Tobacco Use Patterns and Associated Health-related Outcomes: Secondary Analysis of Behavioral Risk Factor Surveillance System (BRFSS) and National Health Interview Survey (NHIS) Data

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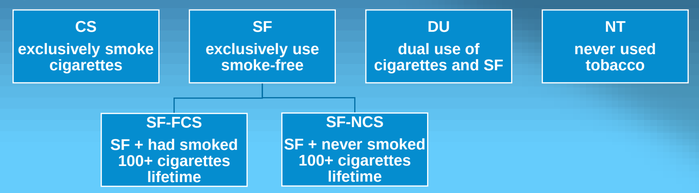
INTRODUCTION

- **While the health risks of cigarette smoking are well-documented, evidence is limited on associations between tobacco use patterns and health outcomes for users of smoke-free (SF) products, including e-vapor and smokeless tobacco.**
- **Behavioral Risk Factor Surveillance System (BRFSS) and National Health Interview Survey (NHIS) are nationally representative US surveys that monitor health-related risk behaviors including tobacco use and chronic health conditions such as chronic obstructive pulmonary disease, emphysema, or chronic bronchitis (COPD), asthma, coronary heart disease (CHD), lung cancer, and stroke.**
- **We assessed different tobacco use conditions on disease occurrences using logistic regression models accounting for sociodemographic, obesity, occupation, and other confronting factors such as cigarette use amount and prior cigarette use history.**

METHODS

- **Data source:**
  - Behavioral Risk Factor Surveillance System (BRFSS) 2015 to 2022 survey data
  - National Health Interview Survey (NHIS) 2015 to 2022 survey data
  - BRFSS data has a much larger sample size than NHIS data and allows investigation on diseases with low occurrences.
- **Disease outcomes:**
  - Ever had COPD, CHD, stroke, lung cancer
  - Ever had and still have asthma
- **Tobacco use:**
  - Tobacco products analyzed include cigarettes, cigars (only in NHIS), e-Vapor, smokeless tobacco products, pipe (only in NHIS).
  - Current use is defined as every day / some days use (and 100+ cigarettes lifetime criteria for current cigarette smokers).
  - Years of smoking is captured as [current age - age started smoking fairly regularly] for current cigarette smokers, and [current age - age started smoking – years since quit smoking] for former cigarette smokers.
  - Cigarettes per day (CPD) is captured as current number of cigarettes smoked each day for current cigarette smokers, and prior number of cigarettes smoked each day for former cigarette smokers (only in BRFSS).
- **Logistic regression models for estimating the effect of different tobacco use conditions on occurrences of disease outcomes were adjusted for sociodemographic, obesity, occupation, and other related factors.**
- **To fully assess the impact of tobacco use on health-related outcomes, while accounting for current and prior tobacco use patterns, two logistic regression models were employed:**
  - Model A: Disease occurrences are regressed by 5 study groups (CS, SF-FCS, SF-NCS, DU, NT), adjusted by sociodemographic factors (age, gender, race/ethnicity, education, household income), obesity
  - Model B: Disease occurrences are regressed by 3 study groups with a cigarette use history (CS, SF-FCS, DU), adjusted by sociodemographic factors (age, gender, race/ethnicity, education, household income), obesity, CPD, years of smoking, years since quit (smoking).
- **Sensitivity analysis was conducted by including usual care status[1] and occupation[2] as covariates.**
- **Study groups:**

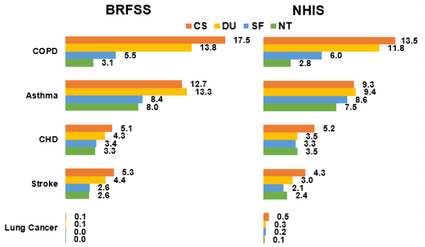


[1]Usual care: answer to question "Is there a place that you usually go to if you are sick and need health care?"
[2]Occupation: Dichotomized as high risk and low risk occupations. High risk occupations include farming, fishing, and forestry occupations; construction and extraction occupations; and material moving workers;

RESULTS

- Disease occurrences are highest in CS and DU groups, followed by SF, and the lowest in NT. Consistent patterns are seen in both BRFSS and NHIS data.

Disease Occurrence (%) by Study Group



Sample Size by Study Group

Study Group	BRFSS 2015-2022	NHIS 2015-2022
CS	169,872	25,326
DU	61,905	3,460
SF	120,009	6986
- SF-FCS	62,855	4,235
- SF-NCS	57,154	2,751
NT	715,382	104,186

Sociodemographic Characteristics (from BRFSS data)

- SF, in comparison to CS, is younger, is comprised of a higher proportion of males, non-Hispanic whites, higher levels of education and greater household incomes.
- DU, in comparison to CS, are also younger, more male-skewed, but exhibit similar levels of education and household income.

Cigarette Use Characteristics (from BRFSS data)

- CS and DU on average smoke 13 cigarettes per day, and SF-FCS on average smoked 15 cigarettes per day when they smoked in the past.
- CS and SF-FCS on average have smoked for 30-31 years; DU on average have a shorter smoking history (24 years).
- SF-FCS reported on average 9 years since quit smoking.

