



Published in final edited form as:

*Tob Control*. 2014 January ; 23(1): . doi:10.1136/tobaccocontrol-2012-050473.

## Contextual and Community Factors Associated with Youth Access to Cigarettes through Commercial Sources

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### Abstract

**Objectives**—This study examines contextual and community level characteristics associated with youth access to tobacco through commercial sources in 50 non-contiguous mid-sized California communities.

**Methods**—The study is based on data from access surveys conducted by 4 confederate buyers (2 males and 2 females) in 997 tobacco outlets. City demographics, adult smoking prevalence and measures of tobacco outlet density, local tobacco retailer licensing and cigarette tax were included.

**Results**—Multilevel regression analyses indicated that buyer actual age, a male clerk and asking young buyers about their age were related to successful cigarette purchases. Buyer actual age and minimum age signs increased the likelihood that clerks will request an ID. At the community level, higher percentage of minors, higher education, and a greater percentage of African Americans were associated with increased likelihood of a successful purchase. Lower percentage of minors, lower education, lower percentage of African Americans, and having a local tobacco retailer licensing were associated with retailer asked for ID. Additionally, supermarkets charged significantly more for a pack of cigarettes than small markets whereas smoke/tobacco shops and drug stores/pharmacies charged less. Higher prices were associated with higher median household income and greater percentage of Hispanics. Findings about community characteristics, however, differed by cigarette brand.

**Conclusions**—This study enhances our understanding of the associations between contextual and community characteristics and youth access to tobacco through commercial sources which can help policymakers to identify and target at-risk communities and outlets to decrease youth access to tobacco.

### Keywords

Youth access to cigarettes; commercial cigarette availability; local cigarette price; contextual level characteristics; community level characteristics

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**Competing Interests:**

None of the authors have a conflict of interest.

**Contributionship:**

Dr. Sharon Lipperman-Kreda conceptualized the study and was primarily responsible for data analysis and manuscript preparation. Dr. Joel W. Grube assisted in data analysis and contributed to the writing of this manuscript. Dr. Karen B. Friend participated in literature review and contributed to the writing of the manuscript. All of the authors helped to interpret findings and review drafts of the manuscript.

## INTRODUCTION

Available research suggests potential associations between community characteristics and physical and economic availability of cigarettes to youth. However, much of this research is limited by the number of community characteristics that have been included and the lack of diversity of the communities that have been studied. Moreover, although some studies have modeled characteristics related to tobacco sales to youths (i.e., buyer characteristics, clerk characteristics, or characteristics related to the retail environment), none has modeled a full range of contextual characteristics together with community characteristics. Since illegal tobacco purchase attempts by minors occur in an ecological environment that includes various contextual and community characteristics, this approach can highlight ways to tailor policies to more effectively reduce youth access to cigarettes via commercial sources. The present study investigates the associations between a wide range of contextual and community-level characteristics and retailer compliance with underage tobacco sales laws and with cigarette pack prices in 50 non-contiguous mid-sized California communities.

Reducing youth access to tobacco products from commercial sources through (1) implementation and enforcement of policies that target retailers and clerks who sell such products to young people and (2) increasing taxes, and therefore cigarette prices are recommended to control tobacco use by youth [1–4]. A comprehensive review that evaluated efforts to prevent the sale of tobacco to youth concluded that every intervention that has successfully disrupted the sale of tobacco to minors has been associated with an observed reduction in tobacco use by youth [5]. Also, higher cigarette prices decrease cigarette smoking [6–8], particularly among youth, who are more price sensitive than adults [9, 10].

Contextual factors associated with youth access to tobacco products from commercial sources include characteristics of youth buyers and retail clerks. Research has shown that girls and older minors are more successful in their purchase attempts [11–15]. Findings related to characteristics of store clerks, including gender and age, are mixed. For example, a study which used federal compliance data from 36 states found that female clerks were more likely to sell tobacco to minors [13]. In contrast, other studies have found that illegal sales are more likely when a clerk is male [12, 16] or did not find any relationship between clerk gender and tobacco sales to minors [11, 17]. Similarly, while studies by Pearson et al [15] and DiFranza et al [18] found that clerks judged to be less than 18 or 21 years of age (respectively) were more likely to make an illegal sale, no such relation was reported in other studies [11, 17]. A few studies that examined youth and clerk ethnicity have shown that White clerks were more likely to sell cigarette to youth [12, 19], and that cigarette sales to minority youth were higher than to White youth [12, 20].

