

Tobacco Retail Licensing and Youth Product Use

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abstract

BACKGROUND: Restricting youth access to tobacco is a central feature of US tobacco regulatory policy, but impact of local tobacco retail licensing (TRL) regulation on cigarette smoking rates remains uncertain. Effects of TRL on other tobacco product use and use as adolescents reach the age to legally purchase tobacco products has not been investigated.

METHODS: Prevalences of ever and past 30-day cigarette, electronic cigarette (e-cigarette), cigar, and hookah use were assessed in a survey of a cohort of 1553 11th- and 12th-grade adolescents (mean age: 17.3 years); rates of initiation were evaluated 1.5 years later. An American Lung Association (2014) youth access grade was assigned to each of 14 political jurisdictions in which participants lived on the basis of the strength of the local TRL ordinance.

RESULTS: At baseline, participants living in 4 jurisdictions with “A” grades (ie, with most restrictive ordinances) had lower odds of ever cigarette use (odds ratio [OR] 0.61; 95% confidence interval [CI] 0.41–0.90) and of past 30-day use (OR 0.51; 95% CI 0.29–0.89) than participants in 10 D- to F-grade jurisdictions. At follow-up at legal age of purchase, lower odds of cigarette use initiation (OR 0.67; 95% CI 0.45–0.99) occurred in jurisdictions with stronger TRL policy. Lower odds of e-cigarette initiation at follow-up (OR 0.74; 95% CI 0.55–0.99) and of initiation with past 30-day use (OR 0.45; 95% CI 0.23–0.90) were also associated with better regulation.

CONCLUSIONS: Strong local TRL ordinance may lower rates of cigarette and e-cigarette use among youth and young adults.



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Dr McConnell conceptualized and designed the study and reviewed and revised the manuscript; Mr Astor collected data on tobacco retail licensing in study communities, conducted a literature review, and drafted the manuscript; Dr Urman conducted all data analyses; Drs Barrington-Trimis, Berhane, Steinberg, Cousineau, Leventhal, Unger, Cruz, Pentz, and Samet provided advice on the analysis and interpretation of results and reviewed and provided guidance on the development of the manuscript; and all authors approved the final manuscript as submitted.

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WHAT'S KNOWN ON THIS SUBJECT: Restricting youth access to tobacco has long been a central feature of US tobacco regulatory policy, but the impact of local tobacco retail licensing regulation on electronic cigarette use rates remains uncertain.

WHAT THIS STUDY ADDS: Strong local tobacco retail licensing ordinances may lower rates of cigarette and electronic cigarette use among youth and young adults. Success of regulations restricting youth access to cigarettes and alternative tobacco products may depend on ensuring a robust enforcement scheme.

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Most US states have had laws to restrict the sale of cigarettes to minors for decades.¹ Because there was widespread violation of these laws by tobacco vendors,² Congress passed the Synar Amendment to the Public Health Service Act in 1993,³ which required that states enact laws banning cigarette sales to minors and that they enforce such laws with compliance checks using undercover “decoys” posing as underage customers.^{4,5}

Enforcement of these youth access regulations is a central feature of US tobacco control programs. However, although compliance checks of vendors have been shown to reduce sales to minors, their effectiveness in reducing youth smoking rates is less certain, for example, because they may obtain cigarettes legally purchased by older friends.^{6,7} Key regulatory features that are reported to reduce both compliance violations and youth cigarette use include a mandatory tobacco retailer licensing fee to provide sustainable funding of undercover decoys to make at least 1 annual visit to each vendor and fines or penalties for violations.^{7,8}

Low rates of vendor compliance checks, which occur annually at only a small fraction of tobacco vendors under existing state and federal enforcement programs,^{9,10} and inadequate penalties may explain why associations with youth smoking rates have not consistently been observed.⁷ Within states, compliance enforcement may vary markedly on the basis of local ordinances that provide funding to do so. Given the expense involved in enforcement and the lack of expert consensus on its benefits, additional studies are warranted to assess the effectiveness in reducing youth cigarette use.

The impact of youth access restriction on the initiation of alternative tobacco products, such as electronic cigarettes (e-cigarettes), hookah, and cigars, has not been studied, although prevalence of ever

using these products is high.¹¹ An additional gap in understanding the effectiveness of youth tobacco access restriction is during the transition to the legal age of purchase. Most adult smokers historically have initiated cigarette use by age 18,¹² which is the legal age of purchase in most states. There have been few prospective studies examining the effect of tobacco licensing and youth access restriction on cigarette and alternative tobacco product use during this transition to adult life.