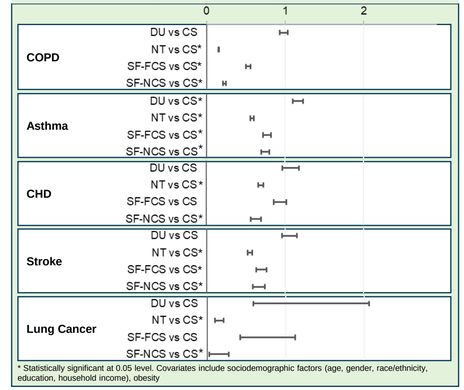
Sociodemographic Characteristics by Study Group

Sociodemographic Characteristics		BRFSS 2015-2022 CS %	DU %	SF %	NT %
Age	21-29	13.7	26.4	29.0	15.1
	30-44	33.9	37.0	32.4	27.1
	45+	52.4	36.6	38.6	57.8
Gender	Female	48.0	35.0	24.1	59.2
	Male	52.0	65.0	75.9	40.8
Race/ Ethnicity	Non-Hispanic Black	12.6	9.8	7.5	13.5
	Hispanic	12.0	11.9	10.5	18.2
	Non-Hispanic Other	7.3	9.2	7.9	8.5
	Non-Hispanic White	68.1	69.2	74.2	59.8
Education	Less Than College	88.2	88.6	79.8	63.5
	College or More	11.8	11.4	20.2	36.5
Household Income	< $75,000	78.3	76.8	61.5	60.8
	>= $75,000	21.7	23.2	38.5	39.2

Cigarette Use by Study Group

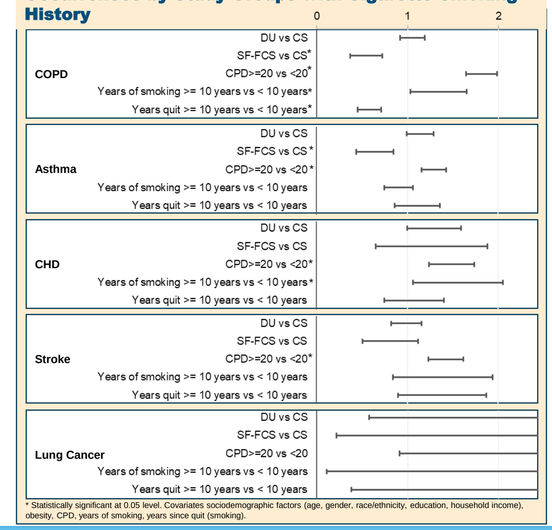
	BRFSS 2015-2022 CS	DU	SF-FCS
CPD	13.4	13.3	15.2
Years Smoked	31.3	23.8	30.2
Years Since Quit Smoking	NA	NA	9.1

Models A: Adjusted Odds Ratios for Disease Occurrences by Study Groups



* Statistically significant at 0.05 level. Covariates include sociodemographic factors (age, gender, race/ethnicity, education, household income), obesity

Models B: Adjusted Odds Ratios for Disease Occurrences by Study Groups with Cigarette Smoking History



* Statistically significant at 0.05 level. Covariates sociodemographic factors (age, gender, race/ethnicity, education, household income), obesity, CPD, years of smoking, years since quit (smoking).

Findings:

- **COPD:**
  - NT, SF-FCS and SF-NCS have lower odds of COPD occurrence compared to CS;
  - DU has similar odds of COPD risk to CS;
  - CPD>=20 and years of smoking >=10 elevate COPD risk while years quit >=10 lowers COPD risk.
- **Asthma:**
  - NT, SF-FCS, and SF-NCS have lower odds of asthma occurrence compared to CS;
  - DU has higher odds of asthma risk compared to CS;
  - CPD>=20 elevates asthma risk.
- **CHD:**
  - NT and SF-NCS have lower odds of CHD occurrence compared to CS;
  - DU and SF-FCS have similar odds of CHD risk compared to CS;
  - CPD>=20 and years of smoking >= 10 elevates CHD risk.
- **Stroke:**
  - NT and SF-NCS have lower odds of stroke occurrence compared to CS;
  - DU has similar odds of stroke risk compared to CS; SF-FCS has similar odds of stroke risk after adjusting for cigarette smoking covariates.
  - CPD>=20 elevates stroke risk.
- **Lung cancer:**
  - NT and SF-NCS have lower odds of lung cancer occurrence compared to CS;
  - DU and SF-FCS have similar odds of lung cancer risk compared to CS.

CONCLUSIONS

- **Never tobacco users showed better health-related outcomes than tobacco user groups overall.**
- **Switching from CS to SF is beneficial, with lower odds for COPD, asthma, and stroke.**
- **Health outcomes of DU group are generally similar to CS group.**

LIMITATIONS

- **BRFSS and NHIS survey data are cross-sectional, so the relationship of disease occurrence and tobacco use should not be interpreted as causal.**
- **Many disease outcomes were evaluated by 'ever' occurrence, which attenuates the ability to detect the effect of switching**

Altria Science

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