Factors related to the retail environment have also been examined. For example, a lower likelihood of illegal sales rate was associated with chain stores compared to independent stores in California [21]. In another study, sales rates were highest in gas stations [13], and a study in a metropolitan county in Washington State found that convenience stores selling gas were more likely to sell tobacco products to minors than restaurants, bars, and tobacco discount stores [15]. Age-of-sale signs, asking about the purchaser's age, and requesting purchaser IDs were also associated with lower rates of underage sales [13, 16, 17, 22].

Less is known about the relationship between youth access to tobacco products from commercial sources and community characteristics. In one study, rural location was associated with increased underage sales [13]. A study by Lipton et al [23] found that areas of higher sales to minors in Los Angeles had lower mean family income, a higher percentage of foreign born residents, and greater population density. In southern California,

Klonoff et al [24] found that minors were able to purchase single cigarettes in 71.2% of visits to minority neighborhoods, but could do so only in 34.4% of visits to predominately white neighborhoods. No neighborhood differences in illegal sales of cigarette packs were found [12]. Similarly, in a case study in Miami, Florida, underage tobacco sales were significantly more concentrated in Hispanic-majority neighborhoods [25]. These investigations are illustrative but omit other important community characteristics, such as tobacco policies and adult smoking prevalence, that might also be associated with higher or lower sales rates.

Focusing on economic availability, a Minnesota study of pack prices in one metropolitan area observed that the maximum price was 1.7 to 1.8 times higher than the lowest price for the same brand [26]. A positive association between percentage of nonwhite residents and the price of discount and premium cigarettes, as well as the overall mean price, was found. No such relation was found with the price of menthol cigarettes. Prices of premium cigarettes and the overall mean price were lower in neighborhoods with a higher percentage of youth. Going beyond previous research, the present study examines the associations between a wide range of contextual and community-level characteristics and retailer compliance with underage tobacco sales laws and with pack prices in 50 non-contiguous mid-sized California communities.

## METHODS

### Study sample and survey methods

This study used data from access surveys conducted by 4 confederate buyers (2 males and 2 females), who were over age 18 but judged to appear younger by an independent panel. Purchase attempts were made at 997 tobacco outlets in 50 midsized California cities. To select 50 non-contiguous California cities, the initial sample frame comprised all 138 California cities with populations between 50,000 and 500,000. We randomly sampled one city and then eliminated all contiguous cities, all cities contiguous to those cities and those that were within a one-mile radius of the selected city. This process was repeated until 50 cities were selected. The resulting sample of 50 cities is a purposive geographic sample intended to maximize validity with regard to the geography and ecology of the state [27]. There were no significant differences between the sampled and the unsampled cities in relation to population size, ethnic diversity, household size, and median household incomes.

Twenty randomly selected tobacco outlets in each city were surveyed to collect information on compliance with underage tobacco sales laws and cigarette prices. Because comprehensive address lists for tobacco outlets in California are not available, outlets were randomly sampled from lists created specifically for the current study. Shape files of parcel or zoning areas with recent zoning attributes were obtained from each of the 50 cities. For 5 cities without usable Geographic Information System files, a zoning map was obtained. Zoning code definitions were reviewed to indicate which areas could include tobacco retailers. Map books were made for field study coordinators. For all but the five largest cities (i.e., cities with population more than 200,000), the map books included *all* retail/commercial areas within the city. For the five most populous cities, retail/commercial areas were randomly selected until a minimum of 124 outlets were identified. Observations in the 50 cities then documented retailer addresses.

Randomly selected tobacco outlets in each city were surveyed by a team of two buyers. At each outlet a single buyer attempted to purchase a pack of Marlboro or Newport cigarettes, which are the most popular cigarette brands among high-school-aged students [28]. Each buyer asked for Marlboro in one outlet and Newport in the next one. If asked about their age they stated that they were over 18 years old and if asked for age identification they indicated

they had none. If a sale was refused, the buyers left without attempting to pressure the clerk. After leaving the outlet, the buyer recorded the purchase outcome and outlet data on a standardized form. These protocols have been successfully used in studies of youth access to alcohol [29–31] and tobacco [32, 33]. Institutional review board approval was obtained prior to study implementation.

