Cigarettes smoked following CVS Health's tobacco-free pharmacy policy

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Acknowledgements

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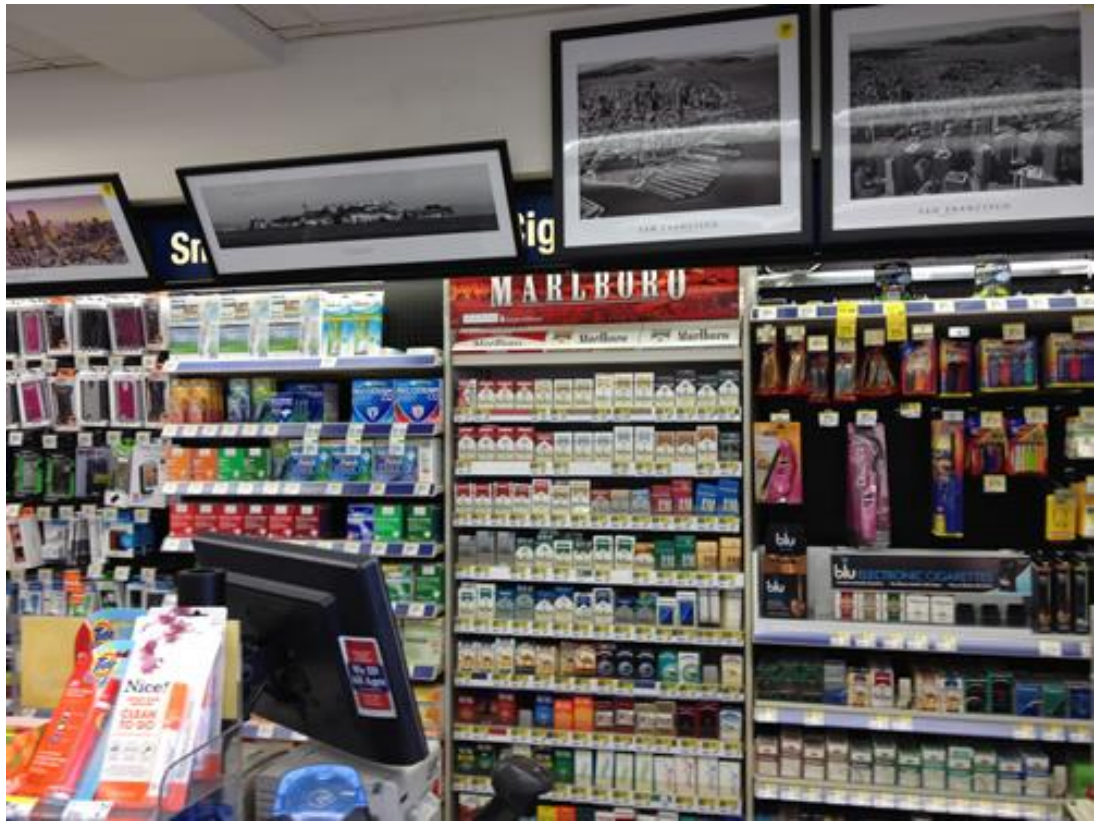
In September 2014, CVS Health removed tobacco products from all 7,700 pharmacy locations.



Pharmacies as settings for tobacco intervention

- Tobacco sales in pharmacies have been increasing while national sales have been decreasing (Seidenberg et al. 2012).

- Tobacco prices are lower in pharmacies (Henriksen et al. 2016).

How might this policy change impact smoking?

1. Reduced impulse purchases
   - 11-30% of cigarette purchases are unplanned (Carter et al. 2015; Clattenburg et al. 2013; Wood et al. 2019)
   - Impulse purchases can be prompted by visual cues (Armel et al. 2008; Laibson, 2001; Milosavljevic et al. 2012)
     - Demonstrated with tobacco in:
       - Experimental studies (Carter et al. 2006; Engelmann et al. 2012; Shiffman et al. 2013; Conklin et al., 2015)
       - Surveys (Wakefield et al. 2008; Hoek et al. 2010)
       - Observational studies of point-of-sale display bans (Carter et al. 2015, Li et al. 2013).

How might this policy change impact smoking?