Among participants in the Southern California Children’s Health Study, we evaluated whether youth living in jurisdictions with a strong tobacco retail licensing (TRL) ordinance had reduced prevalence of cigarette and other tobacco use, compared with participants in jurisdictions with a poor TRL ordinance. In addition, using prospectively collected data, we assessed the association of local ordinances with the initiation of tobacco product use during a cohort follow-up as youth reached 18 years of age, the age at which the sale of tobacco products was legal in California at the time of the study.

METHODS

Study Population

Between January and June of 2014, a total of 2097 11th- and 12th-grade participants in the Southern California Children’s Health Study (mean age: 17.3; SD: 0.6) completed self-administered questionnaires collecting detailed information about cigarette and alternative tobacco product use. Follow-up online questionnaire data were collected on 1553 participants (74% of the 2097 at baseline) as they reached 18 years of age, between January 2015 and June 2016 (mean age: 18.8; SD: 0.6). Additional characteristics of the study sample have been described previously.^{13,14}

Ethics Statement

The study was approved by the University of Southern California Institutional Review Board. Parental written informed consent and child assent were obtained for all Children’s Health Study participants <18 years of age. Participants age 18 or older provided written informed consent.

Tobacco and Alternative Tobacco Product Use

At each survey, participants were asked whether they had ever tried e-cigarettes, cigarettes, cigars, or hookah and the number of days each product was used in the past 30 days.¹² Participants who had “never tried” a product (not “even 1 or 2 puffs”) were classified as never users. Those reporting an age at first use of each tobacco product were classified as ever (lifetime prevalent) users of that product at baseline. Rates of initiation were calculated on the basis of a new report of use of a tobacco product at follow-up among participants not reporting use of that product at baseline. Both prevalent users and initiators of each tobacco product were further characterized on the basis of past 30-day use.

Evaluation of Local Tobacco Regulatory Licensing to Reduce Youth Access

There were 14 political jurisdictions with corresponding tobacco product ordinances across the 12 participating Children’s Health Study communities. Four study jurisdictions were assigned an A grade on the basis of the 2014 American Lung Association (ALA) “Reducing Sales of Tobacco Products” to youth scale, which is used to evaluate the strength of the local TRL ordinance across California.¹⁵ An A grade required adequate annual retail license fees, which were paid by all tobacco retailers (including gas stations, convenience stores, larger grocery stores, and pharmacies),

to cover the administration of an enforcement program and regular compliance checks in each store. An A grade also required (1) an annual renewal of this local license; (2) a provision that any violation of local, state, or federal law is a violation of the license; and (3) a graduated penalty system for violators, including financial deterrents such as fines or other penalties, including license revocation or suspension.¹⁵

The remaining study jurisdictions were assigned an F grade (8) or a D grade (1). An F grade indicated either (1) no local ordinance mandating a license fee or (2) a fee insufficient to fund administrative and compliance checks as well as none of the 3 other provisions for an A grade. The jurisdiction with the D grade had a licensing fee that was insufficient to cover administration and compliance checks, but it had at least 1 of the other 3 provisions listed above that were needed for an A grade. The D and F communities were collapsed for data analysis, because the insufficient annual fee is a central feature of regulation to reduce youth access.^{7,15} No study jurisdiction in this sample had B or C grades corresponding to TRL policies of intermediate quality.¹⁵

ALA assigned grades to other categories of tobacco policy (smoke-free housing policy, smoke-free outdoor policy, and overall tobacco policy).¹⁵ These policies, which are not specific to youth tobacco product access, were not associated with tobacco product use in this study, and results are not presented.

Covariates

Self-administered questionnaires completed by parents of participants were used to assess sociodemographic characteristics, including sex, ethnicity (Hispanic, non-Hispanic white, other), age at baseline, and parental education (completed high school or less, some

college, or completed college or more).