## Measures

### Retail-level measures

**Independent variables:** The following data, documented by the confederate buyers after leaving the outlets, were used: age requested (no/yes), clerk gender (male/female), approximate age of the clerk (numeric age), the number of customers in line at the time of the purchase attempt, the presence of warning signs about tobacco sales to minors in the store (no/yes), and the type of outlet (i.e., small market, supermarket, convenience store, pharmacy/drug store, liquor store, tobacco store, and other). Buyers' gender and actual age were also included as variables in the analyses.

**Outcome variables:** The confederate buyers documented whether the sale was made (no/yes), whether asked to show an ID (no/yes), and the price of the pack of cigarettes (including tax) they purchased or attempted to purchase. Outlets where buyers could not ascertain the price of a pack of cigarettes during the purchase attempt were later telephoned. We excluded three surveys in which the confederate buyer attempted to purchase a pack of cigarettes other than Marlboro or Newport.

### Community-level measures

**City demographics:** Measures of city demographics were obtained from 2010 GeoLytics data [34]. City characteristics included population density (i.e., population per roadway mile), percentage of population under 18 years old, median family income, percentage of population that was African-American, percentage of population that was Hispanic, and percentage of population with a college education. All city-level demographics were standardized.

**Adult smoking prevalence:** Adult smoking prevalence in each city was ascertained from a survey of 8,918 adults over the age of 21 years old conducted in the same 50 cities as a part of another study. Respondents were surveyed through a random digit dial computer-assisted telephone interview and were asked whether they currently smoked cigarettes every day, some days, or not at all. Adult smoking prevalence was computed as the percentage of every-day and some-day smokers in each city.

**Tobacco outlet density:** The total number of licensed tobacco retail establishments in each city was obtained from State of California Board of Equalization data-files for September 2011. These data include the total number of licensed tobacco outlets by city and zip code, but not outlet names or addresses. Outlet density in each city was calculated as the number of outlets per 10,000 persons.

**Local tobacco retailer licensing:** Data about localities requiring tobacco retailer licensing were obtained from the California American Lung Association website [35]. Cities were coded as having or not having a local tobacco retailer licensing ordinance.

**Cigarette tax:** Cigarette sales tax information was obtained from State of California Board of Equalization data available online [36]. This tax information represents the local tax in each city at the time the access survey conducted.

## Data analysis

Multilevel logistic and linear regression analyses were conducted with HLM version 6.04 software to adjust for clustering of observations within cities [37]. Intraclass correlations (i.e., the proportion of variance in compliance with underage tobacco sales, asking for proof of age and cigarette price that is between cities) were .15, .30 and .08 for whether the sale was made, whether retailer requested ID, and cigarette pack price, respectively. ICC results indicate that the between city variation is less for cigarette price than it is for whether the sale was made and whether retailer requested ID. These intraclass correlation values suggest that observations within the cities were not independent and indicate the value of including cities as a random second-level unit. In predicting retail compliance with underage tobacco sales and clerk request for ID, all retail-level variables were included as well as all community-level variables. In predicting cigarette price only the type of outlet was included at the retail-level together with all community-level variables. Additional analyses were conducted to examine the relationships between cigarette price and contextual and community characteristics by brand (i.e., Marlboro and Newport price). In each model, variables at both levels were entered simultaneously. The models assumed that slopes were fixed (i.e., the same across cities) and only the retail-level intercept coefficient was allowed to vary across cities. Unit-specific models were used to evaluate results of the logistic regression analyses.

## RESULTS

### Retailer compliance with underage tobacco sales laws

Overall rate of retailer noncompliance with underage tobacco sales laws in the 997 selected outlets was 14.3%. Descriptive statistics from the access surveys are in Table 1. A multilevel logistic regression analysis was conducted to examine the relationships among retail and community level characteristics and retailer compliance with underage tobacco sales laws. At the retail level, buyer's actual age, the clerk being male, and asking young buyers about their age were each positively associated with selling a pack of cigarettes (Table 2). None of the other retail level characteristics were related to non-compliance. At the community level, higher percentage of minors in the population, a greater percentage of residents with at least a college degree, and a greater percentage of African Americans were associated with increased likelihood of non-compliance.

