

Changes in cigarillo availability following implementation of a local flavoured tobacco sales restriction

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ABSTRACT

Introduction Providence, Rhode Island (RI) was among the first US jurisdictions to enact a policy (effective 3 January 2013) restricting the retail sale of non-cigarette tobacco products with a characterising flavour other than the taste or aroma of tobacco, menthol, mint or wintergreen. We used scanner data to assess the impact of this sales restriction on retail availability of cigarillos, flavoured and otherwise, in Providence and a rest-of-state (ROS) comparison area.

Methods Every unique cigarillo product—each indicated by a universal product code (UPC)—available for sale in RI from January 2012 to December 2016 was assigned to an exclusive flavour-name category (tobacco; explicit or concept flavour; or menthol/mint) based on characteristics in the scanner dataset and, as necessary, information from online websites. We calculated weekly unique cigarillo UPC counts and market share by flavour category and used difference-in-difference regression to assess prepolicy and postpolicy changes in counts and share in Providence relative to ROS.

Results The prepolicy to postpolicy decrease in the number of unique cigarillo products available in Providence was 28.64 (± 5.83) UPCs greater than the comparable decrease in ROS ($p < 0.05$). The prepolicy to postpolicy increase in the number of unique concept-named flavoured cigarillo products in Providence was 6.08 (± 2.31) UPCs greater than the increase in ROS ($p < 0.05$). The postpolicy market share of concept-named flavoured cigarillos was higher in Providence (27.32%, ± 1.77) than ROS (12.67%, ± 1.67) ($p < 0.05$).

Conclusions After policy implementation, Providence consumers were exposed to fewer cigarillo UPCs but a greater variety and proportion of concept-named flavoured cigarillos in the retail marketplace.

INTRODUCTION

Tobacco manufacturers use a variety of marketing strategies in the retail environment to attract consumers and maximise sales and profits.^{1–7} Tobacco product availability and marketing in retail settings is associated with a variety of factors, including neighbourhood characteristics such as the concentrations of low income, or Black/African Americans residents,⁸ or youth.⁹ This is especially the case for the marketing of flavoured and menthol products, which have demonstrated appeal to youth.^{10 11}

Many US jurisdictions have in recent years adopted policies restricting the sale of flavoured non-cigarette tobacco products and menthol

cigarettes.¹² The primary intent of these policies is to reduce the retail availability of flavoured and menthol tobacco products that are directly or indirectly accessible to youth. Thus, following implementation of a sales restriction policy, a narrower range of products should be available for sale in the community-wide retail marketplace—specifically, only those not restricted by the policy—unless new products are introduced.

Retail observational studies have been, for decades, the primary source of surveillance and evaluation data for assessing tobacco product availability in communities.^{13 14} Despite attempts to systematise and simplify methodologies,^{15 16} retail observational studies remain time consuming, costly and yield measures with modest reliability.^{15 17} Observational studies are, however, useful for measuring retailer compliance with local sales restriction policies, where evidence of even a single restricted product being offered for sale is indicative of retailer non-compliance.^{18–24} But, retail observational studies have limited utility for assessing the impact of sales restriction policies on community-wide tobacco product availability because of methodological challenges to detecting, enumerating and characterising the full array of unique tobacco products available for sale within a single retail outlet,¹⁷ let alone throughout a jurisdiction.

Increasingly, retail sales data, collected by computerised point-of-sale universal product code (UPC) bar code scanners, are being used to evaluate tobacco product sales restrictions.^{25–27} UPCs are standardised numeric string identifiers that uniquely specify a product and its manufacturer. Unique company prefixes of 6–10 UPC digits are assigned to each manufacturer through a globally managed system (<https://www.gs1-us.info/upc-codes/>). Companies append to their UPC prefix item reference suffixes of 5 or more digits to indicate a specific item variant, generally reflecting brand, subbrand, product type, product size, package size and other product or packaging characteristics. UPCs are typically encoded in a barcode symbol, which is scanned at the point of sale by participating retailers. These data are compiled by vendors, such as the Nielsen Company, primarily for use by manufacturers to monitor trends in sales as a function of their merchandising activities and market conditions. To date, tobacco policy researchers have primarily used retail scanner data to assess



