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Short communication

Popularity of natural American Spirit cigarettes is greater in U.S. cities with lower smoking prevalence

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HIGHLIGHTS

- NAS cigarettes are perceived as less harmful to health than other cigarettes.
- NAS may be popular in cities where smoking is less normative.
- This study examined NAS sales by city as a function of smoking prevalence.
- As predicted, NAS sales volume was higher in cities with lower smoking prevalence.
- This pattern was unique to NAS and not observed for Marlboro or Pall Mall.

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ABSTRACT

Background: Often perceived as a safer smoke, Natural American Spirit (NAS) may find particular appeal in communities with strong non-smoking norms. We hypothesized NAS would be more popular in cities with lower smoking prevalence, with the pattern unique to NAS. We tested household income, cigarette taxes, and young adult population as alternative correlates and examined brand specificity, relative to Marlboro and Pall Mall.

Methods: Using proprietary, city-specific sales estimates obtained from Nielsen for 30 U.S. cities over one year (9/7/18–9/9/19), we computed cigarette sales volume as standard pack units per 10,000 adult smokers for NAS and Marlboro and Pall Mall. Linear regression models examined associations between city-level sales volume and adult smoking prevalence, median household income, the sum of state/local cigarette excise taxes, and young adult population.

Results: NAS sales volume averaged 44,785 packs per 10,000 adult smokers (SD = 47,676). Across 30 cities, adult smoking prevalence averaged 18.0% (SD = 4.5%), median household income averaged \$53,677 (SD = \$14,825), cigarette excise tax averaged \$2.55 (SD = \$1.63), and young adult population averaged 10.6% (SD = 2.2%). NAS sales volume was greater in cities with lower adult smoking prevalence ($\beta = -0.39$, 95% CI [-0.74, -0.03], $p = 0.034$), a pattern that was not observed for Marlboro or Pall Mall ($ps > 0.356$). Marlboro ($\beta = -0.40$, 95% CI [-0.76, -0.05], $p = 0.027$) and Pall Mall ($\beta = -0.48$, 95% CI [-0.82, -0.14], $p = 0.008$) sales volumes were higher in cities where cigarette excise taxes were lower, a pattern not observed for NAS ($p = 0.224$).

Conclusion: NAS appears to be more popular in cities with lower smoking prevalence and may deter efforts to further decrease prevalence.

1. Introduction

Natural American Spirit (NAS) cigarettes are marketed using nature-related imagery (Moran et al., 2017) and descriptors that imply reduced harm, such as “natural,” “organic,” and previously “additive-free.” (Simoneau, 2015) Such marketing presents NAS as healthier (Epperson

et al., 2017) and more environmentally sustainable (Epperson et al., 2017) than other cigarettes. Prior research has found that smokers and nonsmokers perceive NAS as less harmful to health than other cigarettes (O'Connor et al., 2017). Belief in reduced harm of “natural,” “organic,” or “additive-free” cigarettes compared to other cigarettes is widespread among American adults (Pearson et al., 2019; Leas et al.,

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2017). In experimental studies, both smokers and non-smokers exposed to NAS advertising (Baig et al., 2019; Gratale et al., 2018) and packaging (Epperson et al., 2019) rated the brand as less harmful for health (Baig et al., 2019; Gratale et al., 2018; Epperson et al., 2019) and the environment (Gratale et al., 2018; Epperson et al., 2019) relative to other brands not promoted as “natural.” NAS marketing casts a “health halo” around the product (Epperson et al., 2017). Current smokers had greater misperceptions of “natural” or “additive-free” cigarettes as reduced-harm products than did never or former smokers (O’Connor et al., 2017). Moreover, exposure to NAS marketing (Gratale et al., 2018) and to specific “natural,” “additive-free,” and “organic” claims (Baig et al., 2019) increased current smokers’ interest in using NAS. These findings suggest that NAS marketing results in more favorable views of the product for current smokers. Smokers with health concerns often postpone quitting and switch to cigarettes with lower perceived risk, (Gilpin et al., 2002) raising the possibility that misperceptions of NAS risk could impede quitting (Leas et al., 2018).