2. Social sanctioning against smoking

- Perceived popularity effect: prolific retail presence seen as indicator that products are popular and accepted (Pollay 2007).
- Point-of-sale display bans associated with decreased perceptions of normativity and increased perceptions of harmfulness of cigarettes (McNeill et al. 2011; Scheffels and Lavik 2013).

Heterogeneous effects?

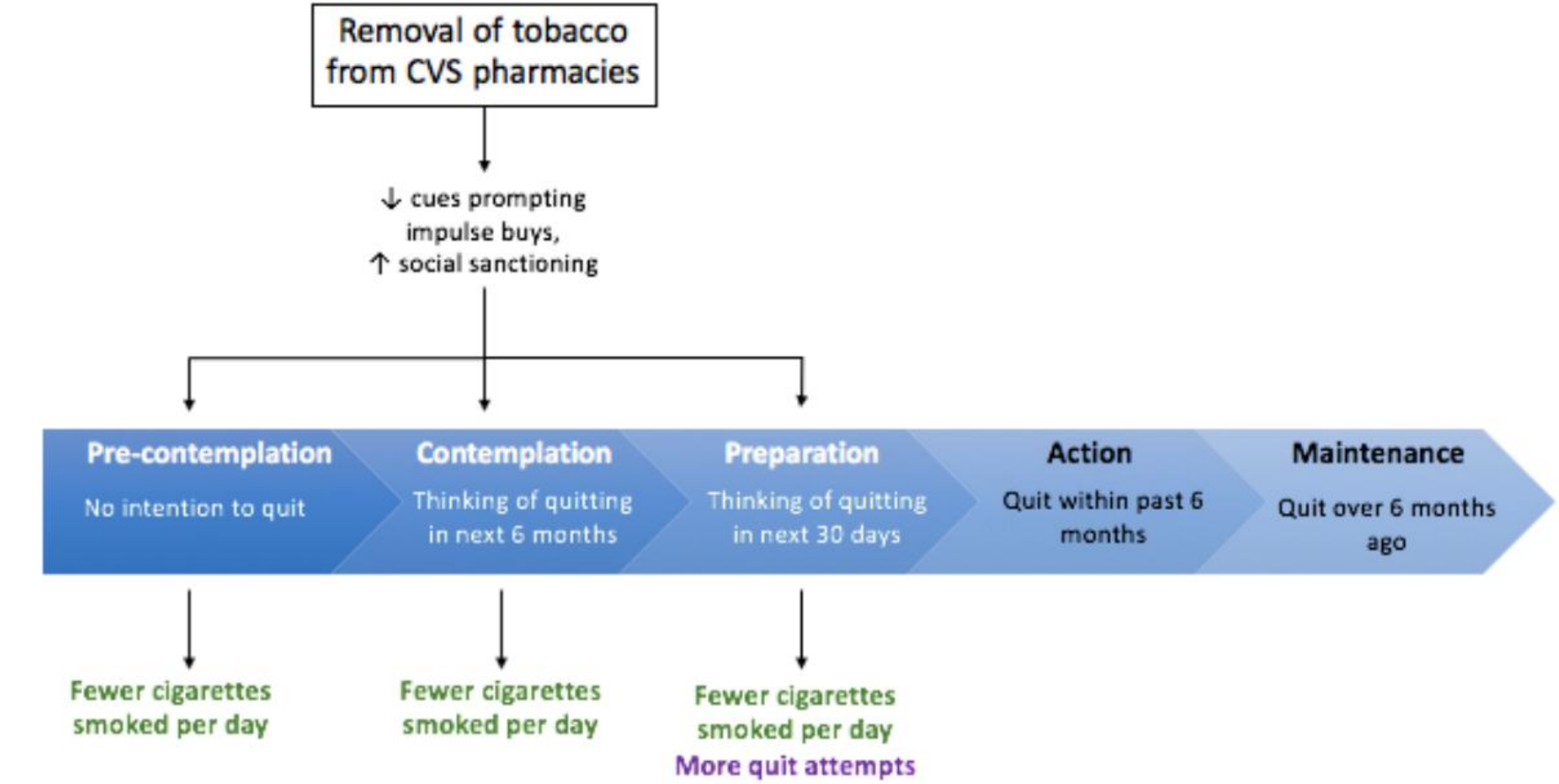
Tobacco-free pharmacy policies may be more likely to impact **nondaily smokers** than **daily smokers**.