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associations between policy implementation and trends in dollar or unit sales of policy-restricted and non-restricted tobacco products.^{25–27}

A recent evaluation of the Providence, Rhode Island (RI) flavoured sales policy is illustrative of studies using retail scanner data to assess the association between policy implementation and trends in product sales.²⁷ The city of Providence began enforcing its flavoured non-cigarette tobacco product sales ordinance on 3 January 2013 (ie, start of the policy implementation period). The ordinance prohibits the retail sale of any product containing tobacco or nicotine—including cigars, loose tobacco, snus, dissolvable tobacco products and electronic cigarette cartridges—that imparts a characterising flavour ('a distinguishable taste or aroma'), other than the taste or aroma of tobacco, menthol, mint or wintergreen (although wintergreen flavour was not identified for cigarillos in this analysis), 'including, but not limited to, tastes or aromas relating to any fruit, chocolate, vanilla, honey, candy, cocoa, dessert, alcoholic beverage, herb or spice.'²⁸ The evaluation documented a significant reduction in unit sales of flavoured cigars with explicit flavour names (eg, 'cherry') in association with policy implementation, and an overall decline in sales of all cigars (flavoured and otherwise), but a concomitant increase in sales of cigars labelled with ambiguous concept names (eg, 'jazz'), which might not be understood by consumers or enforcement agents as being flavoured per the ordinance definition.²⁷

The results of this sales trend study could be explained by increased consumption of concept-named cigar products that were already available in the Providence market before policy implementation. It might also be explained by retail market changes, such as an increase in the availability of a wider variety of flavoured concept-named cigars in the Providence marketplace related to policy implementation. National surveillance studies have documented increased sales of concept-named cigars throughout the USA, which, during the period 2012–2016, occurred predominantly among cigarillos.²⁹ Cigarillos are usually brown; are typically short (3–4 inches), smaller than a large cigar, but bigger than a cigarette; and are usually not filtered, but often have a plastic or wooden tip. The prevalence of cigarillo use among US adults is higher than other cigar types, with 1.7% reporting current established use of cigarillos compared with less than 1% for all other cigar types.³⁰ In the USA, most cigarillo smokers are younger adults aged 18–34 years, and most established cigarillo smokers report that their regular brand has a characterising flavour other than tobacco.³⁰

Despite the studies evaluating the impact of flavoured tobacco sales restrictions on changes in product sales,^{25–27} no studies have used retail scanner data to assess the association of policy implementation with changes in availability of flavoured products as measured by the number of varieties of products offered for sale in the marketplace. And, none has considered how changes in availability of certain product variants (eg, increased number of unique, concept-named flavoured cigars) might reflect product marketing efforts that could mitigate the impact of local policies restricting flavoured tobacco product sales. The earlier study of the Providence flavoured non-cigarette sales restriction demonstrated an association between policy implementation and sales of flavoured cigars.²⁷ In this study, we used retail scanner data to measure changes in availability of cigarillo varieties in association with the Providence flavoured non-cigarette sales restriction.

METHODS

Study design

We employed an interrupted time series, difference-in-difference (DID) study design to assess differential changes in the number of unique cigarillo UPCs, as well as changes in the share of flavoured cigarillo UPCs, from a period prior to implementation of Providence's flavoured non-cigarette product sales restriction to a period following policy implementation in Providence and in a comparison area consisting of all localities elsewhere in the state of RI.