While all NAS cigarettes have disclaimers on the sides of packs, the disclaimers have been found to be insufficient in fully offsetting the effects of “natural,” “additive-free,” and “organic” claims on consumers’ perceptions of reduced harm (Baig et al., 2019; Byron et al., 2016). In a 2017 study of California retailers, NAS prices were, on average, 14.9% higher than Marlboro and 34.4% higher than Pall Mall (Epperson et al., 2019). Similar to organic food products (Massey et al., 2018), this ultra-premium price may further contribute to perceptions of the brand as high-quality (Epperson et al., 2019). Due to its differential marketing and price, NAS may be popular even in cities where smoking is considered non-normative and harmful. NAS use is more prevalent among individuals who frequently consider the harms of tobacco use, compared to those who are less concerned about tobacco risks (Pearson et al., 2017). On a larger scale, social norms and risk perceptions affect population smoking prevalence, such that smoking prevalence is lower in places where smoking is widely viewed as harmful and non-normative (Huang et al., 2014; Kang and Cho, 2020). Therefore, we anticipated NAS would appeal to populations in areas where smoking is perceived to a greater degree as harmful and less normative.

We specifically hypothesized that NAS sales volume would be higher in cities with lower adult smoking prevalence, which we used as a proxy for public opinion that smoking is more harmful and less normative (Huang et al., 2014; Kang and Cho, 2020). Given NAS’s unique ultra-premium price point (Epperson et al., 2019; Henriksen et al., 2019) and popularity with young adults (Pearson et al., 2017), we tested alternative hypotheses that NAS popularity would relate to higher city income, cigarette excise taxes, and young adult population. To test for brand specific effects, we repeated the analyses with two comparator brands: Marlboro (the top-selling cigarette brand in the U.S.) (Centers for Disease Control and Prevention, 2018) and Pall Mall (a value brand).

2. Methods

2.1. Study sample

The 30 sampled cities were part of the Advancing Science & Practice in the Retail Environment (ASPIRE) multi-institutional consortium that aims to establish an evidence base for effective regulation of the retail environment for tobacco (grant #P01-CA225597). Most ($N = 25$) of the cities are members of the Big Cities Health Coalition, (Big Cities Health Coalition, 2020) where 1 in 6 U.S. residents live. Five additional cities were added for broader regional representation. The 30 cities represent 11.5% of U.S. residents (United States Census Bureau., 2018).

2.2. Measures

Proprietary, city-specific sales estimates were obtained from Nielsen in 4-week periods between 9/7/18 and 9/9/19 for seven retail channels

combined (i.e., convenience, dollar, drug, grocery, liquor, military commissaries, mass-merchandisers) (Muth, 2017). Nielsen provided total dollar sales for each Universal Product Code (UPC) during each reporting period. To estimate price for each brand, total dollar sales were summed across UPCs and reporting periods within each city and divided by the total number of packs sold. Cartons and other multi-pack units were converted to single pack unit sales before summing across individual UPCs and the 4-week reporting periods.

Sales volume for each brand was computed as pack sales per 10,000 adult smokers during the one-year period. Total packs sold were divided by the number of 10,000 adult smokers (smoking prevalence \times adult population / 10,000).

Adult smoking prevalence was obtained from the 500 Cities Project 2019 release, which calculated adult smoking prevalence (i.e., percentage of the adult population reporting 100 + lifetime cigarettes and currently smoking “every day” or “some days”) from several nationally representative data sets collected 2013–2017 (Centers for Disease Control and Prevention, 2019). For each city, median household income and proportion of the population age 18–24 were obtained from the American Community Survey (2013–2017) (United States Census Bureau., 2018). Cigarette excise tax for each city was the sum of state and local excise taxes (Campaign for Tobacco Free Kids, 2020a,b).

2.3. Statistical analysis

Descriptive statistics were generated at the city level for the variables of interest. The primary analysis of interest was NAS sales volume examined in association with adult smoking prevalence in a linear regression. To assess the potential influence of price-related city characteristics and young adult population, three additional linear regression models were run to test associations between NAS sales volume and median household income, total cigarette excise tax, and young adult population. Due to low statistical power ($N = 30$ cities), we examined bivariate relationships between city characteristics and sales volume, rather than examining all predictors simultaneously in a multivariable model. To evaluate brand specificity, the models were repeated for sales volume of Marlboro and Pall Mall, tested separately. All variables were standardized for regression analyses; $\alpha = 0.05$. Data were analyzed in February–June 2020 using IBM SPSS Statistics 25.0.