An additional multilevel logistic regression analysis was conducted to examine predictors of clerks requesting identification (see Table 2). At the retail level, the presence of age-of-sale signage was positively associated with clerks requesting ID. Buyer's actual age decreased likelihood of clerks requesting ID. At the community level, lower percentage of minors, lower percentage of residents with at least a college degree, lower percentage of African Americans, and local tobacco retailer licensing were associated with retailers asking for ID. [Insert Table 2 here]

### Cigarette price

Pack prices ranged from \$4.31 to \$8.72 ( $M=6.22$ ,  $SD=.70$ ) and varied greatly across outlets. For the same brand, the maximum price was 1.9 to 2 times higher than the lowest price. Results of a multilevel linear regression analysis to examine the relationships among retail and community level characteristics and cigarette prices are presented in Table 3. Results indicate significant associations between the type of the outlet and prices of a pack of cigarettes. More specifically, supermarkets charged significantly more for a pack of cigarettes than small markets whereas smoke/tobacco shops and drug stores/pharmacies charged less on average. Turning to community level characteristics, higher cigarette prices

were associated with higher median household income and a greater percentage of Hispanics in the community.

Similar results were found with respect to outlet type in the brand-specific models (see Table 3). Supermarkets charged more for both Marlboro and Newport and smoke/tobacco shops and drug stores/pharmacies charged less. Differences, however, were observed in the community level variables. While higher median household income, lower prevalence of adult smokers in the community, and not having local tobacco retailer licensing policy were associated with higher prices of Marlboro, lower percentage of minors and increased percentage of Hispanics were associated with higher prices of Newport. None of the other community level variables that predicted either general cigarette prices or Marlboro prices were related to prices of Newport.

## DISCUSSION

We investigated the relationships of a wide range of retail and community factors with youth access to cigarettes through commercial sources. Results of our investigation suggest that, after controlling for a range of community level characteristics, only a few retail level characteristics are important. Whereas results of previous studies indicated associations between sales of cigarettes to minors and various characteristics of youth buyers, store clerks, the retail environment and factors related to the purchase attempt [11–17, 19, 22], we only found buyer's actual age, being a male clerk, and clerks asking young buyers about their age related to successful cigarette purchases by underage appearing buyers. This supports our argument about the importance of studying a full range of both contextual and community characteristics in order to highlight ways to tailor policies to reduce youth access to cigarettes via commercial sources more effectively.

Our finding that asking young buyers about their age was positively associated with successful purchases is contrary to findings from Arday et al. [22], who reported the opposite. Our finding suggests that retailers who do ask about the age may sell cigarettes to youth who state they are over 18 years old without requesting proof of age. Interventions with retailers should emphasize the importance of requiring clerks to request proof of age regardless of if the person states that he or she is over 18 years old. Procedures to verify that clerks consistently check IDs (e.g., “mystery shoppers” or reward and reminder programs) may be critically important if such policies are to be effective [38]. The importance of store policies is further highlighted by our results showing that visible age-of-sale signs were associated with an increased likelihood that the clerk requested proof of age. Similar findings have been reported regarding the presence of signage sales of alcohol to minors [30]. It is possible that the presence of such signs reminds clerks to be vigilant or that posting signs is simply one indicator that a retailer has implemented consistent and effective policies regarding checking ID.

Our findings also suggest that youth access to cigarettes from commercial sources is easier in some communities than in others. Youth in communities with higher educational levels, greater percentage of minors, or greater percentage of African Americans may have easier access to cigarettes from retail stores. It is possible that retailers in such communities might have more trust that minors will not try to illegally purchase cigarettes, are less concerned with youth smoking in their communities, or believe it is less likely they will be the target of a compliance check. This result supports the importance of enforcing laws that prohibit selling tobacco to minors in all communities.

The likelihood that a retailer will ask for proof of age is greater in communities with local tobacco retailer licensing. Strong licensing policies usually include a fee set to fund



enforcement of tobacco sales to minor laws, a provision that a violation of existing local, state, or federal tobacco regulation results in a suspended or revoked license, and financial disincentives through increased fines and penalties [35]. Our results suggest that requiring a license to sell tobacco may help reduce youth access to cigarettes through commercial sources.

Similar to previous studies [26, 39], our findings suggest that drug stores/pharmacies and smoke/tobacco shops may provide greater economic access to cigarettes for youth than do large supermarkets. Because previous studies have shown consistently that cigarette prices decrease cigarette smoking [6–8] and that youth are more price sensitive than adults [9, 10], control over cigarette prices in such stores may help to reduce youth smoking. Establishing minimum prices for tobacco products may be one effective policy that can be implemented locally.