Statistical Analysis

Unconditional logistic regression models were used to evaluate the associations of living in a jurisdiction with an ALA grade A versus D or F TRL ordinance with baseline ever and past 30-day use of cigarettes, e-cigarettes, hookah, cigars, or use of any of these tobacco products in separate models. Models were also fit to evaluate associations of ALA grade with the initiation of each product, with or without past 30-day use. In models used to evaluate the initiation of use of each tobacco product between baseline and follow-up, the sample was restricted to baseline never users of that product. Odds ratios (ORs) and 95% confidence intervals (CIs) were used to estimate the association of each tobacco product use with an ALA grade. All models were adjusted for sex, ethnicity, highest parental education, and baseline age, factors that have been associated both with e-cigarette use and cigarette use in previous studies.^{13,14} Each tobacco product-specific model was also adjusted for a baseline history of use of any other tobacco product, because there was clustering of the tobacco product outcomes.¹³ A missing indicator category for covariates and any other tobacco product use was included where appropriate. Additionally, all models included a random effect for community to account for similarities among subjects within jurisdictions. In a sensitivity analysis, models were further adjusted for time between baseline and follow-up questionnaire completion. Statistical analyses were based on 2-sided hypotheses tested at a 0.05 level of significance, using SAS 9.4 (SAS Institute, Inc, Cary, NC).

RESULTS

Of the 2097 participants, 31.1% (652) lived in a jurisdiction with an

ALA 2014 TRL A grade, and 68.9% (1445) students lived in jurisdictions with D or F grades. Sex and ethnic distributions were similar in A and D or F jurisdictions, but students in A jurisdictions were more likely to come from less-educated households (Table 1). Unadjusted prevalence and initiation rates for each tobacco product were lower in jurisdictions with A than with D or F grades, with the exception of new initiation of hookah with past 30-day use. Initiation rates were substantial among never tobacco product users at baseline, in particular for e-cigarette use. Both prevalence and initiation rates of past 30-day tobacco product use generally did not exceed 10% for any product.

For baseline prevalence of ever and past 30-day use of cigarette and e-cigarette ever use, and to a lesser degree for prevalence of cigar use, jurisdictions with A grades had generally lower use rates than D or F jurisdictions (Supplemental Fig 3). However, within both grade groups, there was considerable variability in prevalence rates across jurisdictions for all tobacco products. Rates in individual jurisdictions had wide CIs (results not shown) because of small sample size. Rates of tobacco product initiation at follow-up were also generally quite variable across the jurisdictions within both A and D or F grades (Supplemental Fig 4).

At baseline, participants living in the 4 jurisdictions with A grades had lower odds of ever using a cigarette (OR 0.61; 95% CI 0.41–0.90) and of past 30-day use (OR 0.51; 95% CI 0.29–0.89) than participants in 10 D- to F-grade jurisdictions, after adjusting for sociodemographic covariates and other tobacco product use at baseline (Fig 1).

Living in A-grade jurisdictions was associated with lower odds of initiation of cigarette use between baseline and the follow-up questionnaire (OR 0.67; 95% CI 0.45–0.99 [Fig 2]). The risks of

TABLE 1 Prevalence of Sociodemographic Characteristics, Lifetime, and Current (Last 30-Day) Use of Each Tobacco Product at Baseline and Rates of Product Initiation at Follow-up Among Youth Residing in a Jurisdiction With ALA Reduced Tobacco Sales, Grade A or D or F

	Grade A	Grade D or F
	N (% ^a)	N (% ^a)
Sex		
Male	324 (49.7)	735 (50.9)
Female	328 (50.3)	710 (49.1)
Ethnicity		
Hispanic white	349 (53.5)	736 (50.9)
Non-Hispanic white	230 (35.3)	504 (34.9)
Other	73 (11.2)	205 (14.2)
Parent education		
Less than or equal to high school	245 (41.3)	460 (34.3)
Some college	219 (36.9)	502 (37.4)
College or more	129 (21.8)	379 (28.3)
Prevalent ever tobacco product use at baseline		
Cigarette	89 (13.7)	302 (21.0)
E-cigarette	123 (19.0)	379 (26.4)
Hookah	158 (24.3)	411 (28.6)
Cigars	69 (10.6)	204 (14.2)
Any tobacco product	214 (32.9)	564 (39.2)
Prevalent past 30-d tobacco product use at baseline		
Cigarette	24 (3.7)	95 (6.6)
E-cigarette	56 (8.6)	145 (10.1)
Hookah	62 (9.5)	162 (11.3)
Cigars	21 (3.2)	55 (3.8)
Any tobacco product	107 (16.5)	267 (18.6)
Initiation of tobacco product use (between baseline and follow-up) ^b		
Cigarette	52 (13.1)	156 (18.0)
E-cigarette	92 (24.7)	235 (29.7)
Hookah	55 (15.9)	146 (18.9)
Cigars	49 (12.0)	158 (17.1)
Any tobacco product	85 (27.7)	198 (30)
Initiation with past 30-d tobacco product use at follow-up ^b		
Cigarette	17 (4.3)	52 (6.0)
E-cigarette	17 (4.7)	69 (8.9)
Hookah	16 (4.7)	32 (4.2)
Cigars	12 (2.9)	36 (3.9)
Any tobacco product	24 (7.9)	78 (12.1)

^a The denominator (652 in grade A; 1445 in grade D or F) varies because of missing values in covariates.