Measures

We obtained weekly retail scanner data from The Nielsen Company for the city of Providence, RI and the rest of the state (ROS) of RI for the period 8 January 2012 to 31 December 2016. We measured availability of cigarillos in two ways: (1) as a count of the number of unique cigarillo UPCs appearing each week in the Nielsen dataset, in total and by flavour category (including concept-named flavoured, explicit-named flavoured, tobacco or menthol/mint flavoured) for each study area (Providence vs ROS) and policy period (52 weeks before and 208 weeks after the 3 January 2013 policy implementation date); and (2) as a share of cigarillo UPCs, by dividing weekly counts of cigarillo UPCs within flavour categories by the weekly total number of available cigarillo UPCs in each study area. We used previously established methods to differentiate cigarillos from other cigar types and to assign products into exclusive flavour categories.²⁷ Cigarillos were identified by reviewing Nielsen-provided product characteristics for brand (eg, Middleton's Black & Mild), subcategory (eg, cigarillo), tip status (eg, wooden tip), filter status (eg, not filtered), flavour (eg, jazz) and size (eg, two sticks). We used an established systematic process to categorise cigarillos as concept-named flavoured (eg, Jazz), explicit-named flavoured (eg, rum), tobacco, or menthol/mint flavoured based on Nielsen-provided flavour descriptors.^{27–29} Concept-named flavoured products were identified as those which did not have Nielsen-provided flavour descriptor that could not be clearly identified as a commonly recognised smell or flavour. As needed, cigar type and flavour category designations were confirmed by review of brand and online vendor websites. UPCs were included in the weekly count and share metrics only if sales of products with the UPC occurred that week. Sensitivity analyses of alternative operational definitions of availability did not alter the study findings. The alternative definitions of availability were: (1) the continuous range of weeks from the first week to the last week with at least one unit of sales of the UPC; and (2) the continuous range of weeks from the first 3 weeks period with at least one unit of sales of the UPC to the end of the entire study period, with non-availability marked by three or more consecutive weeks with zero sales of the UPC.

Analysis

We plotted trends and conducted descriptive analyses of weekly cigarillo UPC counts and share, and, after confirming parallel prepolicy trends in Providence and ROS, used DID regression models to assess the association between policy implementation and changes in total and flavour category-specific cigarillo UPC counts, as well as changes in cigarillo UPC share by flavour category, in Providence relative to ROS. All models accounted for autocorrelation and heteroskedasticity using Stata's interrupted time-series analysis specifying Newey-West SEs (SEs), with the number of lags indicated by serial autocorrelation tests.^{31–32}

Models were run for each dependent variable, and included variables for time, area and policy implementation. In general, there appear to be few menthol/mint flavoured cigars on the market,³³ and weekly UPC counts ranged from 0 to 3 in our dataset; thus, we omitted regressions on these products because analytical models could not be completed due to extensive missing data. The following postestimation values, with respect to policy implementation and by area (Providence vs ROS) and flavour category (concept named; explicit named; tobacco), were derived from regression coefficients (presented in online supplemental table 1).

- ▶ Prepolicy count/share—number (or share) of unique cigarillo UPCs in the week prior to policy implementation.
- ▶ Postpolicy count/share—number (or share) of unique cigarillo UPCs in the week of policy implementation.
- ▶ Net policy effect on count/share—prepolicy to postpolicy change in cigarillo availability (count or share) in Providence compared with change observed in ROS.
- ▶ Total postpolicy count/share difference—total postpolicy difference in cigarillo availability (count or share) between Providence and ROS.
- ▶ Prepolicy trend—average weekly change in unique cigarillo UPC counts (or share) in the prepolicy period.
- ▶ Postpolicy trend—average weekly change in unique cigarillo UPC counts (or share) in the postpolicy period.
- ▶ Net policy effect on trend—change in UPC count or share trend associated with the policy in Providence compared with trend changes in ROS.
- ▶ Total postpolicy trend difference—total postpolicy difference in count or share trends between Providence and ROS.

We tested the significance of net policy effects—that is, the differences between prepolicy to postpolicy changes in Providence and comparable changes in ROS on cigarillo UPC counts and flavour category share. We also tested the significance of total postpolicy differences in cigarillo UPC counts and share between Providence and ROS using t-tests of linear combinations of regression coefficients.