3. Results

For the 30 cities of interest, smoking prevalence averaged 18.0% ($SD = 4.5\%$) and ranged from 9.9% in Seattle to 29.3% in Detroit. Median household income ranged from \$27,838 (Detroit) to \$96,265 (San Francisco) with a mean of \$53,677 ($SD = \$14,825$). Cigarette excise tax was highest in Chicago, followed by New York City; New York City also enforced a \$13.00 minimum pack price effective June 2018 (Local Law 145, 2017). On average, young adults comprised 10.6% ($SD = 2.2\%$) of the cities’ populations.

As shown in Table 1, NAS cigarettes were priced at an ultra-premium, averaging \$1.13 more per pack than Marlboro ($M = \$7.83$, $SD = \$2.19$) and \$2.29 more per pack than Pall Mall ($M = \$6.67$, $SD = \$2.04$). Across the 30 cities, NAS price ranged from \$6.29 (Kansas City, MO) to \$14.53 (New York City), $M = \$8.96$, $SD = \$2.03$. NAS sales volume (i.e., packs per 10,000 adult smokers) was highest in Minneapolis (193,091 packs), Denver (168,294 packs), and Portland (135,303 packs), and lowest in Boston (8,904 packs), Detroit (5,926 packs), and New York City (1,522 packs). For Marlboro and Pall Mall, sales volumes also were lowest in New York City.

Consistent with hypotheses, NAS sales volume was greater in cities with lower adult smoking prevalence ($p = 0.034$). Across cities, a decrease of 4.5% in smoking prevalence (i.e., one standard deviation) was associated with an increase in NAS sales volume of 18,594 packs per 10,000 adult smokers (i.e., 0.39 of a standard deviation). The pattern of greater pack sales with lower smoking prevalence was unique to NAS

Table 1
Cigarette sales volume and price by brand: 30 U.S. cities (9/7/18–9/9/19).

City	Natural American Spirit		Marlboro		Pall Mall	
	Sales volume ^a	Price ^b	Sales volume ^a	Price ^b	Sales volume ^a	Price ^b
Atlanta, GA	29,039	\$6.33	317,866	\$4.89	28,775	\$4.45
Baltimore, MD	13,295	\$8.25	77,217	\$7.31	14,413	\$5.88
Boston, MA	8,904	\$11.24	54,591	\$10.61	4,601	\$8.84
Charlotte, NC	38,811	\$6.57	488,334	\$5.48	79,777	\$4.28
Chicago, IL	12,999	\$13.47	61,256	\$12.62	5,246	\$10.77
Cleveland, OH	21,930	\$7.98	354,346	\$6.72	66,397	\$5.85
Dallas, TX	32,201	\$7.61	411,774	\$6.23	69,569	\$4.94
Denver, CO	168,294	\$7.18	1,009,444	\$6.09	209,495	\$4.95
Detroit, MI	5,926	\$8.31	23,598	\$7.16	2,182	\$5.92
Fort Worth, TX	23,527	\$7.46	508,478	\$6.00	76,213	\$5.00
Houston, TX	26,606	\$7.70	434,507	\$6.43	54,052	\$5.34
Kansas City, MO	15,174	\$6.29	163,688	\$5.32	45,433	\$4.27
Las Vegas, NV	56,262	\$8.24	751,501	\$7.26	218,260	\$5.83
Los Angeles, CA	27,974	\$9.62	112,367	\$8.49	10,734	\$7.06
Memphis, TN	14,126	\$6.87	185,788	\$5.52	62,312	\$4.63
Miami, FL	59,226	\$7.58	1,210,589	\$6.29	39,569	\$4.92
Minneapolis, MN	193,091	\$10.70	1,166,077	\$9.14	98,432	\$8.40
New Orleans, LA	30,610	\$7.30	154,163	\$6.13	39,533	\$5.32
New York, NY	1,522	\$14.53	9,024	\$13.94	335	\$12.66
Oakland, CA	40,164	\$9.79	135,610	\$8.66	9,935	\$7.41
Philadelphia, PA	13,186	\$10.83	111,875	\$10.05	7,249	\$9.21
Phoenix, AZ	34,762	\$8.76	447,269	\$7.41	67,181	\$6.48
Portland, OR	135,303	\$7.52	341,868	\$6.37	67,840	\$5.51
Providence, RI	24,669	\$10.84	192,955	\$9.75	26,873	\$8.76
Sacramento, CA	47,428	\$9.46	459,491	\$8.25	64,195	\$7.05
San Antonio, TX	45,936	\$7.67	1,011,045	\$6.24	164,558	\$5.30
San Diego, CA	56,967	\$9.28	315,031	\$8.32	35,240	\$7.04
San Francisco, CA	23,306	\$10.04	92,517	\$8.99	7,775	\$7.35
Seattle, WA	125,385	\$9.84	425,812	\$8.66	63,359	\$7.53
Washington, D.C.	16,916	\$11.44	80,376	\$10.60	4,571	\$9.02
MEAN (SD)	44,785 (47,676)	\$8.96 (\$2.03)	370,282 (342,543)	\$7.83 (\$2.19)	54,803 (56,404)	\$6.67 (\$2.04)
MEDIAN (IQR)	28,507 (14,912–49,636)	\$8.28 (\$7.50–\$10.21)	316,449 (107,036–466,701)	\$7.28 (\$6.21–\$9.03)	42,501 (9,395–68,273)	\$5.90 (\$4.99–\$7.75)

