The Effect of Tobacco Sales Bans in Beverly Hills & Manhattan Beach CA

Nita H. Mukand, PharmD, MBA, MPH
PhD Candidate
UC San Francisco, Department of Epidemiology and Biostatistics

Tobacco Online Policy Seminar
March 13, 2026

Funding & disclaimers

Funding

- The study is funded by the California Department of Public Health (CDPH)/ California Tobacco Prevention Program under Contract No. 21-10222. The findings and conclusions of this work are those of the authors and do not necessarily represent the views or opinions of CDPH or the California Health and Human Services Agency.

- NHM was funded by the National Institute on Aging (T32AG049663).

- I have no other competing interests to disclose and have never received funding from the tobacco-nicotine industry.

Data disclaimer

- The researchers' own analyses and calculations are based in part on data reported by NielsenIQ. The conclusions drawn from the NielsenIQ data are those of the researchers and do not reflect the views of NielsenIQ. NielsenIQ is not responsible for, had no role in, and was not involved in analyzing and preparing the results reported herein.

UCSF

Acknowledgements

Coauthors

Elizabeth Anderson-Rogers, MA MSPH

Rafael Colonna, PhD

Wendy Max, PhD

Justin White, PhD

Dissertation committee

Dave Glidden, PhD

Bob Hiatt, MD, PhD

Justin White, PhD

UCSF

BMJ Journals

Tobacco Control

Original research

Effect of tobacco sales bans on retail sales in Beverly Hills and Manhattan Beach, California, USA: a synthetic difference-in-differences analysis

Nita H Mukand [1], Wendy B Max [2], Rafael Colonna [3], Elizabeth Andersen-Rodgers [3], Justin S White [1,4]

doi:10.1136/ tc-2024-059184

bit.ly/tobacco_sales_ban

UCSF

January 1, 2021

Beverly Hills and Manhattan Beach banned the sale of tobacco products

- Both offered retailers a one-year hardship exemption
- Beverly Hills exempted three existing cigar lounges

BEVERLY HILLS™ 90210

Ban on the Sale of All Tobacco Products in Beverly Hills

Beverly Hills Municipal Code - Smoking Regulations

Recent polices: sales & age-based bans

- Sales bans
  - 2004 – 2020: Bhutan
  - COVID-19: S. Africa, Botswana, India
  - 2025: Ross & Tiburon in Marin County California
  - 2025: Santa Cruz tobacco products with plastic filters or tips
- ”Nicotine-Free Generation”
  - 1/1/2000: Brookline, MA
  - 1/1/2004 – 1/1/2025: 21 additional Massachusetts towns and cities
  - 1/1/2007: Maldives
  - 1/1/2009: UK

Prior studies

Nicotine and Tobacco Research, 2024, **26**, 1159–1165
https://doi.org/10.1093/ntr/ntae043
Advance access publication 2 March 2024
Original Investigation

Evaluations of Compliance With California's First Tobacco Sales Bans and Tobacco Marketing in Restricted and Cross-Border Stores

BMJ Journals
Tobacco Control
Original research

Retailer experiences with tobacco sales bans: lessons from two early adopter jurisdictions

Patricia A McDaniel, Elizabeth A Smith, Ruth E Malone

Henrickson, 2024; McDaniel 2023

UCSF

Research question

What was the effect of tobacco sales bans in Beverly Hills and Manhattan Beach on retail sales?