Interestingly, the relationships between community characteristics and cigarette prices varied by cigarette brand. Higher median household income, lower prevalence of adult smokers in the community, and not having a local tobacco retailer licensing were all associated with higher prices of Marlboros. The finding about the inverse relation between prevalence of adult smokers in the community and price supports other studies which consistently have shown negative relation between cigarette prices and cigarette smoking [6–8]. Also, it is very likely that retailers charge more for cigarettes in communities with wealthy households. The positive association between local tobacco retailer licensing and Marlboro price may be explained by the other community-level characteristics identified in this study. It is possible that wealthiest communities with fewer smokers tend to adopt local tobacco retailer licensing ordinances which may also reflect broader community norms that are less supportive of smoking and therefore price promotion.

The findings that the price of Newport was lower in communities with higher percentage of minors and higher in communities with higher percentage of Hispanics may explain why Newports are popular among high school students and less among Hispanics [28]. In another study in California, Henriksen et al [39] found that the price of Newport was lower in high school neighborhoods with higher percentage of Black students. Finally, different results regarding the associations between some community characteristics and Marlboro versus Newport prices may be explained by other factors which were not included in the current study. For example, it is possible that more extensive Newport price promotion in communities with local tobacco licensing diminishes any potential effect such policies may have.

## Limitations

The results of this study should be considered in light of some limitations. First, only two confederate buyers conducted the surveys in each city, which limits our ability to consider characteristics of the buyers other than gender and age. Other studies, for example, have identified buyer ethnicity as significantly associated with increased youth tobacco sales [19, 20]. Second, we only collected price data for Marlboro and Newport cigarettes. Although they are the most popular cigarette brands among high school students [28], they may not represent the range of prices among all cigarette brands. Third, the cross-sectional design of the study limited our ability to make directional inferences about relationships between contextual and community characteristics and outcome variables. For example, in understanding the relationships between the presence of age-of-sale signs and clerk requesting for ID, it is possible that posting these signs is simply an indicator that a retailer has implemented policies regarding checking ID rather than serving to increase clerks' awareness about legal age.

Despite these possible shortcomings, this investigation enhances our understanding of the associations between contextual and community characteristics and youth commercial and economic access to tobacco. Such understanding can help policymakers to identify and target at-risk communities and outlets to decrease youth access to tobacco.

## Acknowledgments

### Funding:

This publication was made possible by grant CA138956 from the National Cancer Institute (NCI) and grant 19CA-016 from the Tobacco-Related Disease Research Program (TRDRP; <http://www.trdrp.org>). The content is solely the responsibility of the authors and does not necessarily represent the official view of NCI and TRDRP.

## References

- Centers for Disease Control and Prevention. Best practices for comprehensive tobacco control programs—October 2007. Atlanta, GA: Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2007.
- Wakefield M, Chaloupka F. Effectiveness of comprehensive tobacco control programmes in reducing teenage smoking in the USA. *Tob Control*. 2000; 9:177–86. [PubMed: 10841854]
- US Department of Health and Human Services. Preventing tobacco use among young people: A report of the Surgeon General. Rockville MD: US Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease and Health Promotion, Office on Smoking and Health; 1994.
- US Department of Health and Human Services. Youth Tobacco Surveillance—United States, 1998–1999. *MMWR CDC Surveillance Summary*. 2000; 49:1–94.
- DiFranza JR. Which interventions against the sale of tobacco to minors can be expected to reduce smoking? *Tob Control*. 2011:12. [Epub ahead of print].
- Botello-Harbaum MT, Haynie DL, Iannotti RJ, Wang J, Gase L, Simons-Morton B. Tobacco control policy and adolescent cigarette smoking status in the United States. *Nicotine Tob Res*. 2009; 11:875–85.
- Carpenter C, Cook PJ. Cigarette taxes and youth smoking: New evidence from national, state, and local Youth Risk Behavior Surveys. *J Health Econ*. 2008; 27:287–99. [PubMed: 18242745]
- Ross H, Chaloupka FJ. The effect of cigarette prices on youth smoking. *Health Econ*. 2003; 12:217–30. [PubMed: 12605466]
- Ding A. Youth are more sensitive to price changes in cigarettes than adults. *Yale J Biol Med*. 2003; 76:115–24. [PubMed: 15369626]
- Townsend J, Roderick P, Copper J. Cigarette smoking by socioeconomic group, sex, and age: effects of price, income, and health publicity. *BMJ*. 1994; 309:923–7. [PubMed: 7950662]
- Erickson AD, Woodruff SI, Wildey MB, Kenney E. A baseline assessment of cigarette sales to minors in San Diego, California. *J Community Health*. 1993; 18:213–24. [PubMed: 8408751]
- Klonoff EA, Landrine H, Alcaraz R. An experimental analysis of sociocultural variables in sales of cigarettes to minors. *Am J Public Health*. 1997; 87:823–6. [PubMed: 9184513]
- Clark PI, Natanblut SL, Schmitt CL, Wolters C, Iachan R. Factors associated with tobacco sales to minors: lessons learned from the FDA compliance checks. *JAMA*. 2000; 284:729–34. [PubMed: 10927782]
- O'Grady B, Asbridge M, Abernathy T. Analysis of factors related to illegal tobacco sales to young people in Ontario. *Tob Control*. 1999; 8:301–5. [PubMed: 10599575]
- Pearson DC, Song L, Valdez RB, Angulo AS. Youth tobacco sales in a metropolitan county: factors associated with compliance. *Am J Prev Med*. 2007; 33:91–7. [PubMed: 17673095]
- DiFranza JR, Celebucki CC, Mowery PD. Measuring statewide merchant compliance with tobacco minimum age laws: the Massachusetts experience. *Am J Public Health*. 2001; 91:1124–5. [PubMed: 11441743]