RESULTS

Descriptive analysis results

Forty-two unique concept-named flavoured cigarillo UPCs, not available for sale in the prepolicy period, were introduced to the Providence market during the 48 months following policy implementation. Additionally, 38 explicit-named flavoured cigarillo UPCs were introduced in the Providence market in the postpolicy period. Similarly, 59 concept-named flavoured cigarillo UPCs and 198 explicit-named flavoured cigarillo UPCs were newly introduced to the ROS market during the 48 months following policy implementation. Among the new cigarillo UPCs introduced in the state following implementation of the Providence policy, multiple UPCs shared similar product characteristics (eg, descriptors, package size). For example, in the postpolicy period, there were 11 and 12 unique UPCs for ‘Middleton’s Black and Mild Jazz cigarillos’ in Providence and ROS, respectively, suggesting an increased presence and assortment of these concept-named flavoured cigarillos.

We observed immediate shifts in UPC counts at the time of policy implementation, but trends in the number of unique explicit-named and concept-named flavoured cigarillo UPCs were flat across the prepolicy and postpolicy periods in both areas (online supplemental figure 1). In Providence, trends in the percentage of unique explicit-named flavoured cigarillo UPCs (‘sales share’) appear to drop from the prepolicy to the

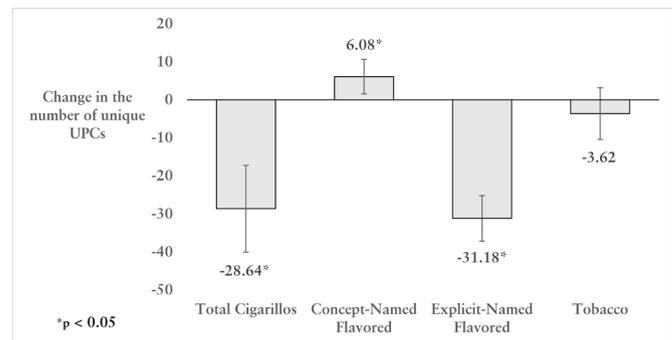


Figure 1 Net policy effect on changes in cigarillo UPC counts in Providence relative to changes in ROS, prepolicy (2012) to postpolicy (2013–2016). ROS, rest of state; UPC, universal product code.

postpolicy period while trends in the share of concept-named and tobacco flavoured cigarillo UPCs appear to increase over these periods (online supplemental figure 2). Sales share trends appear relatively constant in ROS for all categories of cigarillo UPCs.

Regression analysis results

In the week preceding policy implementation, 96.54 and 137.94 unique cigarillo UPCs were available for sale in Providence and ROS, respectively, a difference of approximately 41.40 UPCs ($p < 0.05$) (table 1 and online supplemental table 1). During the week in which the policy was implemented, the number of unique cigarillo UPCs decreased in Providence and increased in ROS, yielding a total postpolicy difference of 70.04 (SE: ± 7.34) fewer UPCs available in Providence relative to ROS ($p < 0.05$). Analysis of the net policy effect revealed that the change in the number of unique UPCs from prepolicy to postpolicy periods in Providence was 28.64 (± 5.83) lower than the comparable change in ROS ($p < 0.05$) (figure 1).

The number of unique concept-named flavoured cigarillo UPCs increased in both Providence and ROS in the week of policy implementation. Although the total postpolicy difference between Providence and ROS in the number of unique concept-named flavoured cigarillo UPCs was insignificant, the increase in availability of these products from prepolicy to postpolicy periods in Providence was 6.08 (± 2.31) UPCs higher than the comparable change in ROS ($p < 0.05$) (figure 1).

The number of explicit-named flavoured cigarillo UPCs decreased in the week of policy implementation in Providence and was unchanged in ROS, resulting in 56.28 (± 4.35) more of these UPCs available in ROS than in Providence ($p < 0.05$). The decrease in the number of explicit-named flavoured cigarillo UPCs from the prepolicy to the postpolicy period in Providence was 31.18 (± 3.06) UPCs lower than the comparable change in ROS ($p < 0.05$) (figure 1). The postpolicy trend of explicit-named flavoured cigarillo UPCs was negative but insignificant in both areas, but it was significantly less negative in Providence by an average of 0.13 UPCs per week ($p < 0.05$). The difference between Providence and ROS in prepolicy to postpolicy changes in trends was positive (average of 0.24 ± 0.08 UPCs per week), suggesting an attenuation in the rate of decline in available explicit-name flavoured cigarillo UPCs in Providence relative to ROS ($p < 0.05$).