Retail sales outcomes:

1. Tobacco products
   a. Overall
   b. By product category: cigarettes, cigars, smokeless tobacco, electronic nicotine delivery systems (ENDS)
2. Cross-border shopping
3. Non-tobacco products

Data

NielsenIQ

- Retail scanner data
  - Generated from point-of-sale system of tax-paid sales at UPC level from all available stores in California
  - Sample of chain grocery, drug, and convenience stores with addresses
  - Tobacco categories: cigarettes, cigars, smokeless tobacco, electronic nicotine delivery systems (ENDS)
- Data preparation
  - April 2018 – December 2022: aggregated to quarterly sales
  - “All tobacco” sales: sum of tobacco categories

Analytic approach: tobacco sales

- Compare *store-level unit sales* of tobacco products in BH and MB with a weighted subset of “untreated” stores in California
  - Excluded border area stores
  - matched based on store type (drug, grocery, convenience)
- Synthetic-difference-in-differences (SDID) used to model the counterfactual that best matched the pre-ban sales

Synthetic difference-in-differences (SDID)

- Hybrid of two quasi-experimental approaches for panel data
- Difference-in-differences (DiD):
  - a two-way fixed effects (TWFE) regression including unit and time specific fixed effects
- Synthetic Control (SC) includes:
  - unit-specific weights construct a control group that best matches treated unit's pre-policy outcome trends
- SDID adds to the DiD-TWFE and SC unit-specific weights:
  - time-specific weights balance the pre- and post-policy outcomes for the control group

Arkhangelsky 2021

Synthetic difference-in-differences (SDID)

Difference-in-differences

$$\left(\hat{\tau}^{\text{did}}, \hat{\mu}, \hat{\alpha}, \hat{\beta}\right) = \underset{\alpha,\beta,\mu,\tau}{\arg\min} \left\{ \sum_{i=1}^{N} \sum_{t=1}^{T} \left(Y_{it} - \mu - \alpha_i - \beta_t - W_{it}\tau\right)^2 \right\}$$

+

Synthetic control

$$\left(\hat{\tau}^{\text{sc}}, \hat{\mu}, \hat{\beta}\right) = \underset{\mu,\beta,\tau}{\arg\min} \left\{ \sum_{i=1}^{N} \sum_{t=1}^{T} \left(Y_{it} - \mu - \beta_t - W_{it}\tau\right)^2 \hat{\omega}_i^{\text{sc}} \right\}$$

SDID

$$\left(\hat{\tau}^{\text{sdid}}, \hat{\mu}, \hat{\alpha}, \hat{\beta}\right) = \underset{\tau,\mu,\alpha,\beta}{\arg\min} \left\{ \sum_{i=1}^{N} \sum_{t=1}^{T} \left(Y_{it} - \mu - \alpha_i - \beta_t - W_{it}\tau\right)^2 \hat{\omega}_i^{\text{sdid}} \hat{\lambda}_t^{\text{sdid}} \right\}$$