^b Restricted to nonusers of each product (or of any tobacco product) at baseline.

initiation of e-cigarettes (OR 0.74; 95% CI 0.55–0.99) and of initiation with past 30-day use (OR 0.45; 95% CI 0.23–0.90) were also lower in A-grade than D- or F-grade jurisdictions. In sensitivity analyses adjusting for time since turning 18 at follow-up, there was no change in the protective effect estimate of living in a well-regulated (A-grade) jurisdiction (results not shown). Participants still living in their jurisdiction of origin at follow-up evaluation would have had consistent exposure to the same regulatory environment. In this sample, there were stronger protective A-grade

compared with D- or F-grade associations with cigarette and e-cigarette initiation at follow-up (and of initiation of e-cigarettes with past 30-day use) than in the entire sample (results not shown). The protective association of A-grade residence with initiation of cigar use was similar in magnitude to the association with cigarette and e-cigarette use but was not statistically significant.

DISCUSSION

Central features of the ALA TRL grade include a licensing fee

sufficient to fund compliance checks and enforcement of regulations prohibiting tobacco sales to minors and penalties for violating the law, features of TRL that have been reported to be necessary to reduce sales to and use by youth.⁷ Compared with living in a jurisdiction with poor TRL policy, youth in a jurisdiction satisfying these criteria were less likely to smoke in high school. In a prospective follow-up of the cohort, the odds of initiation of e-cigarette use, with or without past 30-day use, and of initiation of cigarette use were also lower in well-regulated jurisdictions. Stronger associations among participants still living in their jurisdiction of origin at follow-up evaluation, with consistent exposure to the same regulatory environment throughout, also suggest that the benefits of good TRL policy extended both beyond cigarette use to e-cigarette use and into early adult life at age 18 when the sale of tobacco products was legal at the time of the study. The protective associations were large, with risk lower by one-third to a half in the strong compared with weak TRL jurisdictions (depending on the outcome).

There has been uncertainty regarding the effects of youth access restrictions on cigarette use.^{6,7,16} Some authors of prospective studies in which age-specific prevalence of tobacco use was assessed before and after regulatory intervention to restrict youth access found reductions in cigarette use,^{17–20} but others found no benefit.^{21,22} Authors of 1 review of studies that reported changes in smoking associated with youth access restrictions found no relationship of vendor compliance or of changes in vendor compliance, with smoking prevalence in a meta-analysis of available studies,⁶ perhaps because the restriction of commercial access resulted in a shift to social sources of cigarettes such as older friends or siblings. Authors of other observational studies have

