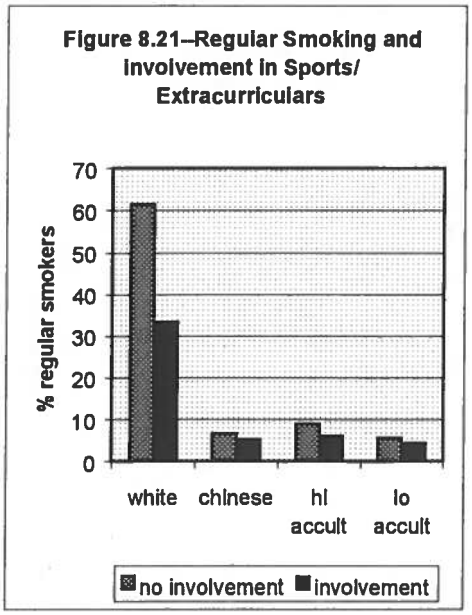
Figures 8.19 and 8.20 demonstrate demonstrate the relationship between academic performance (in terms of grades received in school) and smoking behavior. Poorer levels of school performance are associated with progressively increasing rates of regular smoking for the White adolescents and each acculturation subgroup of Chinese

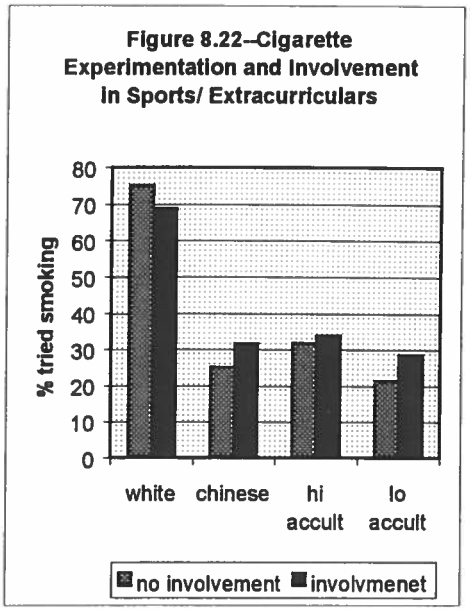
adolescents. For White adolescents, those who had below average performance in school had 2.6 times the regular smoking rate as those who received much above average grades in school, 62% compared to 24%. In Chinese adolescents, there was a similar association—those who had below average performance in school had 3.1 times the regular smoking rate as those who received much above average grades (3.4 compared to 10.7%). However, the lumping of the Chinese groups obscures the fact that higher acculturation group had less than a 2-fold increase in rate (6.4% to 11.1%) while the lower acculturation group had over a 10-fold increase in rate of regular smoking (1.2% to 13.5%). Thus, poor school performance has a much more marked association with regular smoking in the low acculturation Chinese group than in the other groups. Poor school performance was not associated with cigarette experimentation, however, in the low acculturation Chinese group whereas it had a smaller and more variable association (compared to the association with regular cigarette use) for the White and high acculturation Chinese subgroups.

In Chapter 7, I examined the relationship between school performance and the perception that cigarette smoking reduces stress; the results showed the association was stronger for low acculturation Chinese than for high acculturation Chinese—this may account for the observation here that poor school performance in low acculturation Chinese is more highly associated with regular cigarette use. There was a stronger relationship in Chapter 7 for White adolescents (compared to Chinese adolescents) between school performance and the perception that cigarette smoking reduces stress; however, school performance is not as strongly associated with cigarette smoking in White adolescents as in the low acculturation Chinese group—this may be because poor

school performance does not cause White adolescents as much stress as in Chinese adolescents, so they are less likely to turn to regular cigarette smoking for this reason.

Participation in team sports or other community/ school activities





Figures 8.21 and 8.22 demonstrate the relationship between involvement in team sports and other extracurricular activities and smoking behavior. In all groups, involvement with extracurricular activities or team sports was associated with a lower rate of regular cigarette use. This effect was much more pronounced in the White group, who had nearly a 50% reduction in the rate of regular smokers; the effect was also stronger in the high acculturation Chinese group (33% reduction) than in the low acculturation group (21% reduction), suggesting that a similar underlying mechanism may be involved as that in the White adolescents. It may be that those who participate more in structured activities like extracurriculars and team sports experience more of a

sense of belonging to the community, and more connection with traditional forms of socialization, so that they are less likely to have free time or the inclination to use cigarettes regularly.

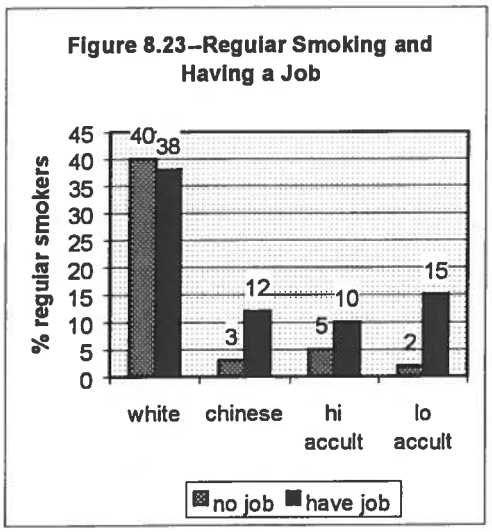
While involvement in extracurricular activities was also associated with a small decrease (albeit statistically insignificant, but the trend is worth considering) in rate of smoking experimentation in White adolescents, it was actually associated with a small but consistent *increase* in rate of smoking experimentation in Chinese adolescents, and the increase was more significant for the low acculturation Chinese group. I propose the following explanation: Chinese adolescents seem to be far more sheltered than their White counterparts. They have less exposure to the media, participate far less in extracurricular activities, jobs, and team sport, and have fewer best friends who smoke (results from previous chapters). For those who participate in team sports and extracurricular activities, this might even be the only venue through which they are exposed to other adolescents who smoke cigarettes, so that the increased rate of experimentation seen with involvement in extracurriculars does not necessarily reflect some characteristic of those who participate in these activities, but merely an increase in exposure. These activities may give the Chinese adolescents a greater sense of community, however, so that they are less likely to become regular users of cigarettes. This idea is supported by the observation that White adolescents who participate in extracurricular activities and team sports have a lower rate of experimentation with cigarette smoking—because this group seems less sheltered in general, these activities serve as less of a means of exposure to smoking, and those who would have experimented would have done so already before.

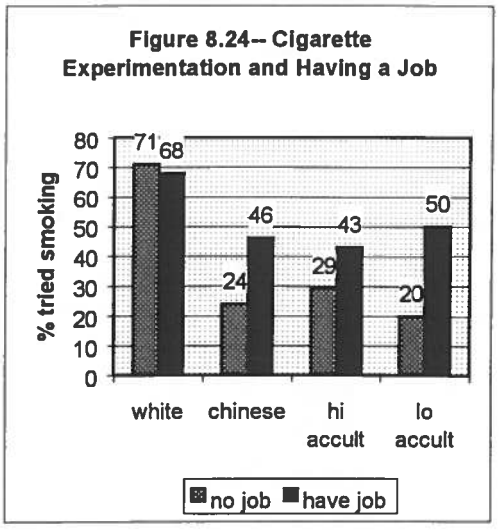
Holding a Job and Amount of Free Spending Money

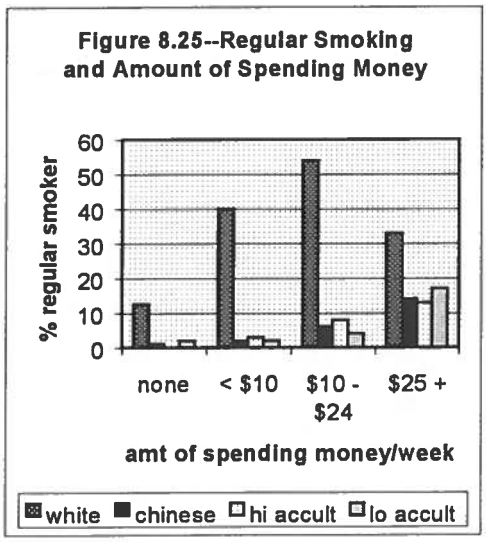
Having a job and greater amounts of free spending money would be expected to increase the rate of regular smokers by increasing the accessibility of cigarettes, making them more affordable. Considering cost alone, having a job may not lead to increased rates of just trying cigarettes, since many adolescents who try cigarettes just a few times do not buy their own, but rather take it from their parents or get offered by their friends. For Chinese adolescents, having a job may increase the rate of cigarette experimentation and regular use because it may give them a sense of independence and self-efficacy apart from their parents, making them less inclined or less willing to "blindly" obey their parents (who would generally disapprove of their smoking).