Our analysis revealed no association between policy implementation and changes in the number of or trends in available tobacco-named cigarillo UPCs, although there were 15.44 (± 4.93) fewer tobacco-named cigarillo UPCs available in

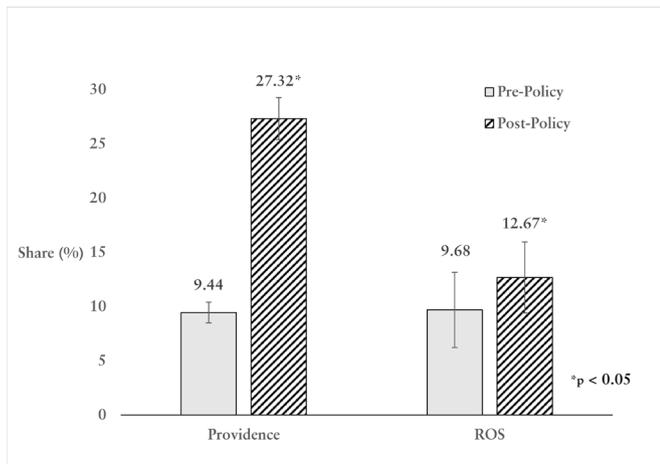


Figure 2 Share of cigarillo UPCs with concept flavour names, Providence and ROS, prepolicy (2012) versus postpolicy (2013–2016). ROS, rest of state; UPC, universal product code.

Providence than in ROS in the first week of policy implementation ($p < 0.05$). The postpolicy trend for available tobacco-named cigarillo UPCs was insignificant in both areas, but the prepolicy to postpolicy change in trends was significantly less negative in Providence than in ROS by an average of 0.05 UPCs per week (± 0.02) ($p < 0.05$).

There was no significant difference in prepolicy share of concept-named flavoured cigarillos between Providence (9.44%, ± 0.49 percentage points) and ROS (9.68%, ± 0.99 percentage points), but the postpolicy share of these products was significantly different between Providence (27.32%, ± 1.77 percentage points) and ROS (12.67%, ± 1.67 percentage points) ($p < 0.05$) (figure 2). Significant percentage-point changes in share were observed in Providence in the first week of policy implementation for concept-named (+14.65 percentage points, ± 2.43), explicit- (-29.27, ± 4.18) and tobacco-named (+14.68, ± 3.75) cigarillo UPCs (all $p < 0.05$) (table 1). There were significant differences in the percentage-point changes in share in Providence compared with ROS for concept-named (+14.88 ± 1.91), explicit-named (-26.90, ± 2.61) and tobacco-named flavoured cigarillo UPCs (+11.96, ± 2.65) (all $p < 0.05$) (figure 3). There was no association between policy implementation and changes in sales share trends by flavour categories in either area, but postpolicy trends for the share of explicit-named UPCs significantly differed between areas by an average of 0.04 percentage points (± 0.01) per week ($p < 0.05$).

DISCUSSION

Earlier research revealed that implementation of the providence flavoured tobacco sales policy was associated with a 51% prepolicy to postpolicy reduction in average weekly unit sales of flavoured cigarillos and a 31% reduction in total (flavoured and otherwise) cigarillos sales in the city.²⁷ The current study demonstrates that implementation of the policy reduced availability of explicit-flavour named and total cigarillo UPCs in retail outlets throughout the city, while there was growth in cigarillo UPC availability in the ROS comparison area. Postpolicy, however, Providence consumers were presented with a greater variety and larger proportion of cigarillo UPCs having concept flavour names. Thus, while the Providence policy had the intended impact of reducing availability of certain flavoured non-cigarette products—for example, cigarillos with explicit flavour names—there was increased availability of cigarillos with concept flavour

names, which could explain the finding of increased sales of these products.²⁷ The significant growth in availability of cigarillos with concept flavour names following policy implementation in Providence, relative to the changes seen in ROS, is worrying and suggests changes in the postpolicy marketplace that were not intended by policy-makers and could attenuate the positive public health impact of the policy.

