Poster #215

Segmenting Dual Users: Role of Frequency of Non-combustible Tobacco Product Use and the Likelihood of Transitioning Away from Cigarette Smoking

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ABSTRACT

Significance: Dual use may be a critical stage for the transition from combusted cigarettes to reduced-harm tobacco products. Prospective studies have shown that most dual users continue cigarette smoking at follow-up. More refined assessments of dual use behavior can provide better insight into the likelihood that dual users will transition away from smoking. This study aims to estimate the transition to nonsmoking among dual users of cigarettes and smokeless tobacco (SLT) as well as cigarettes and e-cigarettes.

Methods: Using Population Assessment of Tobacco and Health study data, we segmented adult current dual users at Wave 1 (2013-2014) based on the number of days they had used each product in the 30 days prior to the assessment: Infrequent Duals (use each product on ≤19 days), Vapers/Dippers who Smoke (vape/dip on ≥20 days, smoke on ≤19 days), Smokers who Vape/Dip (smoke on ≥20 days, vape/dip on ≤19 days), and Frequent Duals (use each product on ≥20 days). For each segment, we estimated the likelihood of not smoking at Wave 2 (2014-2015), at Wave 3 (2015-2016), and at both Wave 2 and 3.

Results: Overall, 12% of Wave 1 SLT-cigarette dual users were not smoking at Wave 2, 20% at Wave 3, and 11% at both Waves. Differences in not smoking were observed across segments at follow-ups. Dippers who Smoke and Infrequent Duals had the highest likelihood of not smoking at both Wave 2 and 3 (35% and 20%, respectively), followed by Frequent Duals (12%). Smokers who Dip, the largest segment of dual users, had the lowest likelihood of not smoking (3% at both Wave 2 and Wave 3). Pairwise comparisons showed no robust differences between Infrequent Duals and Dippers who Smoke, and both had higher likelihood of stopping smoking than Frequent Duals and Smokers who Dip. It is noteworthy that Frequent Duals are more likely to stop smoking compared to Smokers who Dip at follow-ups. Similar results are observed for e-cigarette-cigarette dual users.

Conclusions: There are substantial variations in the likelihood of stopping smoking among dual users. For dual users, frequent use of non-combustible products is an important factor for transitioning away from smoking.

INTRODUCTION

- Dual use may be a critical stage for cigarette smokers to transition to exclusive use of non-combusted, potentially reduced harm products, such as e-cigarettes or smokeless tobacco
- Prospective studies have shown that the majority of dual users continue to smoke cigarettes at follow-up[1]
- Prior research found daily use of e-cigarettes to be associated with smoking cessation[2,3]
- Recent research found that dual users who used e-cigarettes daily and smoked cigarettes on some days were most likely to switch to e-cigarettes at follow-up, compared to other segments of dual users[4]
- The aim of this study is built on past research to assess the probability of stopping smoking among segments of dual users of cigarettes and smokeless tobacco, as well as dual users of cigarettes and e-cigarettes

METHODS

- **Study Population:** non-institutionalized civilian adults 18 years of age and older living in the US, sampled in the first Wave of the longitudinal Population Assessment of Tobacco and Health (PATH) study
- **Analytic Sample:** individuals who smoked cigarettes and used either e-cigarettes or smokeless tobacco during the past 30 days prior to the assessment at Wave 1 (2013-2014), segmented by frequency of use
- **Assessment:** audio computer assisted self-interviews (ACASI), with standardized multi-item modules on use of various tobacco products, including cigarettes, e-cigarettes, and/or smokeless tobacco
  - Survey questions about past 30-day use of these tobacco products are typically in the format of 'On how many of the past 30 days did you…?'
  - Sex, age categories, and the number of cigarettes per day were included as covariates.
- **Outcome variable:** non-current cigarette smoking at follow-up assessment ascertained by a "not at all" response to the question "Do you now smoke cigarettes…" Three timeframes for outcome measures: non-current smoking at Wave 2 only, Wave 3 only, and both Wave 2 and Wave 3
- Descriptive analyses included unweighted frequencies and weighted proportions
- Logistic regression models were used to estimate the association between dual use segmentation with the probability of stopping smoking at follow-up
- Analysis weights were used to adjust for selection probability, non-response patterns, possible deficiencies in the sampling frame, and attrition. Balanced repeated replication (BRR) method was used to generate standard errors and 95% confidence intervals (CI)
- Analyses were conducted using Stata 15.0 (StataCorp, College Station, Texas, USA)