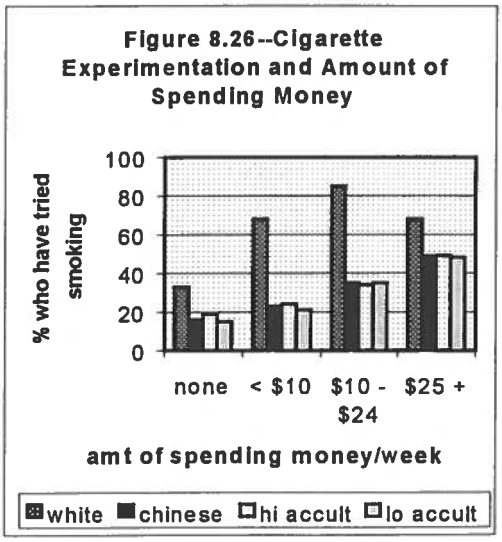
Figures 8.23 and 8.24 present the association between having a job and smoking behavior, while Figures 8.25 and 8.26 present the association between the amount of free spending money and smoking behaviors. For the White adolescents, having a job was not associated with either regular smoking or having tried smoking; in fact, there was a slight (possibly spurious) *decrease* in the rate of both regular smoking and cigarette experimentation in those who have had jobs. Having a job was associated with a 2-fold increase in regular smoking in high acculturation Chinese, and a 7-fold increase in low acculturation Chinese. It was associated with a 1.7-fold increase in cigarette experimentation in high acculturation Chinese, and a 2.5-fold increase in low acculturation Chinese. For all race and acculturation groups, there was an increase in both regular smoking and cigarette experimentation with increasing amounts of spending

money (though for the White group, this effect seemed to peak in the $10 to $24 /week range.









It makes sense that having more spending money would be associated with higher rate of regular smoking and smoking experimentation, because it makes cigarettes more affordable, and that there is more of an association between amount of spending money

and regular smoking (compared to cigarette experimentation). However, I would have expected even less of an association between spending money and cigarette experimentation. Part of the problem may be that the 'ever tried cigarettes' category included both regular smokers and those who had experimented with cigarettes at some point, but had stopped (see Conclusion for further discussion). Also, the observation that just having a job (in itself, without regard to the amount of free spending money) is not associated with increased smoking in White adolescents, but is associated with significant in smoking in Chinese adolescents suggests that having a job may have effects that promote cigarette use and experimentation other than just increasing the amount of spending money (such as increasing the adolescents' sense of independence from his/ her parents). Another potential explanation is that even without a job, White adolescents have enough spending money or ways to get cigarettes that they don't need the extra money that a job would confer in order; Chinese adolescents have less spending money on average than White adolescents, so having a job may be the only way they can get access to cigarettes.

Summary and Discussion

1. In both races and across both Chinese acculturation groups, regular use of cigarettes and experimentation with smoking were generally correlated with the number of benefits attributed to smoking. The relationships were stronger for regular use than for experimentation. In White adolescents, there was only a small and variable

increase in the percent who had tried smoking as the number of benefits attributed to smoking increased.

2. In both races and across both Chinese acculturation groups, regular use of cigarettes and experimentation were inversely correlated with the degree of harm attributed to smoking. Again, the effect was more dramatic for regular smoking than for experimentation, and more pronounced for Chinese than White adolescents.

3. Lack of a social support network was associated with at least a two-fold greater rate of regular cigarette smoking in both White and Chinese adolescents, but it was associated with an increased rate of cigarette experimentation only in White adolescents.

4. Having at least one best friend or a sibling who smokes was associated with a dramatic increase in the rate of regular smoking in both White and Chinese adolescents. It was associated with a less dramatic but still 2 to 3-fold increase in rate of smoking experimentation among all the groups. It makes sense that there is a stronger and more consistent association between the various risk factors and regular smoking, as compared to smoking experimentation. Trying a cigarette is often-times a random, spontaneous decision to accept a cigarette when it is offered, or to smoke when a cigarette happens to be around. Regular cigarette use is a more deliberate process, and one would expect it to be influenced more by logical risk factors.

5. Parental smoking is associated with over a 3-fold increased rate of regular cigarette use among White adolescents, but not with any significant change in regular smoking rate in Chinese adolescents. It is associated with a 33% increase in cigarette experimentation in White adolescents, and a 50% increase in cigarette

experimentation in high acculturation Chinese adolescents, but not with any change in experimentation rates in low acculturation Chinese adolescents. The increase in adolescent smoking with increased parental smoking probably is a "role model" effect. The lack of association of parental smoking with any form of smoking in low acculturation probably also reflects the fact that many of the parents (fathers) are telling the adolescents one thing (not to smoke) but are modeling something entirely different. The low acculturation Chinese group may heed what their parents *say* more than emulate what they *do*. The high acculturation Chinese group, as discussed in previous chapters, are caught in more of a conflict between theWestern ideal of autonomy and the Chinese ideal of filial piety and conformity to standards. They may experiment with cigarettes more, thinking that if their parents smoke, there is no reason they shouldn't try even if their parents disapprove; however, their parents strong disapproval may become more important during their consideration of whether or not to become a regular smoker.

6. In each race and acculturation level, having been offered a cigarette was extremely predictive of smoking behavior—whites were 4 times more likely to become regular smokers, and Chinese adolescents 18 times more so. There is a weaker, but still significant association between having been offered a cigarette and experimentation with smoking.

7. For each race and acculturation level, an increased number of normative groups who disapprove of smoking was associated with decreased rate of regular smoking and experimentation. The association was stronger for regular smoking.

8. Poorer academic performance was associated with an increased rate of regular cigarette smoking in all groups, but especially in the low acculturation Chinese adolescents. The results were just the opposite for smoking experimentation—poorer academic performance was associated with an increased rate of smoking experimentation in all *but* the low acculturation Chinese adolescents.

9. Involvement in team sports and extracurricular activities is associated with a decreased rate of regular smoking in White and Chinese groups (most marked for White, least for Chinese low acculturation). Involvement in these activities is associated with a slightly decreased rate of cigarette experimentation in White groups, but with an *increase* in rate of cigarette experimentation in Chinese adolescents; this effect was most marked for the Chinese low acculturation group.

10. Increased amount of spending money was associated with increased regular smoking and experimentation with cigarettes in White and Chinese groups. However, just having a job alone was *not* associated with increased smoking behavior in White adolescents, but there *was* an association in Chinese adolescents, especially in the low acculturation group.

IX. Logistic Regression of Smoking Behaviors on Risk Factors

Chapter 8 investigated the univariate association between smoking behaviors (regular smoking and experimentation with cigarettes) and various risk factors. Useful as univariate analyses may be for identifying associations between a given smoking behavior and a single putative risk factor; they ignore the interaction of risk factors with each other and the possibility that once one risk factor is taken into account, other highly associated factors may then become less important, or negliglible predictors of cigarette experimentation or regular smoking. A logistic regression analysis was done with interaction terms for race and acculturation with various other predictor variables, but this analysis yielded insignificant results (data not shown), possibly because there weren't enough total White adolescents or Chinese smokers to provide adequate power for the analysis. A loglinear analysis was also performed (see Appendix D) to assess the effect of various risk factors on smoking behavior across race and acculturation divisions, but the results also were not significant.

Stepwise multivariate logistic regressions of the smoking behavior indicators were performed without interaction terms, but separately for each race and acculturation division, in order to determine the independent predictors of regular smoking and cigarette experimentation in each group. The responses and putative risk factors used are as follow:

Binary Response Variables

- whether the subject is a regular smoker, smoking at least a few cigarettes/month (yes/no)
- whether the subject has ever tried smoking (yes/no)

Putative Risk Factors

Personal

- whether cigarette smoking has any benefits
- whether cigarette smoking has any harm
- perceived social support / how isolated the adolescent feels from society
- educational aspirations (four year college or above)

Environmental

- any friends who smoke
- father smokes
- mother smokes
- sibling smokes

Normative

- number of normative groups which disapprove of cigarette smoking

Behavioral

- job
- spending money over $10 /week
- participation in extracurriculars / team sports
- above average grades in school (binary variable yes/no)

The results of the logistic regression analyses are presented in Table 10.1 (Regular smoking) and Table 10.2 (Cigarette Experimentation).

Table 10.1

Logistic Regression of Regular Smoking

	Adjusted Odds Ratio (95% CI)			
Variables	Whites (n = 64)	All Chinese (n = 734)	C – hi accult (n = 340)	C- lo accult (n = 387)
Personal				
Any perceived benefits	7.2 *	6.7 ***	9.6 **	9.5 **
Perceived moderate/ hi harm		0.4 *	0.3 *	
Perceived social support		0.2 ***	0.3 *	0.2 *
Educational aspirations (want to go to at least 4-yr college)				
Environmental				
Any best friends who smoke	11.4 **	28.1 ***	30.9 ***	66.5 ***
Father smokes	10.1 *			
Mother smokes				a
Any sibling smokes		8.4 ***	20.7 ***	
Normative				
Total normative groups which disapprove of smoking				
Behavioral				
Have job	0.24 *			
Spending money over $10/wk				
Participation in extracurriculars/ team sports			0.2 *	
Above average grades in school				
Percent total variance explained	40.3%	44.8%	49.8%	46.1%

Note: those who used to smoke but have since quit are eliminated from this analysis.

* significant at 0.05 level

** significant at 0.005 level

*** significant at 0.0005 level

[a] the mother's smoking predicts regular smoking perfectly for low acculturation Chinese adolescents and was dropped from the rest of the analysis for this group.

Table 10.1 shows that once all thirteen putative risk factors above are taken into account, the number of independent predictors of smoking behavior drops to five or less for each group. The perception of any benefits to smoking was an important predictor across all groups. Chinese adolescents who thought there was at least one benefit to smoking were nine times as likely to be regular smokers, and White adolescents who thought there was at least one benefit to smoking were 7.2 times as likely to be regular smokers. It is unfortunate that the cross-sectional nature of the survey does not allow

determination of causality—it is difficult to say whether perception of benefits *leads* to regular smoking, or that once adolescents start to smoke, they tend to rationalize to justify their habit. The perception of a moderate or high degree of harm of cigarette smoking was significantly associated with reduced levels of regular smoking only in the high acculturation Chinese group. These results suggest that cross-cultural smoking intervention programs might be more effective in focusing on dispelling notions of benefits to smoking rather than focusing on the harm.