This is the first study to use retail scanner data to assess changes in availability of tobacco products associated with a policy restricting the sale of flavoured tobacco products. To date, product availability measures have been gathered through time-consuming and labour-intensive retail observational studies, which have inherent limitations on detecting all available products in a policy-affected geography. Additionally, retail observational studies generally use binary measures of product availability to define retailer policy compliance. A recent evaluation of the effects of enforcement of the Providence flavoured tobacco product sales policy, for example, used the Standardized Tobacco Assessment for Retail Settings (STARS) methodology¹⁵ to measure changes in rates of retailer non-compliance, operationalised as the proportion of Providence retailers observed to have at least one policy-restricted flavoured tobacco product available for sale.²⁴ For ‘clearly labelled’ (ie, explicit flavoured-named) flavoured products, retailer non-compliance rates changed from 41% of 90 stores visited in 2017 to 17% of 82 stores visited in 2018. The investigators also assessed changes in retailer non-compliance rates as measured by the observed availability of one specific ‘not clearly labelled’ (ie, concept flavour-named) product: Garcia y Vega Game Blue cigarillos. On this measure, retailer non-compliance rates were 76% in 2017 and 73% in 2018. It was not reported whether any other concept flavour-named products were available for sale in Providence retailers, or if there were changes in the variety of products available for sale from the first to the second observational period. This study, as well as several others,^{18–24} illustrates how tobacco product availability measures gathered through in-store observations can be useful for determination of policy compliance among retailers visited.

Whereas retail scanner data have been used to measure sales trends associated with policy implementation,^{25–27} our analysis demonstrates that UPC information collected through point-of-sale scanner technology can also be used to assess changes in product availability associated with policy implementation. Changes in cigarillo availability documented in this study—including the introduction of new concept-named products—shaped the retail environment in ways that might have undermined effective enforcement of Providence’s flavoured tobacco retail sales policy.³³ Subtle changes in the marketplace identified through our analysis (eg, introduction of multiple UPCs sharing common packaging and labelling features; growth in share of ambiguously labelled products) might otherwise have eluded detection through other assessment methods. And, our finding of increased availability of all flavour categories of cigarillo UPCs in ROS suggests that changes in the ROS marketplace might have encouraged cross-border purchasing by Providence consumers following policy implementation, which retail sales data suggest could have occurred.²⁷ These findings underscore the utility of scanner data for evaluation of retail tobacco regulations; moreover, if scanner data were paired with qualitative package and labelling analyses, investigators could better elucidate subtle differences in products that appear in a marketplace.³³

This study has several limitations. First, our results might underrepresent the universe of available cigarillo UPCs sold by retailers in Providence and ROS because scanner data are not

Table 1 UPC counts and availability share of cigarillos by flavour category, prepolicy and postpolicy in Providence, RI and an ROS comparison area, January 2012–January 2016