Nondaily smokers more likely to make impulse purchases (Clattenburg et al. 2013)

- Smoking is more strongly related to cues and cravings (Shiffman et al. 2012, Shiffman et al. 2014).
- Impact of availability of cigarettes on nondaily smokers' odds of smoking 3x as strong as its impact on daily smokers' odds of smoking (Shiffman et al. 2014).

Previous literature

1. Households that purchased cigarettes exclusively at CVS pharmacies were **38% more likely to stop purchasing cigarettes** after policy change compared to households that never purchased cigarettes at CVS pharmacies (Polinski et al. 2017).
2. Policy associated with **increased quit attempts** but only among current smokers and in urban counties in the highest quartile of CVS density (Ali et al. 2020).



Adapted from DiClemente et al. (1991), Prochaska et al. (1992)

Study objective

Assess the impact of the of CVS Health's tobacco-free pharmacy policy on the number of cigarettes smoked per smoking day by daily smokers and by nondaily smokers.

Methods

Data

Data sources: Tobacco Use Supplement to the Current Population Survey (CPS-TUS) 2014-2015, Blue Cross and Blue Shield (BCBS) Institute Community Health Management Hub (CHM Hub®)

Data linked using Core-based Statistical Area (CBSA) codes.

Excluded individuals living outside CBSAs or in municipalities with existing tobacco-free policies.

Analytic sample of 111,034 individuals living in CBSAs, including 10,759 daily smokers and 3,055 nondaily smokers.

Measures

- Outcome: number of cigarettes smoked per day (everyday smokers) or per smoking day (nondaily smokers)
- Exposure: CBSA-level CVS market penetration
  - % of all pharmacies in the CBSA that are CVS pharmacies
- Covariates: age, gender, race/ethnicity, educational attainment, income

Models

Continuous difference-in-difference with CVS% modeled continuously (Card 1992; Acemoglu et al. 2014; Allen et al. 2017)

$$Y_{it}=\beta_0 + \beta_1 CVS\_percent_{it} + \beta_2 Post_{it} + \beta_3(CVS\_percent_{it} \times Post_{it}) + \beta_4 \mathbf{X}_{it} + \beta_5 State_{it} + \epsilon_{it}$$

Categorical difference-in-difference with CVS% split into thirds and individuals in each third compared to those in CBSAs with zero CVS locations.

$$Y_{it}=\beta_0 + \beta_1 CVS\_Third1_{it} + \beta_2 Post_{it} + \beta_3(CVS\_Third1_{it} \times Post_{it}) + \beta_4 CVS\_Third2_{it} + \beta_5(CVS\_Third2_{it} \times Post_{it}) + \beta_6 CVS\_Third3_{it} + \beta_7(CVS\_Third3_{it} \times Post_{it}) + \beta_8 \mathbf{X}_{it} + \beta_9 State_{it} + \epsilon_{it}$$

All models estimated using zero truncated negative binomial regression weighted by survey nonresponse weights, controlled for age, sex, race and ethnicity, educational attainment, & current income, include state fixed effects, and errors were clustered at CBSA level.

Sensitivity analyses

- Excluding states with no CVS presence
- Controlling for price paid for last pack
- Triple interaction of post-policy x CVS market share x daily vs. nondaily smoker
- Negative control using Rite Aid pharmacy market share
- Propensity score methods

Propensity score methods

- Generated propensity scores for being surveyed in the pre-policy period vs post-policy period using survey-weighted logistic regression.
- Matching using radius caliper matching with caliper=0.2xSD logit of propensity score (Austin 2009).
- Achieved **best balance** in comparison to strategies that:
  - Generated propensity scores using weight as covariate and excluding weight
  - Created sample using 1:1 nearest-neighbor matching with and without replacement and propensity score weighting