UCSF

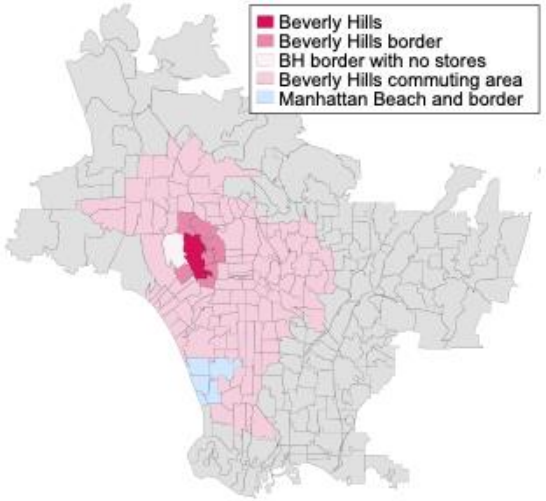
Analytic approach: the SDID model

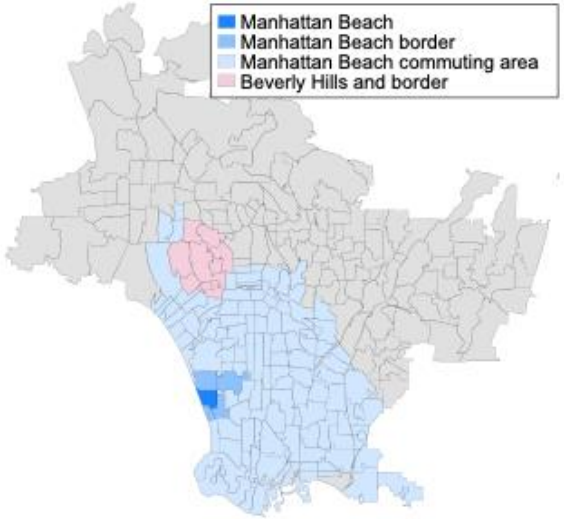
- Additional model components:
  - Fixed effects
    - store
    - year-quarter
  - Covariates
    - store type
    - presence of local flavored tobacco sales restriction
- Event study SDID specification
  - Test of pre-policy balance
  - Dynamic treatment effects

Analytic approach: cross-border shopping

- Border = average commuting time 30 minutes
- Geoappify Isoline API

https://www.geoapify.com/isoline-api/





UCSF

Analytic approach: non-tobacco sales

- Calculate total non-tobacco sales by summing dollar sales across 13 store departments
  - All departments except for alcohol and pet supplies
- Repeat SDID analysis for total dollar sales of all non-tobacco products

Analytic approach: additional statistical considerations

- Confidence intervals estimated with a permutation approach
  - Treated units are omitted
  - Controls randomly assigned to serve as treated units
  - Placebo estimates generated for stores from the potential pool of control stores
  - Repeated for 100 iterations
  - Variance calculated from placebo estimates

Sensitivity analyses

1. Pre-trend fit test (pre-policy RMSPE)
2. Leave-one-out approach
3. Alternate border definition using neighboring zip codes
4. Alternate tobacco outcome: dollar sales instead of unit sales
5. Non-tobacco sales by store type and store department

Pause for questions

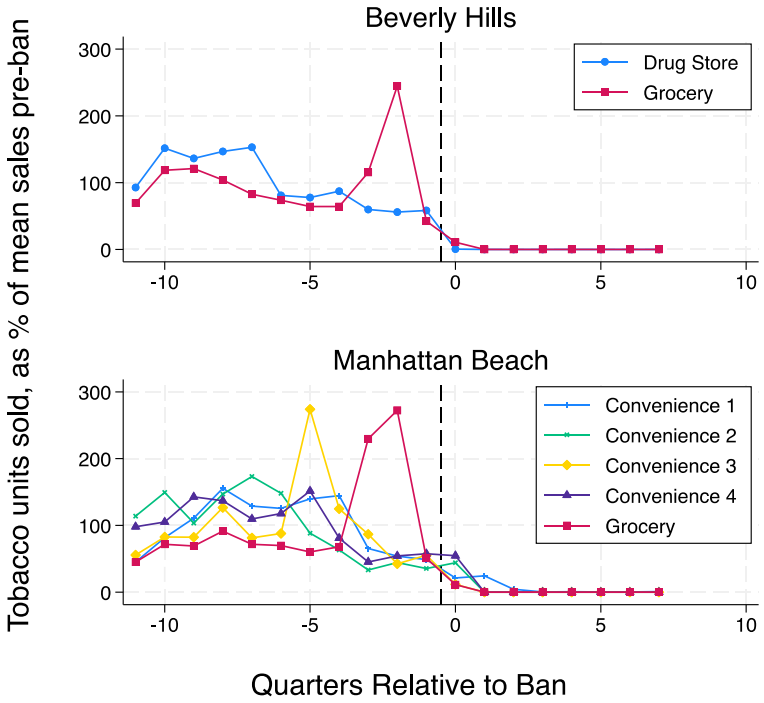
Number of tobacco retailers included in the analysis

Store type	Beverly Hills	Manhattan Beach	Beverly Hills border	Manhattan Beach border
	n (% pre-ban)	n (% pre-ban)	n	n
Grocery	1 (33%)	1 (25%)	46	69
Drug	1 (33%)	–	43	51
Convenience	–	4 (66%)	163	180
Total	**2**	**5**	**252**	**300**
Cities	1	1	387	350
UPCs	351	784	1259	3596

Store closures within first 18 months post-ban (McDaniel et al.)