Postestimation summary results*		Number of unique UPCs (Newey-West standard error)			Share of unique UPCs in percentage points (Newey-West standard error)		
Geography	Coefficient(s)†	Total	Explicit	Tobacco	Concept	Explicit	Tobacco
Prepolicy availability							
Providence	$\beta_0 + \beta_2$	96.54 (1.83)	50.49 (1.47)	36.68 (1.84)	9.44% (0.49)	52.41% (1.70)	37.88% (1.52)
ROS	β_0	137.94 (2.50)	75.59 (1.64)	48.50 (1.25)	9.68% (0.99)	54.78% (1.45)	35.16% (0.57)
Postpolicy availability							
Providence	$\beta_0 + \beta_2 + \beta_3 + \beta_6$	86.26 (4.51)	22.45 (3.28)	41.80 (4.18)	27.32% (1.77)	21.46% (3.63)	51.19% (3.62)
ROS	$\beta_0 + \beta_4$	156.31 (5.80)	78.73 (2.85)	57.24 (2.60)	12.67% (1.67)	50.74% (2.08)	36.51% (1.00)
Net policy effect on availability‡	β_6	-28.64 (5.83)	-31.18 (3.06)	-3.62 (3.47)	14.88 (1.91)	-26.90 (2.61)	11.96 (2.65)
Total postpolicy difference on availabilities§	$\beta_2 + \beta_6$	-70.04 (7.34)	-56.28 (4.35)	-15.44 (4.93)	14.65 (2.43)	-29.27 (4.18)	14.68 (3.75)
Prepolicy trend							
Providence	$\beta_1 + \beta_3$	-0.22 (0.09)	-0.20 (0.06)	0.03 (0.08)	-0.02 (0.01)	-0.10 (0.07)	0.13 (0.07)
ROS	β_1	-0.15 (0.09)	-0.09 (0.05)	-0.05 (0.04)	-0.003 (0.03)	-0.008 (0.04)	0.006 (0.02)
Postpolicy trend							
Providence	$\beta_1 + \beta_3 + \beta_5 + \beta_7$	-0.02 (0.02)	-0.0005 (0.01)	-0.02 (0.01)	0.001 (0.01)	0.003 (0.01)	-0.01 (0.01)
ROS	$\beta_1 + \beta_5$	-0.20 (0.03)	-0.13 (0.01)	-0.06 (0.02)	0.02 (0.005)	-0.03 (0.006)	0.007 (0.004)
Net policy effect on trend**	β_7	0.24 (0.14)	0.24 (0.08)	-0.03 (0.09)	-0.0004 (0.04)	0.13 (0.08)	-0.14 (0.07)
Total postpolicy difference in trend††	$\beta_3 + \beta_5$	0.18 (0.04)	0.13 (0.01)	0.05 (0.02)	-0.02 (0.01)	0.04 (0.01)	-0.02 (0.01)

Trends in Providence and ROS were parallel in the prepolicy period (ie, data met the parallel trends assumption). ROS=rest of state (excludes Providence).
 Bold-p<0.05; significance only indicated for net policy effect (difference-in-difference analysis) and total postpolicy difference rows.
 *Number or share of unique UPCs = $\beta_0 + \beta_1$ (Time Trend) + β_2 (Providence) + β_3 (Providence * Time Trend) + β_4 (Policy Indicator) + β_5 (Providence * Policy Indicator) + β_6 (Policy Indicator * Time Trend).
 †Change in the number or share (in percentage points) of unique UPCs associated with the policy in Providence compared with the change in ROS.
 ‡Change in the number or share (in percentage points) of unique UPCs associated with the policy in Providence relative to ROS.
 §Total difference in the number or share (in percentage points) of unique UPCs between Providence and ROS.
 ¶Trend is the average weekly change in the number or share (in percentage points) of UPCs; if statistically insignificant, the number or share of UPCs does not significantly change from week to week during the defined period.
 **Change in the trend of the number or share (in percentage points) of unique UPCs associated with the policy in Providence compared with the change in ROS.
 †† Total difference between Providence and ROS in the average weekly change in the number or share (in percentage points) of unique UPCs in the postpolicy period.
 RI, Rhode Island; ROS, rest of state; UPC, universal product code.

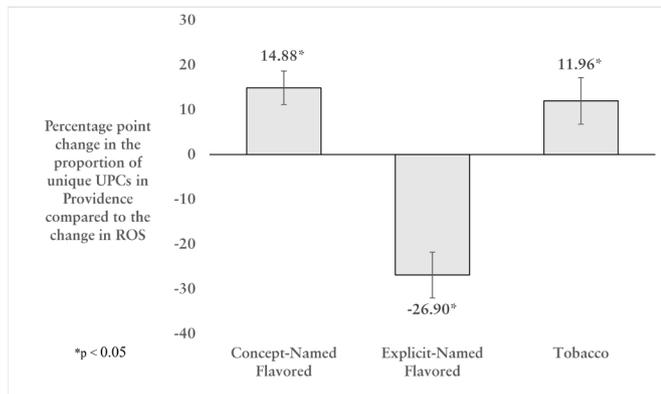


Figure 3 Net policy effect on changes in cigarillo UPC share in Providence compared with changes in ROS, prepolicy (2012) to postpolicy (2013–2016). ROS, rest of state; UPC, universal product code.