Results

CVS market penetration ranged from 0 to 34.78% of pharmacy market

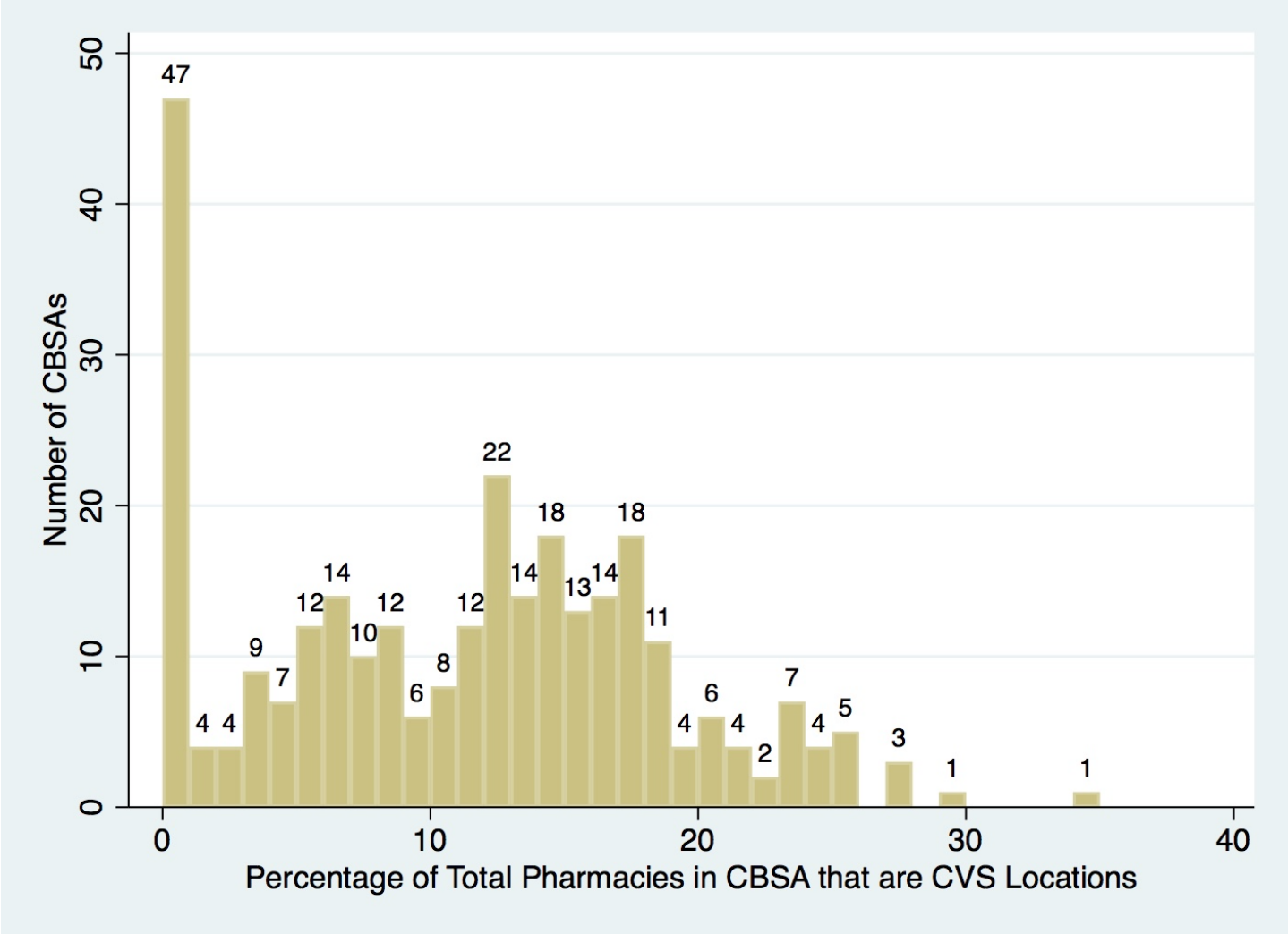


Table 1. Demographic and socioeconomic characteristics of current smokers

	All current smokers (n=13,814)	*Daily smokers* (n=10,759)	*Nondaily smokers* (n=3,055)
Cigarettes smoked per day	11.7	13.9	4.27*
Age (mean)	44.3	45.3	40.91*
Female (%)	45.2	45.9	42.75*
Race (%)			
White	78.2	79.8	72.7*
Black	15.3	14.2	18.8*
Asian/Pacific Islander	3.3	2.9	4.9*
American Indian/Alaska Native	1.1	1.0	1.2
Multiracial	2.2	2.1	2.4
Ethnicity (%)			
Hispanic	11.7	9.9	17.6*
Non-Hispanic	88.3	90.1	82.4*
Education (%)			
< HS degree	15.7	16.4	13.47*
HS degree/GED	38.0	40.1	31.33*
Some college	32.9	32.6	34.0
College degree+	13.3	11.0	21.18*
Income (%)			
<$20,000	27.7	27.8	27.2
$20,000-34,999	21.7	22.2	20.2*
$35,000-49,999	14.8	15.3	13.05*
$50,000-74,999	16.8	16.9	16.5
>$75,000	19.0	17.8	23.05*

* Indicates statistical significance ($p<0.05$) in test of means compared to daily smokers

Table 2. Difference-in-difference models of cigarettes smoked per day among current smokers

	Daily smokers (n=10,759)	*Nondaily smokers (n=3,055)*
Continuous exposure[1]		
Post Policy x CVS%	1.002 (0.002) [0.153]	
Categorical Exposure[2]		
Post Policy x CVS Category 1	0.980 (0.069) [0.774]	
Post Policy x CVS Category 2	1.035 (0.070) [0.612]	
Post Policy x CVS Category 3	1.042 (0.072) [0.549]	

Note. Presented are exponentiated coefficient estimates (rate ratios) of the difference-in-difference parameters using zero truncated negative binomial regression. [1] denotes estimates from model 1 and [2] denotes estimates from model 2, as specified in the text. Clustered standard errors are in parentheses and p-values are in brackets. Boldface indicates statistical significance (*p<0.05, **p<0.01, ***p<0.001).