17. Sundh M, Hagquist C. Compliance with a minimum-age law of 18 for the purchase of tobacco--the case of Sweden. *Health Educ Res.* 2006; 21:378–85. [PubMed: 16675477]
18. DiFranza JR, Savageau JA, Bouchard J. Is the standard compliance check protocol a valid measure of the accessibility of tobacco to underage smokers? *Tob Control.* 2001; 10:227–32. [PubMed: 11544386]
19. Voorhees CC, Swank RT, Stillman FA, Harris DX, Watson HW, Becker DM. Cigarette sales to African-American and white minors in low-income areas of Baltimore. *Am J Public Health.* 1997; 87:652–4. [PubMed: 9146447]
20. Landrine H, Corral I, Klonoff EA, Jensen J, Kashima K, Hickman N, et al. Ethnic Disparities in Youth Access to Tobacco: California Statewide Results, 1999–2003. *Health Promot Pract.* 2010; 11:132–9. [PubMed: 18480321]
21. Weinbaum Z, Quinn V, Rogers T, Roeseler A. Store tobacco policies: a survey of store managers, California, 1996–1997. *Tob Control.* 1999; 8:306–10. [PubMed: 10599576]
22. Arday DR, Klevens RM, Nelson DE, Huang P, Giovino GA, Mowery P. Predictors of tobacco sales to minors. *Prev Med.* 1997; 26:8–13. [PubMed: 9010892]
23. Lipton R, Banerjee A, Levy D, Manzanilla N, Cochran M. The spatial distribution of underage tobacco sales in Los Angeles. *Subst Use Misuse.* 2008; 43:1594–614. [PubMed: 18752162]
24. Klonoff EA, Fritz JM, Landrine H, Riddle RW, Tully-Payne L. The problem and sociocultural context of single-cigarette sales. *JAMA.* 1994; 271:618–20. [PubMed: 8301795]
25. Asumda F, Jordan L. Minority youth access to tobacco: A neighborhood analysis of underage tobacco sales. *Health Place.* 2009; 15:140–7. [PubMed: 18482856]
26. Toomey TL, Chen V, Forster JL, Van Coevering P, Lenk KM. Do cigarette prices vary by brand, neighborhood, and store characteristics? *Public Health Rep.* 2009; 124:535–40. [PubMed: 19618790]
27. Thompson, SK. *Sampling.* New York: John Wiley and Sons; 1992.
28. Centers for Disease Control and Prevention. Cigarette brand preference among middle and high school students, who are established smokers – United States, 2004–2006. *Morb Mortal Wkly Rep.* 2009; 58:112–5.
29. Grube JW. Preventing sales of alcohol to minors: Results from a community trial. *Addiction.* 1997; 92:S251–S60. [PubMed: 9231448]
30. Paschall MJ, Grube JW, Black C, Flewelling RL, Ringwalt CL, Biglan A. Alcohol outlet characteristics and alcohol sales to youth: Results of alcohol purchase surveys in 45 Oregon communities. *Prev Sci.* 2007; 8:153–9. [PubMed: 17243019]
31. Paschall MJ, Grube JW, Black C, Ringwalt CL. Is commercial alcohol availability related to adolescent alcohol sources and alcohol use? Findings from a multi-level study. *J Adolesc Health.* 2007; 41:168–74. [PubMed: 17659221]
32. Biglan A, Ary DV, Koehn V, Levings D, Smith S, Wright Z, et al. Mobilizing positive reinforcement in communities to reduce youth access to tobacco. *Am J Community Psychol.* 1996; 24:625–38. [PubMed: 9145494]
33. Biglan A, Ary DV, Smolkowski K, Duncan T, Black C. A randomized controlled trial of a community intervention to prevent adolescent tobacco use. *Tob Control.* 2000; 9:24–32. [PubMed: 10691755]
34. GeoLytics Inc. *Estimates Premium 2010.* [DVD] E. Brunswick; NJ: 2010.
35. The Center for Tobacco Policy & Organizing. *Matrix of Strong Local Tobacco Retailer Licensing Ordinances.* 2011. [cited 2011 12.19.2011]; Available from: [http://www.center4tobaccopolicy.org/CTPO/\\_files/\\_file/Matrix%20of%20Strong%20Local%20Tobacco%20Retailer%20Licensing%20Ordinances%20March%202011.pdf](http://www.center4tobaccopolicy.org/CTPO/_files/_file/Matrix%20of%20Strong%20Local%20Tobacco%20Retailer%20Licensing%20Ordinances%20March%202011.pdf)
36. California City & County Sales & Tax Rates [database on the Internet]. 2011. [cited December 15 2011]. Available from: <http://www.boe.ca.gov/sutax/pam71.htm>
37. Raudenbush, S.; Bryk, A.; Cheong, YF.; RC; Du Toit, M. *HLM 6: Hierarchical Linear and Nonlinear Modeling.* Lincolnwood, IL: Scientific Software International; 2004.
38. Krevor BS, Ponicki B, Grube JW, DeJong W. The impact of mystery shopper reports on age verification for tobacco purchases. *J Health Commun.* 2011; 16:820–30. [PubMed: 21541874]