collected from tobacco specialty stores, vape shops and other independent retailers lacking point-of-sale barcode readers or from online sources³⁴; however, retail sales surveillance studies suggest that most cigarillos are purchased locally through retailers that use scanner systems or participate in Nielsen in-store audits.^{33 35 36} Second, our flavour categorisation methodology, based on coder interpretation of Nielsen's product descriptor variables and online product information, could contribute to misclassification errors; nevertheless, this methodology has been used in similar analyses.^{26 27} Third, although parallel prepolicy trends suggest that ROS was an appropriate comparison area for Providence, our analysis does not account for the influence of other policies that might differentially affect tobacco availability in Providence and the rest of RI; notably, at the same time as the flavoured product sales restriction was implemented, Providence began enforcement of a city-specific policy prohibiting coupon redemption and multipack discounts on tobacco products.³⁷ It is unclear, however, the extent to which this local policy—intended to regulate tobacco manufacturers' price-reduction strategies—differentially affects retail availability of flavoured tobacco products in Providence and the rest of RI. Fourth, we did not consider the effect of availability of other products on availability of cigarillos. We observed similar patterns for sales of flavoured smokeless tobacco products (SLT) as we observed for sales of flavoured cigarillos reported in our previous study of this policy²⁶ (results not shown). We also observed an increase in the sales of flavoured e-cigarettes in Providence and ROS from prepolicy to postpolicy periods (results not shown). Although the absolute unit sales volumes for these other products remained a small fraction of that seen for flavoured cigarillos during the study period, the increase in sales of other policy-restricted products may have had a suppressing effect on the number of new concept flavoured cigarillos introduced, assuming that flavoured SLT or e-cigarettes serve as substitutes for flavoured cigarillos. Finally, we assume that the UPC is a reasonable identifier of unique product varieties on the market; we cannot, however, determine manufacturer rationale for assigning unique UPCs to similar products, some of which do not appear to have distinctive package characteristics. Thus, it is possible that we overcounted product availability if several (apparently) identical products were assigned multiple UPCs.

The results of this study emphasise the importance of monitoring community-wide product availability in jurisdictions with or without flavoured tobacco product sales policies. The expanded availability of concept-named products poses special

What this paper adds

- ⇒ This is the first study to use retail scanner data to assess the impact of a local tobacco policy on the number and variety of unique tobacco products available to consumers in retail outlets throughout a community.
- ⇒ Although fewer cigarillo universal product code (UPC) were available in Providence following policy implementation—as opposed to the growth in cigarillo UPC availability in the rest of Rhode Island—Providence consumers were then presented with a greater variety and larger proportion of cigarillo UPCs having concept flavour names.
- ⇒ These findings suggest that availability of concept-named flavoured cigarillos, which are difficult to detect through in-store observation, could reflect changes to product design and labelling in response to regulation and underscore the importance of systematic surveillance of product availability.

challenges for enforcement agencies often operating with limited resources or outdated lists of policy-restricted flavoured tobacco products. As noted elsewhere, even local policies with 'presumptive evidence' provisions (as in the case of the Providence ordinance) are challenging to enforce in the absence of accessible information on the characterising flavour characteristics of concept-named products.²⁷ Comprehensive local flavoured product sales restrictions covering all product types and flavours, including all retailers in a jurisdiction, when implemented with extensive retailer education and proactive enforcement might prove to be successful countermeasures to the emergence in the marketplace of policy-restricted products that are challenging to detect and undermine the intent of the policy. Our study also demonstrates that retail scanner data can complement other data collection methods for surveillance, compliance monitoring and evaluation studies of tobacco product availability.

Contributors TR, DGG and XX conceptualised and designed the study; DGG and EMC conducted data analyses; TR, DGG and EMC drafted the article; all authors contributed to writing and editing, and approved the final version of the article.

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