Note: Cartons were converted to packs before calculating total packs sold.

^a Total packs sold divided by number of 10,000 adult smokers.

^b Total dollar sales, including excise tax, divided by total packs sold.

Table 2
Associations between city characteristics and sales volume, by brand: 30 US cities (9/7/18–9/9/19).

	Natural American Spirit				Marlboro				Pall Mall			
	R ²	β	95% CI	p	R ²	β	95% CI	p	R ²	β	95% CI	p
Smoking prevalence	0.15	−0.39	−0.74, −0.03	0.034	0.03	−0.17	−0.56, 0.21	0.357	< 0.01	−0.05	−0.44, 0.33	0.776
Median household income	0.06	0.25	−0.13, 0.63	0.183	0.01	−0.09	−0.48, 0.29	0.623	< 0.01	−0.03	−0.42, 0.35	0.863
Cigarette excise tax	0.05	−0.23	−0.61, 0.15	0.224	0.16	−0.40	−0.76, −0.05	0.027	0.23	−0.48	−0.82, −0.14	0.008
Proportion of population age 18–24 years	0.01	−0.09	−0.47, 0.30	0.641	0.02	−0.14	−0.53, 0.24	0.452	0.05	−0.23	−0.61, 0.15	0.226

Note: Boldface indicates statistical significance ($p < 0.05$). Unstandardized sales volumes for each city are presented in Table 1.

and not found for Marlboro or Pall Mall (see Table 2). NAS sales volume was not associated with median household income ($p = 0.183$), cigarette excise tax ($p = 0.224$), or young adult population ($p = 0.641$). In contrast, Marlboro ($p = 0.027$) and Pall Mall ($p = 0.008$) sales volumes were higher in cities where cigarette excise taxes were lower.

Given New York City's unique \$13.00 minimum pack price law and comparatively low sales volumes for all three brands (as well as publicized concerns about smuggling (Boesen, 2019)), we repeated the linear regression analyses without New York City, and the findings were comparable.

4. Discussion

As predicted, NAS cigarettes, sold at an ultra-premium price, had significantly greater sales volume in cities with lower adult smoking prevalence. This association was specific to NAS and not found for two leading comparator brands. Results support the notion that cigarettes

marketed as “natural” find particular appeal in communities with stronger non-smoking norms.

Consumers may draw parallels between organic or “natural” cigarettes and organic or “natural” foods. Choice of organic food is mostly driven by attributes such as perceived health, safety, quality, and production practices (Massey et al., 2018). “Natural” cigarettes may be viewed as healthier than other cigarettes (Epperson et al., 2017) despite similar toxicant profiles and common harms (Jain et al., 2019). A Lorillard focus group found that consumers equated “natural” cigarettes with products such as natural spring water (McDaniel and Malone, 2007). In 1997, focus groups conducted for Brown and Williamson with NAS smokers in San Francisco and New York City identified key selling points of the brand being, “all natural/no chemical additives,” implying “peace of mind” and that “‘all natural’ may not be as bad for you.” (Goldfarb Consultants, 1997) Participants also thought NAS “might not be as bad for you” because it could be bought in health food stores (Goldfarb Consultants, 1997). In a study of smokers in the San

Francisco Bay Area, preference for NAS was associated with consuming a low-fat diet (Epperson et al., 2018). Perceptions of relative safety and healthfulness may lead individuals to initiate and/or continue smoking NAS instead of quitting (Pearson et al., 2017).