Table 10.2

Logistic Regression of Smoking Experimentation

	Adjusted Odds Ratio (95% CI)			
Variables	Whites (n = 84)	All Chinese (n =837)	C – hi accult (n =393)	C- lo accult (n =438)
Personal				
Any perceived benefits		1.5 **	2.0 **	
Perceived moderate/ hi harm		0.5 ***	0.4 **	
Perceived social support	a			
Educational aspirations (want to go to at least 4-yr college)				
Environmental				
Any best friends who smoke	20.9 ***	3.8 ***	6.6 ***	2.5 **
Father smokes			1.8 *	
Mother smokes				
Any sibling smokes		2.5 *	2.4 *	
Normative				
Total normative groups which disapprove of smoking				
Behavioral				
Have job	0.3 *	2.3 ***		2.8 ***
Spending money over $10/wk	6.2 *			1.9 **
Participation in extracurriculars/ team sports				
Above average grades in school				
Percent total variance explained	31.7%	13.7%	18.6%	10.6%

* significant at 0.05 level

** significant at 0.005 level

*** significant at 0.0005 level

[a] since this variable predicted cigarette experimentation in White adolescents perfectly, it was dropped from the logistic analysis of the other variables.

Peer smoking was an even stronger predictor of regular smoking than perception of benefits. It was associated with a 66.5 times increased odds that a low acculturation Chinese adolescent would be a regular smoker. While this seems to dispel the hypothesis that Chinese adolescents would be less influenced by peer smokers, it is difficult again to infer a causal relation, and the association may simply reflect the possibility that low acculturation Chinese smokers are most likely to seek out other smokers for support. Perception of a social support network was associated with lower rate of smoking in Chinese adolescents only, while a father's smoking habit was associated with regular smoking only in White adolescents; the lack of influence of parental smoking on Chinese smoking may be explained by the fact that Chinese adolescents are more likely to do as their parents say and not necessarily to do as their parents do.

For smoking experimentation, again the strongest predictor was having any best friends who smoke. Again, it is impossible to infer a causal relation. However, the odds ratios here show a different pattern than for regular smokers. For cigarette experimentation, White adolescents who have any best friend who smokes are most likely (20.9 times as likely) to have tried cigarettes, with low acculturation Chinese adolescents only 2.5 times as likely, and high acculturation Chinese adolescents at an intermediate level. Because individuals are more likely to try cigarettes because of peer pressure, and those who have tried cigarettes are less likely to seek out other smokers for support than are regular smokers, these trends seem to support the idea White adolescents

are more susceptible to peer pressure in trying cigarettes, but that of those who become regular smokers, Chinese adolescents (especially those of low acculturation) are more likely to seek out other peer/ adolescent smokers for support.

Having a job and spending money was positively correlated with low acculturation Chinese adolescents' experimentation of cigarette smoking. While having spending money was also associated with White adolescent's experimentation of cigarettes, just the fact of having a job seemed to be protective in White adolescents (see discussion of this effect in Chapter 8). It is interesting that even though having a job/ spending money would seem to be associated more with regular smoking (by conferring a source of income with which to obtain cigarettes), these factors are actually associated more with cigarette experimentation.

High acculturation Chinese adolescents seem to be more influenced by their parents' smoking behavior when it comes to experimentation with cigarettes. Having a father who smokes or a mother who smokes is positively correlated with cigarette experimentation in this group, but not in the White or low acculturation Chinese groups. It may be that the high acculturation group is more willing to go against authority, and less willing to accept unquestioningly their parents' message that the kids shouldn't smoke, but that it is okay for the parents to do so.

The perception of benefits of harm was not an important predictor in smoking experimentation except in the high acculturation Chinese group. This group may think more logically about the risks and benefits of behaviors before they undertake them. Significantly, the odds ratios here are much smaller than for regular smoking—it makes

sense perception of the benefits or harms of a "risky" practice would become more important factor in deciding whether to make the behavior a regular practice versus just trying it a few times.

Forty to 50% of the variance in regular smoking across all the groups was accounted for by the stepwise logistic regression analysis. 32% of the variance in White cigarette experimentation was accounted for, but only 10.6% of the variance for low acculturation Chinese adolescents. It is to be expected that less of the variance for experimentation would be accounted for, since the decision to try a cigarette once or a few times is inherently a much more random process than the decision to become a regular smoker.

These figures suggest that many more risk factors may be involved in regular smoking and initiation than those accounted for in this analysis. The fact that only a very small portion of the variance in low acculturation Chinese cigarette experimentation was accounted for may mean that for this group especially, there are other factors related to culture and acculturation that have yet to be considered.

X. Conclusion

In this study, many interesting differences and similarities were found in smoking behaviors, attitudes, and risk factors between White and Chinese adolescents, and among Chinese adolescents, between those of high and low acculturation. For the most part, these results have been summarized at the end of Chapters 3 to 8, and will not be repeated here.

The fact that differences do exist in smoking behavior patterns, risk factors, and attitudes and beliefs has important implications for public health research and administration of smoking intervention programs. The San Francisco Bay Area has an extremely diverse population base, and in many areas it is impossible to cater smoking intervention programs to each individual ethnic group. However, certain areas (e.g. San Francisco Chinatown) have a relatively homogeneous minority population, and it would make sense in these areas that public health workers do not simply write down a set of risk factors identified on studies of White adolescent populations, but rather do some research first to determine whether those risk factors even apply, or if they do apply, whether they are associated as strongly to smoking in the minority population.

Many interesting associations were uncovered in this study, but there were also some aspects which could be better addressed by further studies.

The cross sectional nature of the study posed many problems. It was possible to find and examine correlations, but impossible to say anything about causality. This was illustrated by the difficulty of interpreting the high odds ratio of regular smoking with

having any best friend who smokes—does peer pressure make an adolescent more likely to smoke, or does an adolescent who already smokes tend to associate more with others who smoke?

There was an inadequate number of adolescents from other races. The study was designed mainly to examine the smoking behavior of Chinese adolescents, but if it had been feasible to make this a larger study, there would have been a better basis for comparison across more racial groups.

The age distribution of adolescents in the study was not even across the White and Chinese races, and within the Chinese race, by acculturation level. This posed a problem because age became confounded with race and acculturation level. The low acculturation Chinese group smoked the least, and the White adolescents smoked the most, but it was difficult to say how much of this difference was due to the fact that the low acculturation group was also the youngest, and the White adolescents were also the oldest. Because of the small number of White adolescents in the study and the paucity of Chinese smokers, it was impossible to stratify the groups additionally by age without reducing the counts in each cell so severely as to make the numbers subject to random fluctuation.

I did not find as much difference as I had hoped to find between the risk factors for cigarette experimentation versus regular use. Part of the problem was definitional. When I defined experimenters as those who had ever tried smoking, it included the regular smokers too. Because there was overlap between the regular users and experimenters (as I defined them), it may have obscured any differences between those who had just tried cigarette smoking a few times but who had never become regular

smokers. Also, more distinct difference may have been uncovered by defining the smoker category more stringently (eg a few cigarettes or more/ week); however, the sample was not large enough to do this analysis, and it was not consistent with the 'regular smoker' definition used in other youth smoking studies. It may have been worthwhile to examine the characteristics of those who had smoked regularly (over a few times/ month) for a while but had since quit. There were not enough people in the quitter category in this survey to do this analysis.

The acculturation definition was arbitrary. I made a division that would give me two groups with large enough numbers of smokers in each group to do an analysis. It is possible there are important differences between the very low acculturation group and the somewhat low acculturation group, for example, that were obscured by my lumping of them together into one group.

Despite the shortcomings of this study and analysis, I think it is an important first step to understanding the interplay between culture and smoking behavior because to date, there has not yet been a published study in the literature describing the smoking patterns of Chinese adolescents in the United States.

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Appendix A

HEALTH SURVEY

FOR OFFICE USE ONLY: DATE_____ SCHOOL CODE:_____

The following are questions about you and cigarette smoking. We are asking many students in the San Francisco Bay Area these questions. It is important for you to be thoughtful and honest in your answers.

Please DO NOT put your name anywhere on this booklet. Only researchers will be allowed to read your answers. This is a voluntary survey.

FOR EACH QUESTION THAT PROVIDES ANSWER BOXES, PLEASE MARK YOUR ANSWER WITH A CHECK (√)

SECTION A: About you and your cultural background

1. What grade are you in now?

   grade #_____

2. Are you a boy or a girl?

   ☐ male
   ☐ female

3. How old are you now?

   years old:_____

4. In what country were you born?

   ☐ USA
   ☐ China
   ☐ Hong Kong/Taiwan
   ☐ Japan/Korea
   ☐ Mexico
   ☐ Philippines
   ☐ Vietnam/Cambodia/Laos
   ☐ Other

5. If you were born in a country outside of the U.S., how old were you when you came to live in this country?

   ☐ I was born in the U.S.

   Age when I came to live in the U.S.:_____

6. Which of the following ethnic groups best describes you? PLEASE MARK ALL THAT APPLY

   ☐ White
   ☐ Black
   ☐ Chinese
   ☐ Japanese
   ☐ Korean
   ☐ Filipino
   ☐ Vietnamese/Cambodian/Laotian
   ☐ Hispanic/Latino
   ☐ Other

1

7. What language do you usually speak at home?

- ☐ Only English
- ☐ Mostly English
- ☐ English and another language about equally
- ☐ Mostly another language
- ☐ Only another language

8. In what language do you usually think?

- ☐ Only English
- ☐ Mostly English
- ☐ English and another language about equally
- ☐ Mostly another language
- ☐ Only another language

9. What language do you usually read?

- ☐ Only English
- ☐ Mostly English
- ☐ English and another language about equally
- ☐ Mostly another language
- ☐ Only another language

10. What language do you usually speak with your friends?

- ☐ Only English
- ☐ Mostly English
- ☐ English and another language about equally
- ☐ Mostly another language
- ☐ Only another language

11. Do you celebrate the following holidays by:

a. Receiving presents at Christmas?