RESULTS

TABLE 1. Dual User Segments: Proportion of cigarette and smokeless tobacco dual users by frequency of use (shown in parentheses first) and proportion of cigarette and e-cigarette dual users by frequency of use (shown second). Data from PATH adult Wave 1 (2013-2014).

Tobacco Product		Smokeless Tobacco/ E-cigarette	
	Frequency of Use	≥20 days	<20 days
Cigarettes	≥20 days	Frequent Duals (27% / 13%)	Dippers/Vapers who Smoke (14% / 5%)
	<20 days	Smokers who Dip/Vape (52% / 69%)	Infrequent Duals (8% / 12%)

TABLE 2. Estimated associations of baseline frequencies of smokeless tobacco use and cigarette smoking and stopping smoking at follow-up among Wave 1 dual users of smokeless tobacco and cigarettes. Data from PATH adult Wave 2 and Wave 3 (2014-2016).

Follow-up time	Wave 1 Status	n	Likelihood of Stopping Smoking (%)	Unadjusted model OR (95% CI)	Sex & age adj. aOR (95% CI)	Baseline aOR (95% CI)
Wave 2	Dippers who Smoke	54	44%	Reference	Reference	Reference
	Infrequent Duals	90	26%	0.4 (0.2, 1.1)	0.4 (0.2, 1.0)	0.5 (0.2, 1.4)
	Smokers who Dip	349	8%	**0.1 (0.1, 0.2)**	**0.1 (0.1, 0.2)**	**0.3 (0.1, 0.8)**
	Frequent Duals	163	14%	**0.2 (0.1, 0.4)**	**0.2 (0.1, 0.4)**	0.5 (0.2, 1.2)
	Frequent Duals vs. Smokers who Dip			**2.0 (1.0, 3.8)**	1.9 (1.0, 3.8)	1.7 (0.9, 3.3)
Wave 3	Dippers who Smoke	50	53%	Reference	Reference	Reference
	Infrequent Duals	78	29%	**0.4 (0.2, 0.8)**	**0.3 (0.1, 0.7)**	0.4 (0.2, 1.0)
	Smokers who Dip	316	11%	**0.1 (0.1, 0.2)**	**0.1 (0.1, 0.2)**	**0.4 (0.2, 0.9)**
	Frequent Duals	146	22%	**0.3 (0.1, 0.5)**	**0.2 (0.1, 0.5)**	0.9 (0.4, 1.9)
	Frequent Duals vs. Smokers who Dip			**2.4 (1.3, 4.4)**	**2.2 (1.2, 4.2)**	**2.0 (1.1, 3.7)**
Both Wave 2 and 3	Dippers who Smoke	48	20%	Reference	Reference	Reference
	Infrequent Duals	77	35%	0.5 (0.2, 1.3)	0.4 (0.1, 1.2)	0.5 (0.1, 1.4)
	Smokers who Dip	302	3%	**0.1 (<0.1, 0.1)**	**<0.1 (<0.1, 0.1)**	**0.2 (0.1, 0.6)**
	Frequent Duals	138	12%	**0.3 (0.1, 0.6)**	**0.2 (0.1, 0.5)**	0.8 (0.3, 2.2)
	Frequent Duals vs. Smokers who Dip			**4.8 (1.8, 12.7)**	**4.7 (1.7, 13.3)**	**4.1 (1.6, 10.6)**

For the cigarette and smokeless tobacco dual user population, Smokers who Dip are the largest segment (52%) (Table 1).

Smokers who Dip are least likely to stop smoking (Table 2).