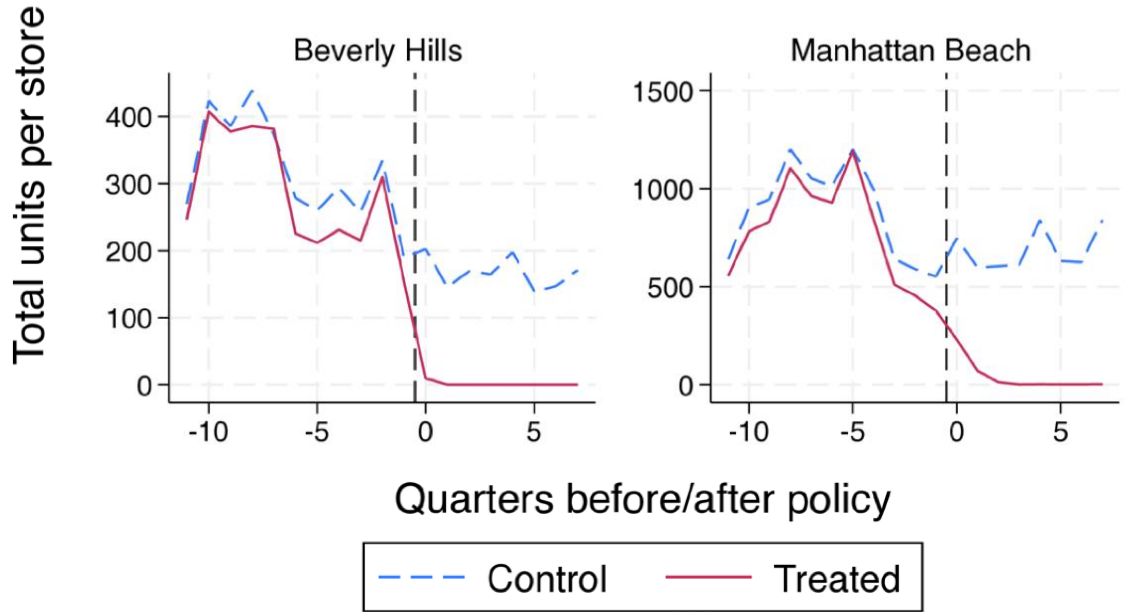
- BH: 3 stores (gas station, chain pharmacy, hotel gift shop)
- MB: 1 store (small grocery)

Pre- and post-policy trends in tobacco sales



UCSF

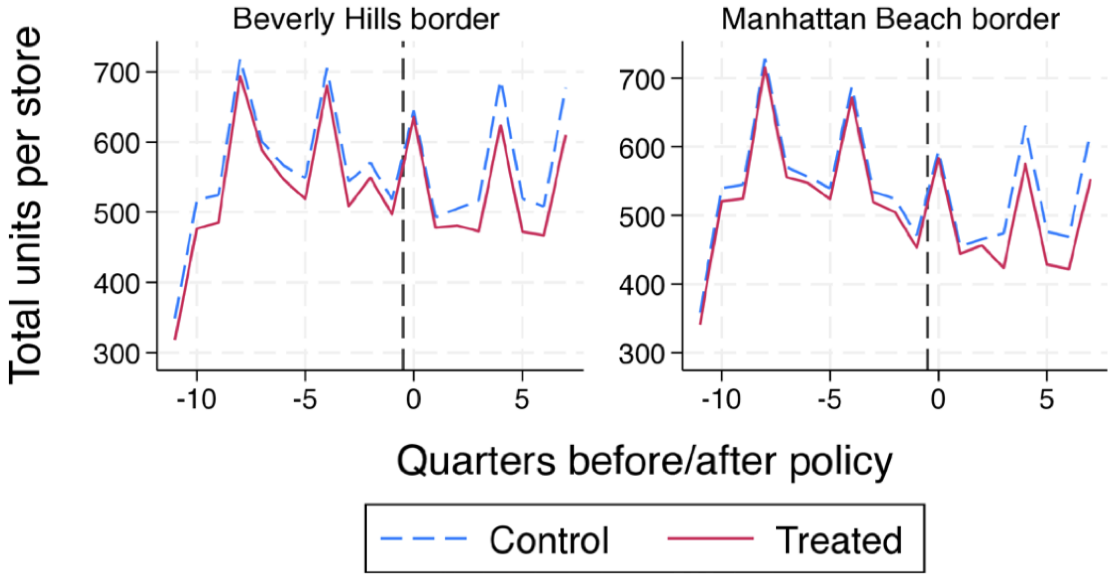
All tobacco sales in Beverly Hills & Manhattan Beach