- ☐ Yes
- ☐ No
- ☐ Don't know

b. Eating turkey on Thanksgiving?

- ☐ Yes
- ☐ No
- ☐ Don't know

c. Receiving pocket money in a red envelope during Chinese New Year?

- ☐ Yes
- ☐ No
- ☐ Don't know

12. What kind of food do you <u>mostly</u> eat at home?

- ☐ American or Western
- ☐ Asian
- ☐ Asian and American (Western) both equally
- ☐ Other
- ☐ Don't know

SECTION B: Smoking Behavior

The following set of questions is about cigarette smoking. PLEASE ANSWER EVERY QUESTION EVEN IF YOU HAVE NEVER SMOKED OR DO NOT SMOKE AT PRESENT.

13. Have you ever tried or experimented with cigarette smoking, even a few puffs?

- ☐ no
- ☐ yes

14. How old were you when you smoked your first whole cigarette?

- ☐ I have never smoked a whole cigarette

I smoked my first whole cigarette at age: _____

15. Have you smoked at least 100 cigarettes in your life?

- ☐ no
- ☐ yes
- ☐ don't know

16. How much do you smoke now?

- ☐ I have never smoked
- ☐ I have stopped smoking
- ☐ A few times a month
- ☐ A few times a week
- ☐ A few times most days
- ☐ About half a pack per day
- ☐ A pack or more per day

17. How many cigarettes in total have you smoked in the past 30 days?

- ☐ None
- ☐ Only one puff or part of one cigarette
- ☐ One cigarette
- ☐ 2-10 cigarettes
- ☐ 11-20 cigarettes
- ☐ More than 20 cigarettes

18. How many cigarettes altogether have you smoked in the past 7 days?

- ☐ none
- ☐ only one puff or part of one cigarette
- ☐ one cigarette
- ☐ 2-10 cigarettes
- ☐ 11-20 cigarettes
- ☐ more than 20 cigarettes

19. How may cigarettes have you smoked in the past 24 hours?

- ☐ none
- ☐ only one puff or part of one cigarette
- ☐ one cigarette
- ☐ 2-10 cigarettes
- ☐ 11-20 cigarettes
- ☐ more than 20 cigarettes

20. Have you tried to quit smoking in the last six months?

- ☐ I have never smoked cigarettes
- ☐ I did not smoke cigarettes in the past 6 months
- ☐ I did not smoke enough to think about quitting
- ☐ No, I did not try to quit
- ☐ Yes, I tried to quit

21. Where do you usually get cigarettes? PLEASE MARK ALL THAT APPLY TO YOU.

- ☐ I do not smoke cigarettes
- ☐ From friends, with or without asking
- ☐ From relatives, with or without asking
- ☐ From home, with or without asking
- ☐ From vending machines
- ☐ From a small store, such as a 7-Eleven, gas station or Quik-Stop
- ☐ From large store, such as supermarkets
- ☐ Free samples from shopping malls
- ☐ Mailed samples

22. Do you think you will be smoking cigarettes one year from now?

- ☐ Definitely yes
- ☐ Probably yes
- ☐ Definitely not
- ☐ Probably not
- ☐ Don't know

23. Have you ever been offered cigarettes?

- ☐ No
- ☐ Yes
- ☐ Don't know

24. If one of your best friends were to offer you a cigarette, would you smoke it?

- ☐ Definitely yes
- ☐ Probably yes
- ☐ Definitely not
- ☐ Probably not
- ☐ Don't know

25 Have you ever asked someone not to smoke?

- ☐ No
- ☐ Yes

26. How many times in the last 30 days have you asked someone not to smoke?

- ☐ None
- ☐ Once
- ☐ 2 to 10 times
- ☐ 11 or more times

27. Have you ever tried chewing tobacco or snuff?

- ☐ No
- ☐ Yes
- ☐ Don't know

28. Are you now a regular user of chewing tobacco or snuff?

- ☐ No
- ☐ Yes
- ☐ Don't know

SECTION C: Beliefs About Smoking and Health

FOR EACH STATEMENT PLEASE INDICATE WHETHER YOU STRONGLY AGREE, AGREE, DISAGREE, STRONGLY DISAGREE OR DON'T KNOW

	Strongly agree	Agree	Disagree	Strongly Disagree	Don't Know
29. I would rather date people who don't smoke.	☐	☐	☐	☐	☐
30. If I started to smoke cigarettes regularly, I could stop smoking anytime I wanted	☐	☐	☐	☐	☐
31. Cigarette smoking helps reduce stress	☐	☐	☐	☐	☐
32. When I am older my parents won't mind if I smoke cigarettes.	☐	☐	☐	☐	☐
33. Cigarettes are expensive.	☐	☐	☐	☐	☐
34. Cigarette smoking helps people feel more comfortable at parties and in other social situations.	☐	☐	☐	☐	☐
35. I personally don't mind being around people who are smoking cigarettes.	☐	☐	☐	☐	☐
36. Cigarette smoking can help people when they are bored.	☐	☐	☐	☐	☐
37 There is no harm in having an occasional cigarette.	☐	☐	☐	☐	☐
38. Smoking cigarettes makes young people look more grown-up.	☐	☐	☐	☐	☐
39. Kids do not want their friends to smoke cigarettes.	☐	☐	☐	☐	☐
40. Cigarette smoking helps people to keep their weight down.	☐	☐	☐	☐	☐
41 Cigarette smoking helps people to relax	☐	☐	☐	☐	☐

SECTION D: Cigarette Smoking by Family and Friends

The following questions are about smoking habits of your family and friends, your attitudes toward their smoking and their attitudes toward your smoking.

42. How many people live in your home now, including yourself?

Number:_____

43. Which of the following people live in the same home with you?
PLEASE MARK ALL THAT APPLY

- ☐ Father
- ☐ Mother
- ☐ Older brother(s)
- ☐ Older sisters(s)
- ☐ Younger brother(s)
- ☐ Younger sister(s)
- ☐ Other adults
- ☐ Other children

44. Among those living with you now, who are the ones who smoke cigarettes?
PLEASE MARK ALL THAT APPLY

- ☐ No one smokes at home
- ☐ Father
- ☐ Mother
- ☐ Older brother(s)
- ☐ Older sisters(s)
- ☐ Younger brother(s)
- ☐ Younger sister(s)
- ☐ Other adults
- ☐ Other children

45. How do you feel about smoking by members of your household?

- ☐ No member of my household smokes
- ☐ I approve of their smoking.
- ☐ I don't approve of their smoking.
- ☐ I don't care whether they smoke or not.

46. If you lit up a cigarette in front of your father, how do you think he would react?

- ☐ I don't have a father
- ☐ Tell me to stop
- ☐ Disapprove but not tell me to stop
- ☐ Not care if I smoke
- ☐ Approve of my smoking
- ☐ Don't know

47. If you lit up a cigarette in front of your mother, how do you think she would react?

- ☐ I don't have a mother
- ☐ Tell me to stop
- ☐ Disapprove but not tell me to stop
- ☐ Not care if I smoke
- ☐ Approve of my smoking
- ☐ Don't know

48. About how many best friends do you have that are male?

☐ I don't have any best friends who are male.

Number of male best friends:_____

49. Among your best friends that are male, how many of them smoke?

☐ I don't have any best friends who are male.

Number of male best friends who smoke:_____

50. About how many best friends do you have that are female?

☐ I don't have any best friends who are female

Number of female best friends:_____

51. Among your best friends that are female, how many of them smoke?

☐ I don't have any best friends who are female.

Number of female best friends who smoke:_____

52. How would your best friends feel about your smoking?

☐ I don't have any best friends
☐ I don't smoke
☐ They would not care
☐ They would approve
☐ They would not approve
☐ I don't know whether they would approve or disapprove

53. Do any of your friends who smoke ever say that they should quit smoking?

☐ I don't have any friends who smoke
☐ Yes
☐ No
☐ I don't know

SECTION E: Media Exposure

The following set of questions is about what you have seen or heard about smoking recently.

54. During last week, did you see or hear anything good or bad about smoking cigarettes?

a) on the television?
- ☐ Yes
- ☐ No
- ☐ Don't know
- ☐ Did not watch television

b) in newspapers or magazines?
- ☐ Yes
- ☐ No
- ☐ Don't know
- ☐ Did not read newspapers or magazines

c) on the radio?
- ☐ Yes
- ☐ No
- ☐ Don't know
- ☐ Did not listen to radio

d) on billboards or posters?
- ☐ Yes
- ☐ No
- ☐ Don't know
- ☐ Did not see billboards or posters

55. Think back to the cigarette advertisements you have recently seen. What brands of cigarettes were advertised most often?

PLEASE MARK ALL THAT APPLY

- ☐ Marlboro
- ☐ Salem
- ☐ Merit
- ☐ Winston
- ☐ Benson and hedges
- ☐ Kool
- ☐ Camel
- ☐ Vantage
- ☐ Newport
- ☐ Pall Mall
- ☐ Kent
- ☐ Virginia Slims
- ☐ Others
- ☐ Don't know

SECTION F: School, Job and Alcohol Use

The following questions are about school, activities outside of school, jobs and alcohol use.