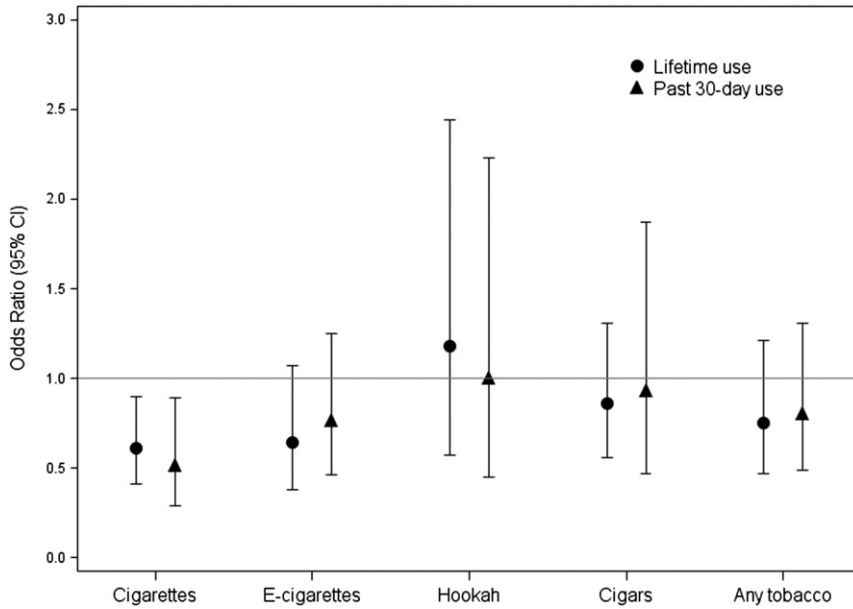


FIGURE 1

Associations of prevalent lifetime and current (last 30-day) use of each tobacco product at baseline with residence in ALA Reduced Tobacco Sales grade A jurisdictions, compared with residence in grade D or F jurisdictions. Models were adjusted for sex, ethnicity, parental education, age at baseline, and for any other tobacco product use at baseline (except for any tobacco product use prevalence, which was compared with never users of any tobacco product) and included a random effect for jurisdiction.

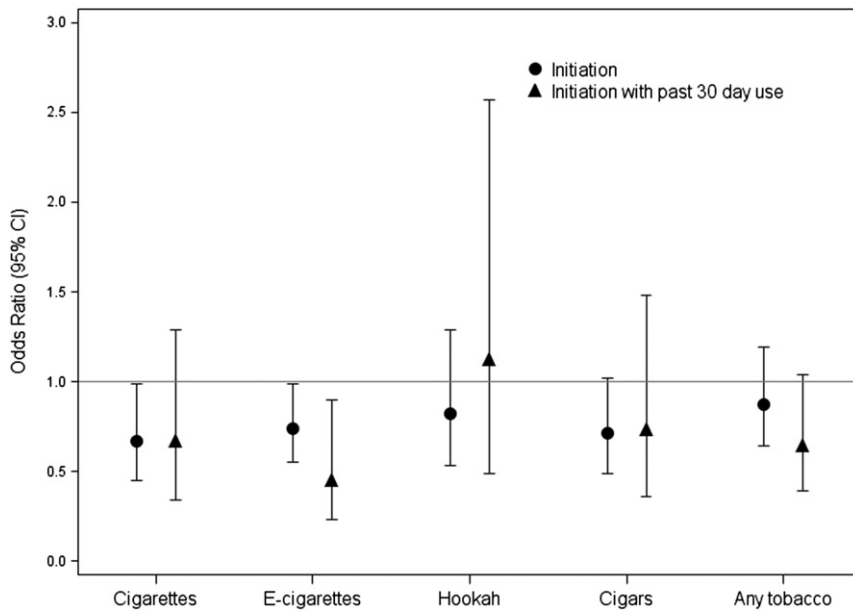


FIGURE 2

Associations of initiation of use of each tobacco product between baseline and follow-up and of initiation and current (last 30-day) use, with residence in ALA Reduced Tobacco Sales grade A jurisdictions, compared with residence in grade D or F jurisdictions. Each model was restricted to nonusers of product at baseline. Models were adjusted for sex, ethnicity, parental education, age at baseline, and for any other tobacco product use at baseline (except for any tobacco product use initiation, which was compared with never users of any tobacco product at either baseline or follow-up) and included a random effect for jurisdiction.

found reduced smoking rates in communities with youth access restrictions, but it was not clear that reduced access mediated the reduction in smoking rates.^{19,23} For example, sustained reductions in adolescent daily smoking rates were observed in Minnesota communities that were randomly assigned to intervention supporting community organizers to develop and promote good TLR ordinances, compared with nonintervention communities.²⁰ However, it was not clear whether the observed reductions in smoking rates were due to youth access restrictions and improved vendor compliance or to other regulatory features resulting from the intervention, such as bans on vending machines and requirements for posted signs reporting age of sale policies, or for storing cigarettes behind the sales counter.¹⁷

Our results are broadly consistent with findings of a comprehensive review in which authors concluded that lower smoking rates occur if local TRL requires yearly compliance checks with effective enforcement.⁷ Our study is 1 of the few that assessed associations of TRL with both prevalence and initiation rates in a prospective assessment of the same participants during an adolescent period of known high incidence of initiation. The prospective cohort design of the study also provided the opportunity to examine the impact of TRL on legal tobacco product use by young adults. The reduced risk of initiation of cigarette and e-cigarette use at follow-up in jurisdictions with better TRL regulation (with effect estimates that were unaffected by adjusting for time since turning 18 at follow-up) suggests that regulation may have lowered initiation rates even after participants reached the age for legal purchase. Although most adult smokers historically first use cigarettes before age 18,¹² in our cohort, rates of initiation of tobacco

product use were substantial, even in well-regulated jurisdictions. For example, in jurisdictions with an A grade, rates of initiation of cigarette and e-cigarette use during the follow-up period were 13.1% and 24.7%, respectively (from Table 1); these high rates of experimentation indicate a need for interventions to reduce initiation in this susceptible age window.