Note: Dotted black line indicates quarter of implementation.
Estimates from SDID models that include store and quarter-year fixed effects.

UCSF

All tobacco sales in Beverly Hills & Manhattan Beach border areas



Note: Dotted black line indicates quarter of implementation.
Estimates from SDID models that include store and quarter-year fixed effects.

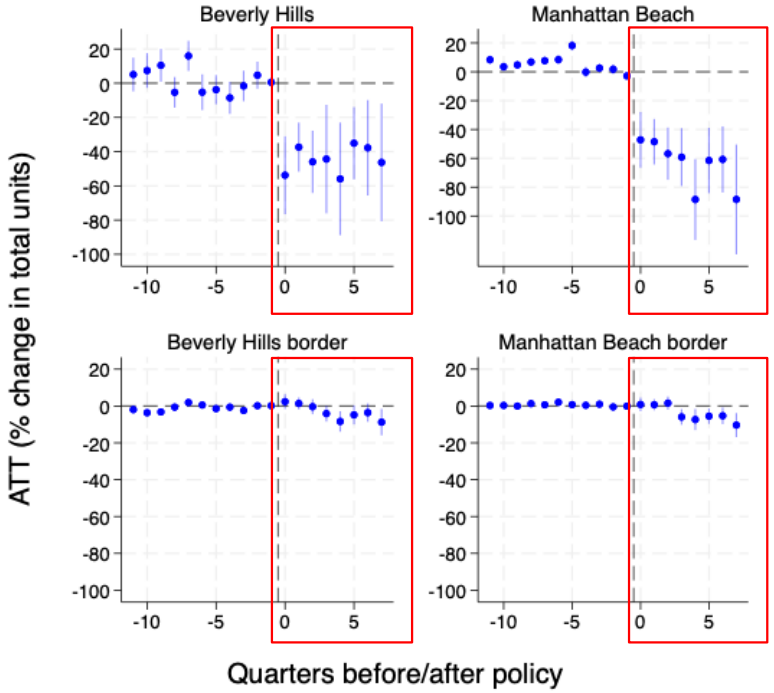
Border area tobacco sales by category

Table 2 Effect of tobacco sales bans on store-level quarterly unit sales in treated and border areas, by tobacco product category

	Unit sales by product category				
	All tobacco	**Cigarettes**	**Cigars**	**SLT**	**ENDS**
C. Beverly Hills border					
ATT	−17.1*	−2.5	13.8***	−18.3***	−9.8***
	(−35.9 to 1.8)	(−10.1 to 5.2)	(5.6 to 22.0)	(−30.6 to −6.0)	(−13.7 to −5.9)
Number of observations	57 323	56 715	48 925	45 809	38 988
Mean outcome	532.9	265.9	125.9	105.6	69.5
ATT as % change	−3.2	−0.9	11.0	−17.3	−14.1
	(−6.7 to 0.3)	(−3.8 to 1.9)	(4.4 to 17.5)	(−29.0 to −5.7)	(−19.7 to −8.4)
D. Manhattan Beach border					
ATT	−20.0**	−3.4	9.3**	−21.1***	−12.2***
	(−37.1 to −2.9)	(−10.2 to 3.3)	(2.0 to 16.7)	(−34.2 to −8.0)	(−15.8 to −8.7)
Number of observations	58 235	57 627	49 476	46 379	39 558
Mean outcome	534.3	266.8	144.3	112.6	57.9
ATT as % change	−3.7	−1.3	6.5	−18.7	−21.1
	(−7.0 to −0.5)	(−3.8 to 1.2)	(1.4 to 11.6)	(−30.4 to −7.1)	(−27.3 to −14.9)