56. What grades do you usually get in school?

- ☐ Much better than average
- ☐ Better than average
- ☐ Average
- ☐ Below average
- ☐ Much below average

57. In the past year have you participated in any kind of team sports?

- ☐ No
- ☐ Yes
- ☐ Don't know

58. In the past year have you participated in any other activities, e.g, language club, student government, choir, music, theater acting, church activities or community activities?

- ☐ No
- ☐ Yes

59. Does your school allow students to smoke cigarettes on school property?

- ☐ No
- ☐ Yes
- ☐ Don't know

60. Have you ever taken a class or course at school in which health risks of smoking were discussed?

- ☐ No
- ☐ Yes
- ☐ Don't know

61. If you had a serious problem, whom could you talk to or go to for help? PLEASE MARK ALL THAT APPLY

- ☐ Nobody
- ☐ Father or Step-father
- ☐ Mother or Step-mother
- ☐ Guardian
- ☐ Brother(s) or Step-brother(s)
- ☐ Sister(s) or Step-sister(s)
- ☐ Other relatives
- ☐ Friends
- ☐ Teacher
- ☐ School counselor
- ☐ Priest or Minister
- ☐ Someone else
- ☐ Don't know

62. How many drinks of beer, wine or liquor have you ever had in your whole life? (1 beer = 1 glass of wine = 1 drink of liquor)

- ☐ I have never had even one sip
- ☐ Only sips
- ☐ Part or all of one drink
- ☐ 2 to 10 drinks
- ☐ 11 to 20 drinks
- ☐ 21 or more drinks

63. How many drinks of beer, wine or liquor have you had in the last 30 days? (1 beer = 1 glass of wine = 1 drink of liquor)

- ☐ None
- ☐ Only sips
- ☐ Part of all of one drink
- ☐ 2 to 10 drinks
- ☐ 11 to 20 drinks
- ☐ 21 or more drinks

64. Do you have a paying job?

- ☐ No
- ☐ Yes

65 About how much money do you have each week to spend on yourself any way you want?

- ☐ None
- ☐ Less than $5.00
- ☐ $5.00 - $9.00
- ☐ $10.00 - $14.00
- ☐ $15.00 - $24.00
- ☐ $25.00 - $49.00
- ☐ $50.00 or more
- ☐ Don't know

66 What is the highest level of education that you plan to complete?

- ☐ I do not have any plans for my future education.
- ☐ High School
- ☐ Trade school
- ☐ 2 year college
- ☐ 4 year college or beyond
- ☐ Don't know

THANK YOU FOR YOUR PARTICIPATION.

Appendix B

Smoking and Passive Smoking Patterns in Chinese Americans Project

March 23, 1992

Dept of Epidemiology
and Biostatistics
School of Medicine
University of California
San Francisco, CA 94143-0560
Telephone: (415) 476-0744
(415) 476-0743

Sponsoring Organizations:
UCSF, School of Medicine
Bay Area Cancer Coalition
California Public Health
Foundation

Advisory Committee
Kenneth Chang, M.D.
- Chinese Community Smoke-Free Project
Michael Jang, M.A.
-Asian American Health Forum
Rod Lew, M.P.H.
-Asian Health Services in Oakland

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Gerardo Marin, Ph.D.
Rena Pasick, Dr. P.H.
Peggy Renolds, Ph.D.
Dee West, Ph.D.

Project Coordinator:
Florence Lee, M.P.H.

Supported By:
California Tobacco Related
Disease Research Program

Dear Parent or Guardian:

Dr. Marion Lee of the University of California is conducting a study at your child's school to learn more about the kinds of health instruction that will reduce tobacco use among middle and high school students. The State of California is funding this research as part of their effort to reduce tobacco-related illness. This project has the full support of Mr. Herbert Chan, Principal of Francisco Middle School.

Students will be asked to fill out a survey that will take about 15 minutes to complete. The survey will be given to students during Science class. The questions we will ask include the following: the use of tobacco products, attitudes related to smoking and health, media exposure to smoking and cigarette advertising, school performance, alcohol use.

The participation in this study is entirely voluntary. Your child has the right to decide not to participate and can do so by telling his/her teacher. The individual student information will be kept confidential. Names will not appear on the questionnaire. You will not have any access to your child's response to this survey.

The information gathered in this study will provide a better understanding of the health and smoking habits among youths in the San Francisco Bay Area, and will be used to plan health promotion programs for youth in the Bay Area.

We hope your child will take this opportunity to help their peers improve their health. If you have any questions about this study, you may call Dr. Lee at 415-476-0744. If you do not want your child to participate, please sign your name on the bottom of this letter and have your child return it to his/her teacher. If you do not return this letter, this will imply your consent for your child's participation in this study.

Sincerely,

Mr. Herbert Chan
Principal
Francisco Middle School

Marion Lee, Ph.D.
Principal Investigator
Approval No. H6442-05859-02

I do not want my child, _____ to participate in the Youth Smoking Survey.

_____ _____
Signature of parent or guardian Date

致家長、監護人：

貴校聯同三藩市加洲大學正在灣區進行
調查研究以了解青少年的吸煙習慣，並制訂
適當的預防教育計劃。我研究得到加
洲政府資助本是為了實行減低吸煙引
起的疾病的目的，我研究是由李明璜博士主
持，並得到學校校長的支持。

進行我調查需要請學生在上課時花大概十
五分鐘填寫一份問卷。問卷的內容包括應用
的煙品，學生對吸煙與健康的意見，新聞上的
吸煙及煙品廣告，學校成績、飲酒習慣等問題。

學生參加我調查是自願的，而且所提供的資料
是完全保密，問卷上並無記載個別學生的名字。

我研究所收集的資料不但使我們了解三藩市
灣區青年人的健康與吸煙的習慣，而且可幫助
我們為他們安排促進體健的服務。

我們希望您的兒女會藉此機會幫助同學改善
體健。若您有疑問請致電李博士查詢電話号
碼為(415) 476-0114。若您不同意兒女參加調查，請在
下面簽字，由他/她將代交回教師。

李明璜敬上
研究組長

我不願意兒女 _____ 參加青年吸煙調查

_____ _____

家長、監護人簽字 日期

YOUTH SMOKING SURVEY

June 9, 1992

	Class	Chinese	Mixed Chinese	Other	Total
Francisco Middle School					
Grade 6	Science	64	8	68	140
Grade 7	Science	81	17	47	145
Grade 8	Science	115	23	82	220
subtotal : N (% of total)		260 (51.5%)	48 (9.5%)	197 (39.0%)	505 (100%)
Marina Middle School					
Grade 6	ESL	43	3	13	59
Grade 7	ESL	33	7	15	55
Grade 8	ESL	38	0	18	56
subtotal : N (% of total)		114(67%)	10 (5.9%)	46 (27.1%)	170 (100%)

	Class	Chinese	Mixed Chinese	Other	Total
Lincoln High					
Grade 10	English	81	14	96	191
Grade 11	English	20	1	22	43
Grade 12	English	134	10	75	219
subtotal : N (% of total)		235 (51.9%)	25 (5.5%)	193 (42.6%)	453 (100%)
Lowell High					
Grade 10	Driver's Ed.	45	9	53	107
subtotal : N (% of total)		45 (42.1%)	9 (8.4%)	53 (49.5%)	107 (100%)
George Washington High					
Grade 9	Adv. Math	20	1	10	31
Grade 10	Adv. Math	19	2	9	30
Grade 11	Adv. Math	20	4	11	35
Grade 12	Adv.Math	33	3	14	50
subtotal : N (% of total)		92 (63.5%)	10 (6.2%)	44 (30.3%)	146 (100%)
TOTAL: N (% of total)		**746 (54.0%)**	**102 (7.4%)**	**533 (38.6%)**	**1381 (100%)**

Appendix D

This appendix consists of part of a project I did for a multivariate statistics class (Public Health 245). I did a loglinear analysis to assess the association between smoking behavior and various risk factors across race and different levels of acculturation. The results were not included in the main body of the thesis because they were not significant. A logistic regression analysis which included race and acculturation interaction terms yielded similar inconclusive results.

The Effect of Acculturation in the Importance of Risk Factors Associated with Cigarette Use in Chinese-American Adolescents

Methods

Measures: Many indicators were assessed. The ones relevant to this project are summarized below:

(1) smoking behavior. *How much do you smoke?* Respondents were to indicate: never smoked, stopped smoking, a few times a month, a few times a week, a few times most days, half a pack per day, a pack or more per day.

(2) Acculturation. Respondents were asked their country of birth, the languages in which they thought, read, and used with family and friends, and whether they celebrated Christmas, Thanksgiving, and Chinese New Year. An acculturation index was compiled giving higher scores (more acculturated) to birth in U.S., more frequent use of English, celebration of Christmas and Thanksgiving, and non-celebration of Chinese New Year.

(3) Peer influence. Respondents were asked to indicate how many male or female best friends they had who smoked. Positive peer influence was defined (by me) as having at least one best friend (of either sex) who smoked.

(4) Parental smoking. Respondents were asked to indicate which members of their family smoke. The parental smoking indicator was defined as at least one parent smoking (there weren't enough mothers who smoked in this survey).

(5) Perceived parental attitude towards smoking. Respondents were asked to describe how they felt their mother or father would respond if they lit up a cigarette. "Approval" in this project was defined as whether either parent would approve.