Among frequent smokers, Frequent Duals are more likely to stop smoking compared to Smokers who Dip at longer follow-up (at Wave 3 and at both Wave 2 & 3), even after controlling for baseline number of cigarettes smoked per day (Table 2).

TABLE 3. Estimated associations of baseline frequencies of e-cigarette use and cigarette smoking and stopping smoking at follow-up among Wave 1 dual users of e-cigarettes and cigarettes. Data from PATH adult Wave 2 and Wave 3 (2014-2016).

Follow-up time	Wave 1 Status	n	Likelihood of Stopping Smoking (%)	Unadjusted model OR (95% CI)	Sex & age adj. aOR (95% CI)	Baseline aOR (95% CI)
Wave 2	Vapers who Smoke	313	35%	Reference	Reference	Reference
	Infrequent Duals	128	28%	1.4 (0.8, 2.2)	1.4 (0.8, 2.3)	1.0 (0.6, 1.7)
	Smokers who Vape	1582	9%	**0.3 (0.2, 0.4)**	**0.3 (0.2, 0.4)**	**0.4 (0.2, 0.6)**
	Frequent Duals	297	13%	**0.4 (0.2, 0.6)**	**0.4 (0.2, 0.6)**	**0.5 (0.3, 0.9)**
	Frequent Duals vs. Smokers who Vape			**1.5 (1.0, 2.1)**	1.4 (1.0, 2.0)	1.4 (1.0, 1.9)
Wave 3	Vapers who Smoke	295	40%	Reference	Reference	Reference
	Infrequent Duals	118	35%	1.3 (0.8, 1.9)	1.3 (0.8, 2.1)	0.9 (0.6, 1.5)
	Smokers who Vape	1480	12%	**0.3 (0.2, 0.4)**	**0.3 (0.2, 0.4)**	**0.4 (0.2, 0.6)**
	Frequent Duals	275	19%	**0.4 (0.3, 0.7)**	**0.5 (0.3, 0.8)**	0.6 (0.3, 1.1)
	Frequent Duals vs. Smokers who Vape			**1.7 (1.2, 2.4)**	**1.6 (1.2, 2.3)**	**1.6 (1.1, 2.2)**
Both Wave 2 and 3	Vapers who Smoke	282	27%	Reference	Reference	Reference
	Infrequent Duals	113	21%	1.4 (0.8, 2.5)	1.5 (0.8, 2.8)	1.0 (0.5, 1.9)
	Smokers who Vape	1411	5%	**0.2 (0.1, 0.3)**	**0.2 (0.1, 0.4)**	**0.3 (0.2, 0.6)**
	Frequent Duals	263	9%	**0.4 (0.2, 0.7)**	**0.4 (0.2, 0.7)**	0.5 (0.2, 1.0)
	Frequent Duals vs. Smokers who Vape			**1.8 (1.2, 2.8)**	**1.7 (1.1, 2.7)**	**1.7 (1.1, 2.6)**

For the cigarette and e-cigarette dual user population, Smokers who Vape are the largest segment (69%) (Table 1).

Smokers who Vape and Infrequent Duals are less likely to stop smoking compared to the other two segments (Table 3).

Among frequent smokers, Frequent Duals are more likely to stop smoking compared to Smokers who Vape at longer follow-up (at Wave 3 and at both Wave 2 & 3), even after controlling for baseline number of cigarettes smoked per day (Table 3).

Table 2 & 3 Notes: Bolded font indicates statistical significance (p<0.05).

STRENGTHS & LIMITATIONS

- Strengths
  - PATH is a prospective study
  - By using nationally representative data, our results are generalizable to the US adult population
  - Use of ACASI and relatively low attrition enhances internal validity by reducing potential socially desirable responding and bias associated with attrition
- Limitations
  - Observational study based on self-report data
  - Use of other tobacco products were not taken into account
  - The response level at the household screening is moderate

CONCLUSIONS

- **There are substantial variations in the likelihood of stopping smoking among dual users. For dual users, frequent use of non-combustible products predicted transitioning away from smoking.**

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