39. Henriksen L, Schleicher NC, Dauphinee AL, Fortmann SP. Targeted advertising, promotion, and price for menthol cigarettes in California high school neighborhoods. *Nicotine Tob Res.* 2012; 14:116–121. [PubMed: 21705460]

### What This Paper Adds

Going beyond previous research, the present study examines the associations between a wide range of contextual and community-level characteristics and retailer compliance with underage tobacco sales laws and with pack prices in 50 non-contiguous mid-sized California communities. Since any illegal tobacco purchase attempt by minors occurs in an ecological environment that includes both contextual and community characteristics, this approach may help to highlight ways to tailor policies to reduce youth access to cigarettes via commercial sources more effectively.

**Table 1**

Retail-level characteristics by retailer compliance with underage tobacco sales laws in mid-sized California cities

	Compliant (N=854)	Non-compliant (N=143)	All retailers (N=997)
Mean young buyer real age	19.39 (.79)	20.14 (.99)	19.49 (.87)
Young buyer gender			
% Male	92.5	7.5	51
% Female	78.5	21.5	49
Type of outlet			
% Small markets	85.8	14.2	11.5
% Convenience store	84.6	15.4	46.3
% Smoke/tobacco shop	71.9	28.1	5.7
% Supermarket	85.2	14.8	10.8
% Drug/pharmacy store	90.6	9.4	9.6
% Liquor store	89.6	10.4	13.5
% Other	96.2	3.8	2.6
Clerk gender			
% Male	83.7	16.3	61.4
% Female	89.3	10.7	38.4
Brand of cigarettes purchased			
% Marlboro	91.3	8.7	47.3
% Newport	80.6	19.4	52.7
Mean clerk estimated age	35.43 (9.87)	35.49 (9.75)	35.45 (9.85)
Minimum age signs			
% No	87.2	12.8	11.7
% Yes	85.7	14.3	86.8
Mean of number of customers in line behind buyers	.66 (1.05)	.61 (1.11)	.65 (1.06)
Asked about age			
% No	89.7	10.3	85.3
% Yes	63.0	37.0	14.7

Note: Non-compliant means that a retailer sold cigarettes to a confederate buyer who judged to look younger than 18.