This table shows estimates from synthetic difference-in-differences models of the change in total units sold per store for each product category by geographic area. 95% CIs, derived from permutation-based inference, are provided in parentheses. Data were analysed at the store-quarter level and included a set of convenience, grocery and drug stores. Stores used in creating the synthetic controls for Beverly Hills were restricted to the channels present in Beverly Hills: grocery and drug stores. Stores used in creating the synthetic controls for Manhattan Beach were restricted to the channels present in Manhattan Beach: grocery and convenience stores. Mean outcome = mean outcome measure of the treated group during the prepolicy period. ATT as % change = theATT expressed as a per cent change relative to the mean baseline outcome variable.
Significance: *p<0.10, **p<0.05, ***p<0.01.
ATT, average treatment effect on the treated; ENDS, electronic nicotine delivery systems; SLT, smokeless tobacco.

Event studies: change in all tobacco sales

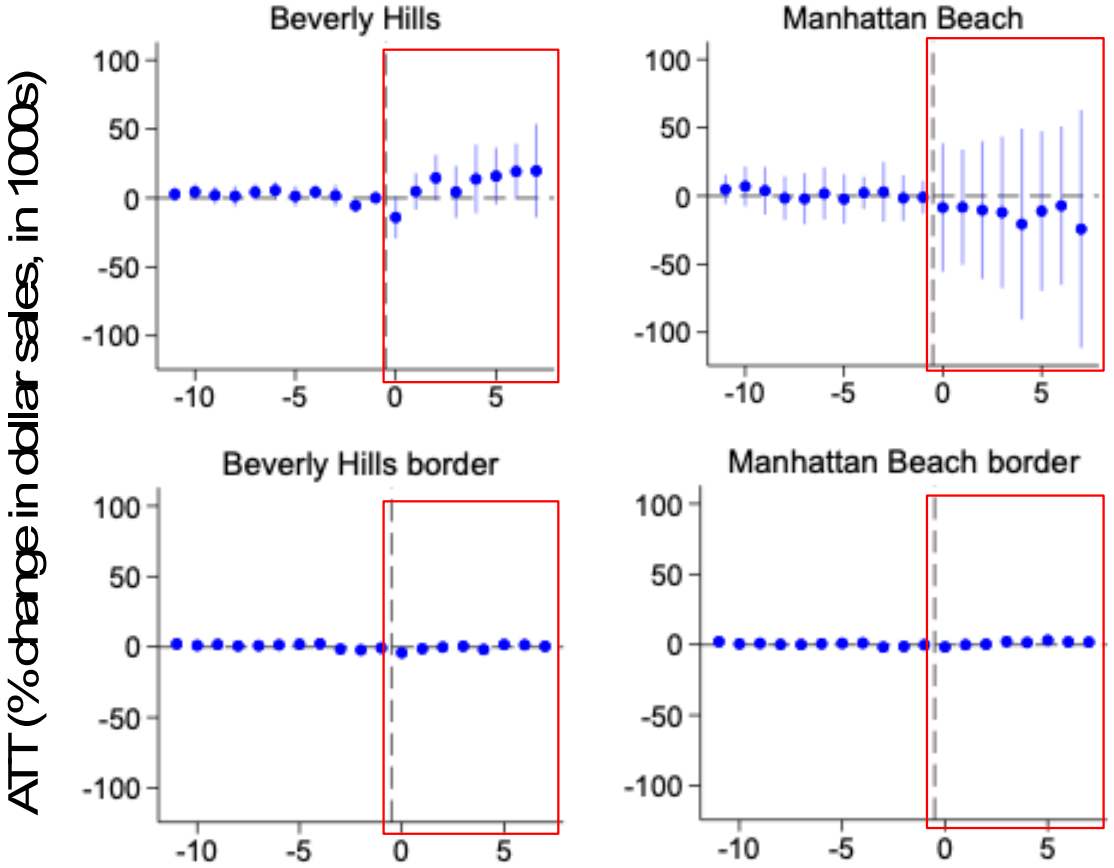


Treated cities

Border areas

Note: Estimates from SDID models that include store and quarter-year fixed effects.
ATT = average treatment effect on the treated

Event studies: non-tobacco dollar sales



Dollar sales of non-tobacco products did not decline in BH… but decreased non-significantly in MB.

	% Δ	(95% CI)
BH:	9.6%	(–6.8 to 26.0)
BH border:	–0.6%	(–2.9 to 1.8)
MB:	–13.0%	(–56.2 to 30.2)
MB border:	1.0%	(–1.2 to 3.1)

Note: Estimates from SDID models that include store and quarter-year fixed effects.
ATT = average treatment effect on the treated

UCSF

Sensitivity analyses results

1. Pre-trend fit test: Pre-policy RMSPE 7.6% of pre-ban mean, or 0.102 pre-period SDs
2. Leave-one-out approach: mean change <0.1%
3. Alternate border definition neighboring zip codes gave similar results
4. Alternate outcome: dollar sales gave similar results
5. Non-tobacco sales by store type: no differential effects

Limitations

- Nielsen – limited to major chains
  - Independent stores
  - Tobacco specialty stores
  - Liquor stores
  - Online sales