Source. Tobacco Use Supplement to the Current Population Survey (TUS-CPS) 2014-2015, BCBSA Community Health Management Hub®.

No evidence of effect among daily smokers.

Decrease in the number of cigarettes smoked by non daily smokers following policy change.

↓ 0.3 cigarettes/day

↓ 0.4 cigarettes/day

Table 3. Difference-in-difference estimates from sensitivity analyses assessing cigarettes smoked per day among nondaily smokers

	Main analysis (n=3,055)	*Only states with some CVS presence (n=2,930)*	*Controlling for price (n=2,294)*	*Triple interaction term[1] (n=13,814)*	*Rite Aid market share (n=2,029)*	*Propensity score weighted (n=3,038)*
Continuous exposure						
Post Policy x CVS%	**0.985*** (0.006) [0.022]	**0.984*** (0.007) [0.025]	**0.987*** (-0.006) [0.035]	**0.983*** (0.006) [0.004]	1.010 (0.008) [0.165]	**0.985*** (0.006) [0.022]
Categorical Exposure						
Post Policy x CVS Category 1	0.818 (0.126) [0.192]	0.676~ (0.153) [0.084]	0.796 (0.134) [0.176]	0.932 (0.129) [0.611]	0.919 (0.259) [0.765]	0.802 (0.131) [0.177]
Post Policy x CVS Category 2	**0.723*** (0.116) [0.043]	**0.598*** (0.136) [0.023]	0.733~ (0.131) [0.081]	0.800 (0.121) [0.142}	0.943 (0.271) [0.838]	**0.698*** (0.118) [0.033]
Post Policy x CVS Category 3	**0.706*** (0.111) [0.027]	**0.584*** (0.132) [0.018]	**0.702*** (0.114) [0.030]	**0.742*** (0.108) [0.040]	1.053 (0.300) [0.856]	**0.695*** (0.116) [0.029]

Discussion

The removal of tobacco products form CVS pharmacies was linked to smoking fewer cigarettes per smoking day among **nondaily smokers**, particularly in areas with large CVS market share.

- Nondaily smokers are **a unique population**
- Relatively small effect size

Limitations

- Limited number of time periods!
  - Not able to assess pre-policy trends.
  - Not able to detect long term effects.
- Restricted to individuals living in CBSAs with >100,000 population.
- Possible store closures during time period.