An alternative explanation for the protective effects of better TRL policy is that the associations reflected broadly unfavorable community attitudes toward cigarette use, including other tobacco regulations that affected the use of cigarettes and e-cigarettes to minors. If this were the explanation, we might expect to have seen associations with the other ALA tobacco grades relating to, for example, smoke-free housing, smoke-free outdoor air, or the overall tobacco grade in a jurisdiction. However, protective effects only of the TRL grade were observed.

Lower odds of cigar use initiation associated with better TRL regulation, although not statistically significant, were similar in magnitude to reductions in odds of the initiation of cigarettes and e-cigarettes. However, living in a jurisdiction with stronger regulation was not protective for baseline prevalence or subsequent initiation of hookah use. Sales of hookah paraphernalia often occur in specialty shops and hookah bars where cigarettes may not have been sold²⁴ and therefore may not consistently have been subjected to the same rigorous compliance checks as traditional cigarette vendors. E-cigarettes are commonly sold at locations that also sell cigarettes that would have been subject to TRL regulation, and a state law passed in 2010 made it illegal to sell e-cigarettes to minors.²⁵ However, e-cigarettes are also sold in specialty “vape” shops,²⁶ and at

the time of the study, e-cigarettes were not specifically categorized as a tobacco product.²⁷ Therefore, vape shops were not required by state law to obtain a tobacco vendor license if they were not selling other tobacco products. If strong TRL regulation was responsible for the lower rates of e-cigarette use in A-grade jurisdictions, it is possible that similar TRL requirements for vape shops would have resulted in larger protective effects.

The US Food and Drug Administration (FDA) has contracts with regulators in most states to restrict youth tobacco access and also conducts its own inspections and hires third parties to conduct compliance checks.²⁸ However, the frequency of compliance checks is generally low, because of resource limitations, and penalties for violation of the law vary widely between states. California, for example, which has been a leader in tobacco control, annually inspected, on average, only 7% of tobacco retailers in 2016.^{9,10} If a high rate of compliance checks, accompanied by enforcement, is necessary to reduce youth smoking as our results suggest, then strong local TRL ordinances may be an important option to reduce teen tobacco product use through access restriction.^{10,29,30}

The study has some limitations. The ALA criteria for an A grade covered a relatively broad spectrum of TRL policy relevant to youth access, including larger fees, compliance access, and penalties if vendors violated the law. Identifying the possible effects of specific features of the TRL policy was not possible. A minimum proportion of vendors actually undergoing compliance checks was not specified, and it was not possible to assess the effect of the proportion of vendors visited. In addition, the “deeming rule” that defined e-cigarettes and hookah as tobacco products means that TRL

will be required of all vendors of these products.³¹ The recent increase in the legal age of tobacco product purchase to 21 years in California, passed after data collection for this study was completed, means that the associations of TRL policy with use during the transition to legal age of purchase may no longer be applicable to California. However, the results may broadly be generalizable to local jurisdictions in states with a legal purchase age of 18 years, with the exception of a few states that have prohibited local jurisdictions from enacting more stringent local regulation.³² The increase of poorly regulated e-cigarette Internet vendors, a relatively new way for minors to obtain tobacco products illegally at the time of data collection, may limit the future impact of TRL as a regulatory tool.³³ Future follow-up of this cohort is warranted to determine the persistence of associations with strong youth TRL and to examine longitudinally potential mediating factors, such as social characteristics of neighborhoods and communities and individuals’ changing tobacco social environment over time. There were also other potential confounders or mediators of TRL effects, such as differences in school-level tobacco prevention programs or number of tobacco outlets by jurisdiction, that were not available to study.

CONCLUSIONS

The results suggest that a strong local TRL ordinance that provides adequate resources to fund regular compliance checks and enforcement may result in large reductions in the use of cigarettes and may also result in reduced e-cigarette use. The benefits of these policies may extend into early adult life. The study also suggests that the success of future FDA regulation to reduce youth cigarette and alternative tobacco product access and use, under rules

deeming these products to be subject to FDA regulation,³¹ may depend on the availability of resources for universal annual compliance checks and enforcement targeted to both traditional and alternative tobacco product vendors. Continued monitoring is needed to assess the impact on the effectiveness of TRL

policy within the rapidly evolving tobacco product patterns of use, new national regulation, and poorly regulated Internet sales.