(6) School performance. This was assessed by asking the respondents to indicate whether get got above average, average, or below average grades in school.

Methods: I did loglinear analyses of three sets of variables at a time: (1) race or acculturation level, (2) risk factor, and (3) smoking behavior, to examine the association between the risk factor and smoking behavior at different levels of race or acculturation.

Breakdown of respondents by race.

Race	Freq	Percent of subjects	# smokers[1] (%)	# smokers[2] (%)
White	93	6.76	25 (27)	14 (15.1)
Black	69	5.01	8 (12)	2 (2.90)
Chinese	743	54.00	42 (5.6)	26 (3.50)
Mixed Chinese	100	7.27	5 (5)	1 (1.00)
Japanese/Korean	48	3.49	8 (17)	3 (6.25)
Filipino	83	6.03	5 (6)	2 (2.41)

Viet/Camb/Lao	91	6.61	10 (11)	6 (6.59)
Hispanic	59	4.29	4 (6.8)	2 (3.39)
All Others	90	6.54	10 (11.1)	7 (7.78)
Total	1376	100.0	117 (8.50)	63 (4.58)

1 smokers defined to be a few times/month or more.
2 smokers defined to be a few times/week or more.

I decided to lump the chinese and mixed chinese groups into the same category since they would probably share many of the same cultural characteristics. For each risk factor, I decided to do two sets of comparisons—(1) comparing the effect of race on the risk factor's association with smoking, and (2) comparing the effect of acculturation on the risk factor's association with smoking for the Chinese subjects. I chose to compare the Chinese with the White group since this group has been extensively studied (and would probably serve as a good basis for comparison). There have also been some studies on the Black group and fewer on the Hispanic group, but because these groups had so few smokers in this sruvey, they were excluded from this analysis.

I categorized smokers/nonsmokers two different ways (see table above). The more inclusive categorization defined smokers to be those who currently smoke a few times a month/more. The less inclusive categorization defined smokers to be those who currently smoke a few times a week/more. In both cases, those who had never smoked and those who had smoked but had quit were classified as nonsmokers – this is probably not the ideal way to do things since never-smokers and quitters probably have some different characteristics, but since this was a cross-sectional survey looking at current smoking behavior, I thought I should try to look at current smoking behavior with current levels of risk factors.

Results and Analyses

Initially, I carried out analyses using the more inclusive definition of smokers. This was consistent with many studies using data from the 1992 National Health Interview Survey which defined adolescent smokers as those who smoked cigarettes on 1 or more of the 30 days preceding the survey (e.g. Lowry *et al.* 1996).

Peer Influence and Smoking, Effect of race

A three-way interaction loglinear model was fitted using race (two categories of white/Chinese), whether a best friend smoked, and whether the subject is a current smoker. The p-value for the three-way interaction term was 0.084, so I refitted the model deleting the three-way interaction term.

To test the null hypothesis that the saturated model fits as well as the restricted model (without the three-way interaction term) against the alternate hypothesis that the saturated model fits better than the restricted model, the goodness-of-fit chi2 test yielded a p-value of 0.0925. This indicates that there is not sufficient evidence to reject the null hypothesis, so there appears to be an association between each pair of the variables above, but specifically, the effect of peer influence does not seem to be affected by the race of the subject. Also, the standardized residuals after fitting to the restricted model don't show any significantly large (> 2 SD) deviations of the observed values from the fitted values, which seems to lend support to the idea that the restricted model is just as adequate to explain the data. Some stata output follows:

```
. loglin count newrace smkrnow frndsmk, fit (newrace smkrnow frndsmk)
Variable newrace = A
Variable smkrnow = B
Variable frndsmk = C
Margins fit: newrace smkrnow frndsmk
```

```
Poisson regression                                      Number of obs     =          8
Goodness-of-fit chi2(0)      =      0.000               Model chi2(7)     =1819.535
Prob > chi2                  =          .               Prob > chi2       =  0.0000
Log Likelihood               =    -21.642               Pseudo R2         =  0.9768
------------------------------------------------------------------------------
       count |      Coef.   Std. Err.       z     P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          A2 |    2.761307   .1651114     16.724   0.000      2.437695    3.08492
        AB22 |   -2.424835   .6083721     -3.986   0.000     -3.617222   -1.232448
        AC22 |    -.969548    .265465     -3.652   0.000      -1.48985   -.4492462
      ABC222 |    1.214997   .7038251      1.726   0.084     -.1644747    2.594469
          B2 |   -2.054124   .4750148     -4.324   0.000     -2.985136   -1.123112
        BC22 |    1.702726   .5615226      3.032   0.002      .6021616    2.80329
          C2 |   -.3677247   .2503559     -1.469   0.142     -.8584131    .1229638
       _cons |    3.663562   .1601282     22.879   0.000      3.349716    3.977407
------------------------------------------------------------------------------

. loglin count newrace smkrnow frndsmk, fit (newrace smkrnow, newrace frndsmk,
> smkrnow frndsmk) resid
Variable newrace = A
Variable smkrnow = B
Variable frndsmk = C
Margins fit: newrace smkrnow, newrace frndsmk, smkrnow frndsmk

Poisson regression                                      Number of obs     =          8
Goodness-of-fit chi2(1)      =      2.831               Model chi2(6)     =1816.704
Prob > chi2                  =     0.0925               Prob > chi2       =  0.0000
Log Likelihood               =    -23.057               Pseudo R2         =  0.9752
------------------------------------------------------------------------------
       count |      Coef.   Std. Err.       z     P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          A2 |    2.701668   .1574664     17.157   0.000       2.39304    3.010296
        AB22 |   -1.490529   .3160919     -4.715   0.000     -2.110058   -.8710004
        AC22 |   -.8092894   .2528685     -3.200   0.001     -1.304903   -.3136762
          B2 |   -2.706502   .3823576     -7.078   0.000     -3.455909   -1.957095
        BC22 |    2.553684   .3353501      7.615   0.000      1.89641    3.210958
          C2 |   -.5105674   .2406786     -2.121   0.034     -.9822888   -.038846
       _cons |    3.719554   .1526434     24.368   0.000      3.420379    4.01873
------------------------------------------------------------------------------
count   newrace  smkrnow  frndsmk   cellhat    resid   stdres
 39     white      no         no    41.246   -2.246   -0.350
 27     white      no        yes    24.754    2.246    0.451
  5     white     yes         no     2.754    2.246    1.353
 19     white     yes        yes    21.246   -2.246   -0.487
617     chinese    no         no   614.754    2.246    0.091
162     chinese    no        yes   164.246   -2.246   -0.175
  7     chinese   yes         no     9.246   -2.246   -0.739
 34     chinese   yes        yes    31.754    2.246    0.399
```

Odd ratios for the two races show statistically significant deviations from the null hypothesis (OR = 1, no association between the two variables), as indicated by the Pearson chi2 and likelihood-ration chi2 tests. For whites, having friends who smoke results in a 5.5 times higher chance of being a current smoker, and for chinese, having friends who smoke results in an 18.5 times higher chance of being a current smoker. Since there was no evidence to indicate that three way interaction exists, the difference between these two odds ratios are probably not significant. Using the fitted values, we get an OR of 12.85. So for both groups, having friends who smoke seems to result in a 12.85-fold higher chance of being a current smoker.

```
-> newrace=    white
           | smkrnow
   frndsmk |        no        yes |     Total
-----------+----------------------+----------
        no |        39          5 |        44
       yes |        27         19 |        46        OR = 5.49
-----------+----------------------+----------
     Total |        66         24 |        90
```

```
          Pearson chi2(1) =  10.3091   Pr = 0.001
 likelihood-ratio chi2(1) =  10.8571   Pr = 0.001
```

OR (fitted for both groups)
-> newrace= chinese
= 12.85 (work is not shown)

```
           | smkrnow
   frndsmk |        no        yes |     Total
-----------+----------------------+----------
        no |       617          7 |       624
       yes |       162         34 |       196        OR = 18.5
-----------+----------------------+----------
     Total |       779         41 |       820
          Pearson chi2(1) =  82.6628   Pr = 0.000
 likelihood-ratio chi2(1) =  67.9332   Pr = 0.000
```

These results do not support my hypothesis that chinese adolescents would be more resistant to the influence of peers in terms of smoking behavior.

Peer Influence and Smoking, Effect of acculturation

Due to the small number of smokers, I used only two levels of acculturation for the analysis. I turned the continuous acculturation index (see methods) into a categorical variable. Those with indices above the mean were labeled "high acculturation" and those below were labeled as "low acculturation." Approximately half the chinese/mixed chinese subjects fell into each group. I realize that this may not be the best way to divide acculturation—for example, these categorizations are rather broad, and the "culture" of those within each group might be rather different. I had initially tried categorizing by three levels of acculturation, but ran into problems—since there are so few smokers, dividing them into three acculturation categories, and then further dividing them by levels of the different risk factors resulted in many cells with very few (2, 1, even zero) observations.