NAS price was higher than Marlboro and Pall Mall prices in all 30 cities, replicating prior results from observed prices in California (Epperson et al., 2019; Henriksen et al., 2019). Standardized at pack sales per 10,000 adult smokers, NAS sales were highest in Minneapolis, Denver, and Portland, and lowest in Boston, Detroit, and New York City. Organic and natural products appear popular in Portland and Denver, which are among the cities with the most Whole Foods Market locations (ScrapeHero, 2020) despite their relatively small populations (United States Census Bureau., 2018). Low NAS sales volume in New York City may have been partially driven by high prices (i.e., \$13.00/pack minimum) (Local Law 145, 2017). NAS may be prohibitively expensive in New York City, where consumers spent an average of \$14.53 per pack. Additionally, low cigarette sales in New York City may have been driven by smuggling. An estimated 55% of cigarettes smoked in New York in 2017 were smuggled—a higher proportion than any other state (Boesen, 2019).

NAS sales volume was not related to median household income or cigarette excise tax. Marlboro and Pall Mall sales were lower in cities with higher cigarette excise tax and were not associated with adult smoking prevalence. Prior research found that tobacco companies disproportionately increased the price of ultra-premium brands, compared to value brands, following a cigarette excise tax increase (Henriksen et al., 2019). Using scanner data, our results corroborate NAS's ultra-premium price point. Despite its popularity with young people, NAS sales volume was not associated with the proportion of a city's population being aged 18–24 years, suggesting broad appeal (Pearson et al., 2017).

Study limitations include sampling of only 30 large metropolitan cities and the exclusion of some tobacco retailers, such as tobacco shops. Hence, pack sale estimates here are underestimates. However, most U.S. smokers buy their cigarettes from convenience stores and gas stations (Kruger et al., 2017). Nielsen's methods for estimating city-specific sales are proprietary and unverifiable, although the data source is widely used in tobacco control research (Cantrell et al., 2018; Delnevo et al., 2020; Gammon et al., 2016). Analyses were likely underpowered and may have missed some meaningful correlates of NAS pack sales. Cost of living and median household size vary across cities; therefore, median household income may not fully capture a city's average disposable income. Nonetheless, it is a widely used and accepted measure that largely reflects typical income level for a geographic area (University of Missouri Office of Social and Economic Data Analysis, 2020). The statistically significant association between adult smoking prevalence and NAS sales volume is a strong signal that should be explored in future research.

5. Conclusions

Since 2002, while the U.S. smoking prevalence has been on a steady decline, NAS's market share has increased by 400% (Sharma et al., 2016). NAS has demonstrated apparent immunity to public health tobacco control efforts (McAtee, 1996), and regulatory actions to address the modified risk claims made in NAS marketing have been largely insufficient and unsuccessful.

The current findings indicate NAS sales volume, but not that of Marlboro or Pall Mall, is greater in cities with lower smoking prevalence. In cities with lower smoking prevalence, harm perceptions of smoking are likely greater, and smoking is less normative (Huang et al., 2014; Kang and Cho, 2020). Popularity of NAS, which is often perceived as a safer smoke (Pearson et al., 2019; Leas et al., 2017), may deter cities' efforts to further reduce smoking prevalence. Future research should examine whether NAS sales increase as smoking prevalence declines and to what extent industry advertising contributes to

increased sales. New regulatory actions, such as standardized, plain packaging (Leas et al., 2018), are needed to address reduced harm perceptions resulting from “natural” marketing of cigarettes.

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CRedit authorship contribution statement

Erin A. Vogel: Conceptualization, Methodology, Formal analysis, Data curation, Writing - original draft, Writing - review & editing. **Lisa Henriksen:** Conceptualization, Methodology, Investigation, Writing - review & editing, Supervision, Funding acquisition. **Trent O. Johnson:** Conceptualization, Methodology, Investigation, Data curation, Writing - review & editing. **Nina C. Schleicher:** Conceptualization, Methodology, Writing - review & editing. **Judith J. Prochaska:** Conceptualization, Methodology, Investigation, Writing - review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

JJP has provided consultation to pharmaceutical and technology companies that make medications and other treatments for quitting smoking and has served as an expert witness in lawsuits against the tobacco companies. All other authors have no financial disclosures.

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