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ABBREVIATIONS

ALA: American Lung Association
CI: confidence interval
e-cigarette: electronic cigarette
FDA: US Food and Drug Administration
OR: odds ratio
TRL: tobacco retail licensing

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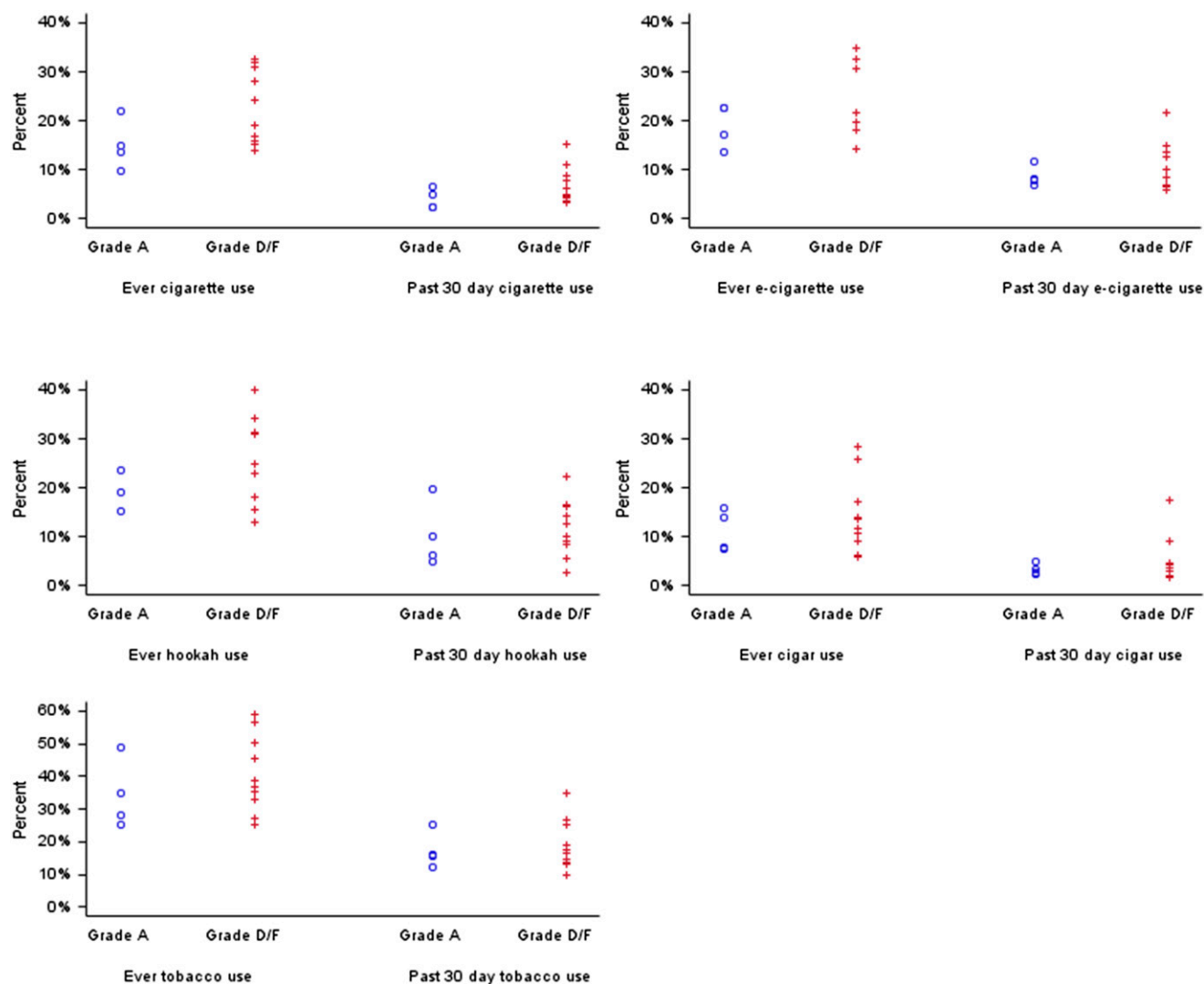
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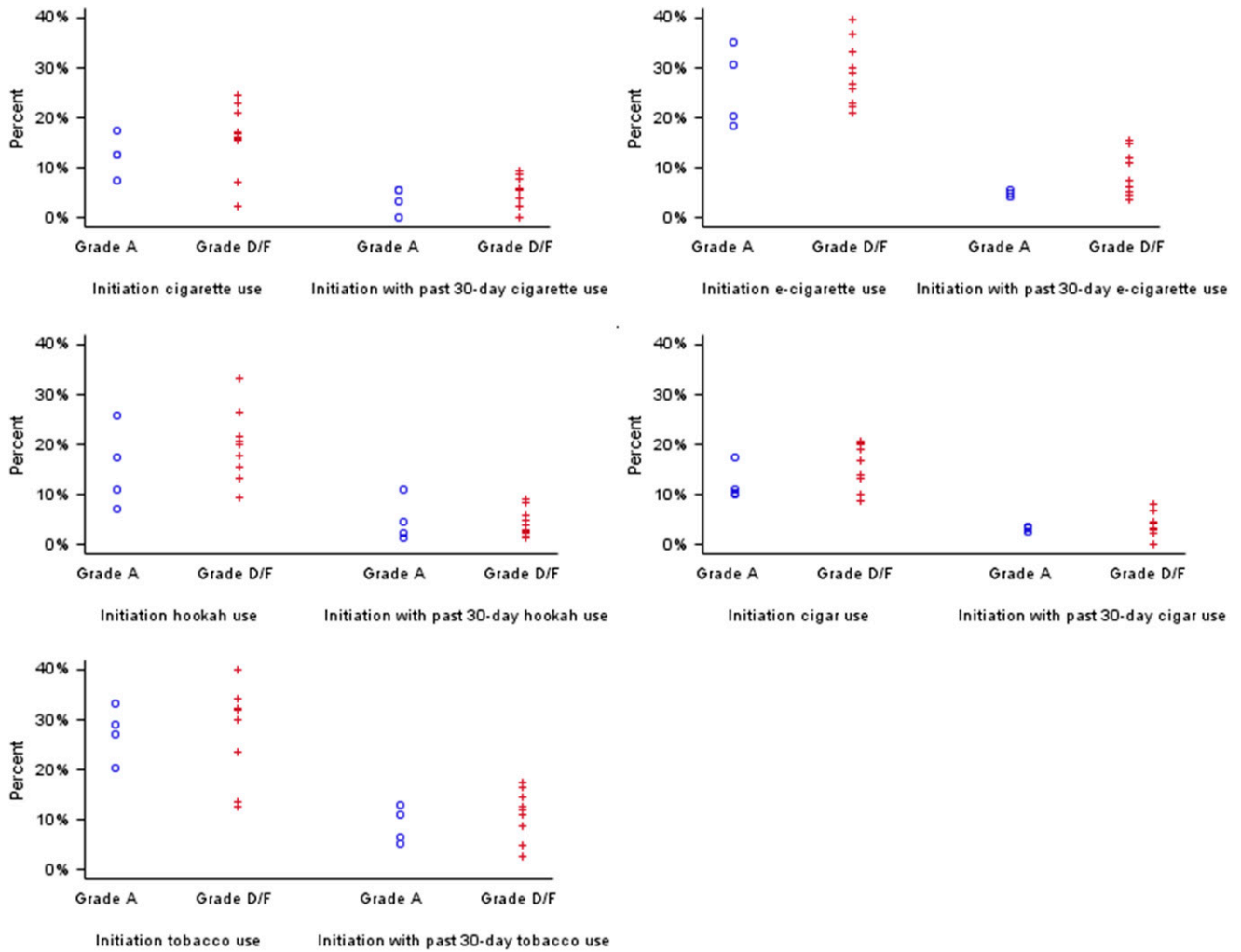
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Supplemental Information



SUPPLEMENTAL FIGURE 3

Jurisdiction-specific prevalence of baseline ever and past 30-day use of (A) cigarettes, (B) e-cigarettes, (C) hookah, (D) cigars, and/or (E) any tobacco product, by ALA TRL grade assigned to the jurisdiction of residence.



SUPPLEMENTAL FIGURE 4

Jurisdiction-specific rate of initiation between baseline and follow-up and of initiation with past 30-day use of (A) cigarettes, (B) e-cigarettes, (C) hookah, (D) cigars, and/or (E) any tobacco product, by ALA TRL grade assigned to the jurisdiction of residence.