A three-way interaction loglinear model was fitted using the two acculturation categories, whether a best friend smoked, and whether the subject is a current smoker. The p-value for the three-way interaction term was 0.115, so I refitted the model deleting the three-way interaction term.

```
. loglin count acc2catb frndsmk smkrnow, fit (acc2catb frndsmk smkrnow)
Variable acc2catb = A
Variable frndsmk = B
Variable smkrnow = C
Margins fit: acc2catb frndsmk smkrnow
Note: Regression-like constraints are assumed.  The first level of each
variable (and all iteractions with it) will be dropped from estimation.

Poisson regression                                Number of obs     =         8
Goodness-of-fit chi2(0)      =      0.000         Model chi2(7)     =1120.893
Prob > chi2                  =          .         Prob > chi2       =  0.0000
Log Likelihood               =    -21.367         Pseudo R2         =  0.9633
------------------------------------------------------------------------------
       count |      Coef.   Std. Err.       z     P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          A2 |   -.173923   .0812175    -2.141   0.032    -.3331063   -.0147397
        AB22 |   .5689168    .180963     3.144   0.002     .2142359    .9235977
        AC22 |   .8670703   .8698254     0.997   0.319    -.8377562    2.571897
      ABC222 |  -1.498453   .9497609    -1.578   0.115    -3.35995    .3630444
          B2 |  -1.646252   .1365176   -12.059   0.000    -1.913821   -1.378682
        BC22 |   3.897543   .7558231     5.157   0.000     2.416157    5.37893
          C2 |  -5.111988   .7092334    -7.208   0.000     -6.50206   -3.721916
       _cons |   5.805135   .0548821   105.775   0.000     5.697568    5.912702
------------------------------------------------------------------------------

. loglin count acc2catb frndsmk smkrnow, fit (acc2catb frndsmk , acc2catb smkrn
> ow, frndsmk smkrnow) resid
Variable acc2catb = A
Variable frndsmk = B
Variable smkrnow = C
```

```
Margins fit: acc2catb frndsmk , acc2catb smkrnow, frndsmk smkrnow

Poisson regression                                Number of obs     =          8
Goodness-of-fit chi2(1)      =      2.657         Model chi2(6)     =    1118.235
Prob > chi2                  =     0.1031         Prob > chi2       =     0.0000
Log Likelihood               =    -22.695         Pseudo R2         =     0.9610
------------------------------------------------------------------------------
       count |      Coef.   Std. Err.       z     P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          A2 |  -.1621532   .0808679     -2.005   0.045    -.3206515    -.003655
        AB22 |   .5106651   .1769108      2.887   0.004     .1639264    .8574038
        AC22 |  -.3737837   .3460945     -1.080   0.280    -1.052117    .3045491
          B2 |  -1.613349   .1335872    -12.077   0.000    -1.875175   -1.351523
        BC22 |   3.128019   .4545353      6.882   0.000     2.237146    4.018892
          C2 |  -4.468645   .4298267    -10.396   0.000    -5.311089     -3.6262
       _cons |   5.799743    .054934    105.577   0.000     5.692075    5.907412
------------------------------------------------------------------------------
```

The goodness-of-fit chi2 test shows a p-value of 0.1031, indicating no reason to reject the null hypothesis that the model without the three-way interaction term fits as well as the saturated model. Furthermore, the interaction term between acculturation level and smoking status has a p-value of 0.280, indicating that this interaction might not be significant either. Deleting it yields...

```
. loglin count acc2catb frndsmk smkrnow, fit (acc2catb frndsmk , frndsmk smkrno
> w) resid
Variable acc2catb = A
Variable frndsmk = B
Variable smkrnow = C
Margins fit: acc2catb frndsmk , frndsmk smkrnow

Poisson regression                                Number of obs     =          8
Goodness-of-fit chi2(2)      =      3.827         Model chi2(5)     =    1117.065
Prob > chi2                  =     0.1476         Prob > chi2       =     0.0000
Log Likelihood               =    -23.280         Pseudo R2         =     0.9600
------------------------------------------------------------------------------
       count |      Coef.   Std. Err.       z     P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          A2 |  -.1656939   .0807934     -2.051   0.040    -.3240462   -.0073417
        AB22 |   .4473334    .166333      2.689   0.007     .1213266    .7733401
          B2 |  -1.576314   .1271459    -12.398   0.000    -1.825515   -1.327113
        BC22 |   3.080794   .4516685      6.821   0.000      2.19554    3.966048
          C2 |  -4.623337   .4102479    -11.270   0.000    -5.427408   -3.819266
       _cons |   5.801369   .0548628    105.743   0.000      5.69384    5.908898
------------------------------------------------------------------------------

count  acc2catb  frndsmk  smkrnow   cellhat    resid   stdres
  332        0        0        0   330.752    1.248    0.069
    2        0        0        1     3.248   -1.248   -0.692
   64        0        1        0    68.378   -4.378   -0.529
   19        0        1        1    14.622    4.378    1.145
  279        1        0        0   280.248   -1.248   -0.075
    4        1        0        1     2.752    1.248    0.752
   95        1        1        0    90.622    4.378    0.460
   15        1        1        1    19.378   -4.378   -0.995
```

Again, there is no reason to reject the null hypothesis that this model fits as well as the saturated model (goodness of fit chi2 test p-value = 0.1476). Also, the likelihood chi2 test between this model and the model with all the two-way interaction terms yields a chi-statistic of 1.17 with df = 1 (p-value > 0.25). So, it seems like not only does acculturation level not affect the interaction between peer smoking and current smoking status, it is also independent of smoking status. The odds ratios below are significant for both races (confirming that peer smoking is associated with whether the subject smokes); even though the two odds ratios using the observed values differ by a magnitude of four, this difference is not significant, because acculturation does not interact with the relationship between the two variables. The OR using the fitted values is 21.6. So, adjusting for acculturation, having a friend who smokes increases a chinese adolescent's risk of being a current smoker 21.6 times. This is independent of acculturation.

Again, my hypothesis is not supported. Not only did the data not show that increasing levels of acculturation would lead to increased susceptibility to peer influence, the observed data actually suggested the opposite (that at lower levels of acculturation, smokers are more likely to have best friends who smoke), but this was not statistically significant. Also, the OR here between friend smoking and current smoking status is different from that calculated above, probably because we adjusted for different variables in the two analyses. Both OR's could be (and probably are) still affected by other confounders that we still have not taken into account.

```
-> acc2catb=        low
           | smkrnow
   frndsmk |         no        yes |     Total
-----------+----------------------+----------
        no |        332          2 |       334
       yes |         64         19 |        83        OR = 49.3
-----------+----------------------+----------
     Total |        396         21 |       417
          Pearson chi2(1) =  69.0834   Pr = 0.000
 likelihood-ratio chi2(1) =  52.6821   Pr = 0.000
                                                      OR fitted (for both
groups)
-> acc2catb=        high                              = 21.6 (work not shown)
           | smkrnow
   frndsmk |         no        yes |     Total
-----------+----------------------+----------
        no |        279          4 |       283
       yes |         95         15 |       110        OR = 11.01
-----------+----------------------+----------
     Total |        374         19 |       393
          Pearson chi2(1) =  25.7216   Pr = 0.000
 likelihood-ratio chi2(1) =  22.5384   Pr = 0.000
```

The OR between current smoking status and having friends who smoke could reflect two phenomena: (1) that having many friends who smoke increases a person's likelihood of smoking by peer pressure, or (2) that those who smoke are more likely to associate with other people who smoke. Even though the differences in OR's between white and chinese and between the two levels of acculturation are not significant, the magnitude of the difference, and in the opposite direction that I would expect, makes me think that something might be going on.

<u>Parental Smoking and adolescent smoking, effect of race:</u>
Since there were only a total of 12 mothers who smoked in both the chinese and the mixed chinese groups, I combined the mothers who smoked and the fathers who smoked into one indicator variable—parsmok. This had a value of "1" if either or both parents were smokers.

A three-way interaction loglinear model was fitted using the two race categories, whether a parent smoked, and whether the subject is a current smoker. The p-value for the three-way interaction term was 0.002, very significant. To confirm that the level of race was important in determining the level of association between parmok and current smoking status, I fit another model without the three-way interaction term. The goodness-of-fit chi2 p-value was only 0.0009, confirming that the saturated model fits better than the model with only the two-way interaction terms. (stata output deleted).

The odds ratios calculated using the saturated model are given below. In white adolescents, the children of smoking parents had a 5.76 greater chance of being current smokers (the trend is as expected). In chinese adolescents, the odds ratio was not significantly different from 1, which seems to suggest that the parents' smoking status does not affect the adolescent's current smoking status one way or the other. This was very surprising, and again, seemed to contradict my hypothesis that the centrality of dominance of the family in chinese culture might lead to a greater impact of parental role modelling on adolescent smoking behavior. I thought that maybe some of the parents smoked but

disapproved of their children smoking, and that this disapproval might carry more weight than modeling of the smoking behavior. This will be tested further (two sections down).

```
-> race=    white
           | smkrnow
   parsmok |        no         yes |     Total
-----------+----------------------+----------
        no |        47           7 |        54
       yes |        21          18 |        39
-----------+----------------------+----------
     Total |        68          25 |        93
          Pearson chi2(1) =  12.6920   Pr = 0.000
 likelihood-ratio chi2(1) =  12.7785   Pr = 0.000

-> race=  chinese
           | smkrnow
   parsmok |        no         yes |     Total
-----------+----------------------+----------
        no |       558          35 |       593
       yes |       238          12 |       250
-----------+----------------------+----------
     Total |       796          47 |       843
          Pearson chi2(1) =   0.4058   Pr = 0.524
 likelihood-ratio chi2(1) =   0.4171   Pr = 0.518
```

OR = 5.76 (significant)

OR = 0.804 (insignificant)

Parental smoking and adolescent smoking, effect of acculturation

Again, I carried out stepwise backward eliminations, deleting first the three way, and then the two-way interaction terms one at a time, starting with the ones with the highest P-values. The final heirarchical model was (acc parsmok, smkrnow), which involved association only between acculturation level and parental smoking, but independence between smkrnow/acc, and smkrnow/ parsmok (controlling for the level of parsmok and acc, respectively). This model had a log likelihood chi2 test statistic of 0.197 with 3 degrees of freedom (as compared to the saturated model with all the two way and three way interaction terms); the p-value was 0.9781, showing no evidence to reject the null hypothesis that this model fits as well as the saturated model. The standardized residuals all had values less than 0.3 (absolute value), again confirming that the fitted values under this model are very consistent with the observed values.