**Table 2**

Multi-level logistic regression analyses predicting retailer compliance with underage tobacco sales laws in mid-sized California cities

Predictors:	Retailer Non-Compliance (0=No;1=Yes)	Requested ID (0=No;1=Yes)
	OR 95% CI	OR 95% CI
<b>Community level (N=50):</b>		
Population density	1.26 (.87, 1.83)	.82 (.60, 1.12)
Percentage of minors	1.79 (1.01, 2.93)*	.52 (.33, .83)*
Median HH income	1.03 (.73, 1.44)	.88 (.65, 1.18)
Education	1.60 (1.02, 2.51)*	.51 (.33, .80)*
African American	1.41 (1.01, 1.96)*	.55 (.40, .76)**
Hispanics	.54 (.27, 1.12)	1.59 (.91, 2.81)
Prevalence of adult smokers	1.03 (.98, 1.09)	1.00 (.95, 1.04)
Tobacco outlet density	1.05 (.96, 1.14)	.95 (.89, 1.01)
Local tobacco retailer licensing	.52 (.22, 1.20)	2.20 (1.02, 4.76)*
Cigarette tax	1.24 (.93, 1.66)	.92 (.71, 1.19)
<b>Retail level (N=997):</b>		
Young buyer gender	1.49 (.78, 2.83)	.59 (.31, 1.13)
Buyer actual age	1.66 (1.17, 2.38)*	.65 (.46, .91)*
Type of outlet (small market reference)		
Convenience store	.85 (.47, 1.53)	1.04 (.58, 1.83)
Smoke/tobacco shop	1.75 (.63, 4.86)	.42 (.16, 1.11)
Supermarket	.94 (.44, 2.01)	1.19 (.44, 3.30)
Drug/pharmacy store	1.03 (.41, 2.58)	1.39 (.40, 4.91)
Liquor store	.59 (.27, 1.29)	1.42 (.51, 3.95)
Other	.34 (.04, 3.04)	1.54 (.17, 13.84)
Female clerk	.60 (.39, .94)*	1.62 (.94, 2.82)
Clerk estimated age	.99 (.96, 1.01)	1.00 (.97, 1.03)
Minimum age signs	.50 (.24, 1.05)	2.49 (1.15, 5.42)*
Number of customers in line behind buyers	1.01 (.83, 1.24)	1.02 (.80, 1.29)
Asked about age	5.20 (3.27, 8.28)**	1.25 (.74, 2.13)

\*\* p .005;

\* p .05

**Table 3**

Results of multi-level regression analyses predicting cigarette pack prices in mid-sized California cities

Predictors:	Price	Marlboro Price	Newport Price
	b SE <sub>b</sub>	b SE <sub>b</sub>	b SE <sub>b</sub>
<b>Community level (N=50):</b>			
Population density	-.04 (.04)	-.05 (.05)	-.01 (.03)
Percentage of minors	-.05 (.06)	-.01 (.06)	-.13 (.06)*
Median HH income	.08 (.03)*	.12 (.04)*	.03 (.03)
Education	.04 (.07)	.04 (.08)	.02 (.07)
African American	.00 (.03)	.06 (.04)	-.05 (.03)
Hispanics	.12 (.06)*	.13 (.07)	.13 (.06)*
Prevalence of adult smokers	-.01 (.01)	-.02 (.01)*	-.00 (.01)
Tobacco outlet density	.02 (.01)	.02 (.01)	.00 (.01)
Local tobacco retailer licensing	-.10 (.09)	-.20 (.10)*	-.01 (.07)
Cigarette tax	-.01 (.04)	.00 (.06)	-.03 (.04)
<b>Retail level:</b>	<i>N</i> =997	<i>N</i> =472	<i>N</i> =525
Type of outlet (small market reference)			
Convenience store	-.07 (.08)	-.08 (.09)	-.07 (.10)
Smoke/tobacco shop	-.31 (.12)*	-.31 (.12)*	-.31 (.15)*
Supermarket	.48 (.10)**	.49 (.12)**	.55 (.12)**
Drug/pharmacy store	-.43 (.09)**	-.35 (.12)**	-.38 (.13)**
Liquor store	-.02 (.07)	-.15 (.11)	.01 (.09)
Other	-.06 (.16)	.05 (.14)	-.02 (.29)

\*\*  
p .005;\*  
p .05