- Analysis limited to:
  - 2 stores in Beverly Hills (13% of tobacco retailers)
  - 5 stores in Manhattan Beach (29% of tobacco retailers)
- No information on illicit tobacco sales
- Purchasing is not equivalent to consumption

Key takeaways

Tobacco sales **ceased** within three months in Beverly Hills and within a year in Manhattan Beach

Overall tobacco sales were **not displaced** to the border area, although there was some evidence of displacement for cigars

There were **no significant change** in the sale of non-tobacco products in either city or the border areas

Policy implications

- Tobacco sales bans were feasible in these two cities without considerable unintended effects
- May provide proof-of-concept for other cities
- Tobacco sales bans are one in a toolbox of retail tobacco endgame strategies
- Additional experimentation will help researchers evaluate the impacts of these policies

Kong 2021

Questions and Discussion

Contact:
Justin White juswhite@bu.edu

References

Arkhangelsky D, Athey S, Hirshberg DA, *et al*. Synthetic Difference-in-Differences. *American Economic Review* 2021;111:4088–118.

Action on Smoking and Health. Tobacco Endgame Progress. 11 Dec 2025. Available:https://ash.org/wp-content/uploads/2025/12/Endgame-Progress-Infographic_Dec-11-2025.pdf [Accessed 12 Mar 2026].

Ciccia D. A short note on event-study synthetic difference-in-differences estimators. Statistical Software Components S459354, Boston College Department of Economics; 2024.

Geoapify. Isoline API playground 2025. 2025. Available: https://commutetimemap.com [Accessed 15 Apr 2025].

Henriksen L, Andersen-Rodgers E, Voelker DH, *et al*. Evaluations of Compliance With California's First Tobacco Sales Bans and Tobacco Marketing in Restricted and Cross- Border Stores. *Nicotine Tob Res* 2024;26:1159–65.

Kong AY, Henriksen L. Retail endgame strategies: reduce tobacco availability and visibility and promote health equity. *Tobacco Control* 2022;**31:**243-249.

McDaniel PA, Smith EA, Malone RE. Retailer experiences with tobacco sales bans: lessons from two early adopter jurisdictions. *Tob Control* 2024;33:tc-2023-057944:739–44:.

UCSF