The odds ratios between parental smoking and adolescent smoking status for each level (using the fitted values) of acculturation are 1.000, as expected based on the model. So based on the data, parental smoking is not associated with current smoking status for chinese. This is consistent with the chinese vs white analysis done earlier, but seems very inconsistent with the fact that children often adopt behaviors modeled by their parents. To see if chinese adolescents might be more responsive to the parents dispproval of smoking behavior in their children (even though the parents themselves smoke), I looked at the following associations...

Parental approval and adolescent smoking, effect of race

I made one indicator variable—parreact, given the value "1" if either parent approved of smoking or the subject didn't know. The value "0" was given only if both parents disapproved of smoking. The approval category might be too broad, but because of the small number of smokers, I didn't want to reduce the power of the study by dividing them up too much.

Using stepwise elimination of first the three way and then two-way interaction terms that had insignificant p-values (> 0.05), the following model was obtained – (newrace smkrnow, parreact smkrnow). So parental reaction seems to be independent of the race, but there is association between both race and current smoking status (this is consistent with the association found in the analyses I described above) and between parental reaction and current smoking behavior, as expected.

The goodness-of-fit chi2 test statistic , comparing this model to the full, saturated model, is 1.554, with 2 degrees of freedom, yielding a p-value of 0.4598 → not enough evidence to reject the null hypothesis that this restricted model fits as well as the saturated model. None of the standardized residuals have an absolute value greater an 0.8, again confirming that the model fits the observed values well.

The odds ratio calculated using the fitted values is 2.46—so a person with a parent who does not react negatively has a 2.46 greater risk of being a current smoker than a person whose parents do disapprove of their smoking. The fitted value of the OR is the same for both races because the model above suggested that race is independent of the relationship between parental reaction and whether someone is a current smoker.

```
-> newrace=    white
           | smkrnow
  parreact |        no        yes |     Total
-----------+----------------------+----------
    disapp |        49         17 |        66
   approve |        12          7 |        19       OR = 1.68      (p-value > 0.05 → no
evidence
-----------+----------------------+----------                      that the odds ratio is
     Total |        61         24 |        85                      different from 1.00)
         Pearson chi2(1) =   0.8946   Pr = 0.344
 likelihood-ratio chi2(1) =   0.8626   Pr = 0.353

-> newrace=  chinese                                          OR (fitted) for both models = 2.46
           | smkrnow                                         work is not shown.
  parreact |        no        yes |     Total
-----------+----------------------+----------
    disapp |       597         21 |       618
   approve |       154         17 |       171       OR = 3.14
-----------+----------------------+----------
     Total |       751         38 |       789
         Pearson chi2(1) =  12.5099   Pr = 0.000
 likelihood-ratio chi2(1) =  10.6024   Pr = 0.001
```

Parental approval and adolescent smoking, effect of acculturation

Starting with the saturated model, sequential backward deletions of insignificant terms (with p-values > 0.05) yields the following heirarchical model. The goodness-of-fit chi2 test statistic = 0.1059 with df = 2, yielding a p-value of 0.1059. This means that there is no reason to reject the null hypothesis that the restricted model fits as well as the saturated model. In this model, acculturation is independent of whether an adolescent smokes or not, so whether or not the parent disapproves of adolescent smoking or not, the OR between acculturation and current smoking status should be 1. The ORs for the other pairs should not be 1 (because they are associated), but they should be the same value at each level of the third variable (because their association is independent of the value of the third variable).

Though the odds ratios using the raw data show that the smoking status of the less acculturated are more influenced by parents' approval/disapproval than the more acculturated, this difference is not statistically significant, and disappears when we use the values fitted to the model.

```
. loglin count acc parreact smkrnow, fit (acc parreact,  parreact smkrnow) resid
□
Variable acc = A
Variable parreact = B
Variable smkrnow = C

Poisson regression                                  Number of obs     =         8
□
Goodness-of-fit chi2(2)      =      4.491           Model chi2(5)     =1482.272
□
```

```
Prob > chi2                   =    0.1059          Prob > chi2       =  0.0000
Log Likelihood                =   -26.658          Pseudo R2         =  0.9653
------------------------------------------------------------------------------
       count |      Coef.   Std. Err.       z     P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          A2 |   .4884783   .0667634      7.317   0.000      .3576245    .6193321
        AB22 |  -.4225203   .1382943     -3.055   0.002      -.693572   -.1514686
          B2 |  -1.088261   .1048064    -10.384   0.000     -1.293678   -.8828447
        BC22 |   .8285565   .2208622      3.751   0.000      .3956746    1.261438
          C2 |   -2.68147   .1323472    -20.261   0.000     -2.940866   -2.422075
       _cons |   5.825424   .0532386    109.421   0.000      5.721078    5.929769
------------------------------------------------------------------------------

  count  acc  parreact  smkrnow   cellhat    resid   stdres
    346    0     0     0   338.805     7.195     0.391
     16    0     0     1    23.195    -7.195    -1.494
    116    0     1     0   114.110     1.890     0.177
     16    0     1     1    17.890    -1.890    -0.447
    545    1     0     0   552.195    -7.195    -0.306
     45    1     0     1    37.805     7.195     1.170
    120    1     1     0   121.890    -1.890    -0.171
     21    1     1     1    19.110     1.890     0.432

-> acc=        low
□
           | smkrnow
□
  parreact |         0          1 |     Total
□
-----------+----------------------+----------
□
         0 |       346         16 |       362
         1 |       116         16 |       132       OR = 2.98
-----------+----------------------+----------
     Total |       462         32 |       494
          Pearson chi2(1) =   9.4700   Pr = 0.002
 likelihood-ratio chi2(1) =   8.4402   Pr = 0.004          OR (fitted, both groups) = 2.28

-> acc=        high
           | smkrnow
  parreact |         0          1 |     Total
-----------+----------------------+----------
         0 |       545         45 |       590
         1 |       120         21 |       141       OR = 2.12
-----------+----------------------+----------
     Total |       665         66 |       731
          Pearson chi2(1) =   7.3160   Pr = 0.007
 likelihood-ratio chi2(1) =   6.5105   Pr = 0.011
```

Discussion and Further Studies

There are several reasons that there were no significant differences in the OR's for risk factor and smoking status between the groups (acculturation or race):

(1) There really is no difference, though previous studies suggest that there should be a difference.

(2) There was not enough power in the study.

(3) My categories were too broad—for example, lumping those who smoke several packs a day in with those who only smoke several times a month into the same "smoker" category may have resulted in too "diverse" of a category. Those who smoke a few times a month may be more like the nonsmokers than those who smoke a pack a day; the few times a month smokers made up about 30% of the "smoker" category for the chinese, so any similarities they have to the nonsmoker group may have obscured the differences between the other smokers and the nonsmokers.

To investigate the third possibility further, I generated new smoking status categorical variables, this time defining "smoker" as only those who smoked a few times a week or more. The analyses have not been included in the project write-up, but most of the analyses were either still insignificant, or I ended up with tables in which some of the cell counts were zero, this made it impossible to compute odds ratios.

I think the other problem was that there was not enough power in this study. Power is the probability of rejecting the null hypothesis when the alternate hypothesis is in fact true. Low power often results from too small of a sample size, for the same significance level α. The cell counts were already pretty low (decreasing power), and lumping large ranges of acculturation levels, smoking levels, parental approval levels, etc together probably generated such heterogeneous groupings that made it even harder to detect differences. When I attempted to correct this potential problem by increasing the number of smoking or acculturation categories, there just wasn't enough data to fit all the cells. Ironically, when I tried to make more groups so that the groups would be more homogeneous, I reduced the number of observations in each cell, further reducing the power of the study.

Ideally, I would be able to generate a large number of levels of acculturation, and to separate the never-smokers from the quitters from those who smoke only a few times a month/week, to regular smokers who smoke several times a day. An important assumption underlying assigning categories is that all members of the category behave the same—having categories that are too broad probably violates this assumption—the more "spread out" the individuals in a group, the less likely they are to all behave the same way.

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October 30, 1997

Jenny Way
2601 College Avenue, #106
Berkeley, CA 94704

RE: "The Effect of Acculturation on Smoking Risk Factors in Chinese Adolescents" Graduate Research - Health and Medical Sciences

Dear Ms. Way:

Thank you for the statement and request for exemption that you submitted to the Committee for the project referred to above. As described in the statement, your research satisfies the Committee's requirements under Exemption #6, page 15, of CPHS Guidelines of September 1996 (Exemption #4 of the Federal Regulations.) Accordingly, the project is exempt from full Committee review provided that there are no changes in the use of human subjects.

For our records, the number of the project is 97-11-85. Please refer to this number in any future correspondence about the project.

If you have any questions about this matter, please contact the CPHS staff at 642-7461; FAX 643-6272; Email subjects@uclink3.berkeley.edu.

Sincerely,

R. Steinhardt

Richard Steinhardt
Professor of Molecular and Cell Biology
Chair, CPHS

RS:nan
cc: Professor Henrik Blum
Graduate Assistant
Graduate Division (SID #1115-6179)