

Health-related quality of life across tobacco and nicotine product use statuses: EQ-5D-5L findings from the National Tobacco Use and Transitions Survey (NTTS)

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Introduction

Health-related quality of life (HRQoL) provides a standardized, self-reported measure of health status that captures functioning and well-being not fully reflected by traditional measures of smoking-related harm such as mortality and morbidity. Most HRQoL research has focused on cigarette smoking, and evidence is limited on how HRQoL differs among adults who exclusively use different tobacco or nicotine products. This study used the National Tobacco Use and Transitions Survey (NTTS) to compare EQ-5D-5L and EQ-VAS outcomes among exclusive current established users of cigarettes, e-cigarettes, smokeless tobacco, and modern oral products.*

Methodology

Study sample

The NTTS is an ongoing monthly online opt-in survey of U.S. residents aged 21 years or older, conducted using a repeated cross-sectional, quota-based design. Data from March 2020 to April 2026 included 122,885 respondents who were mutually exclusive current established users of cigarettes (n = 112,520), e-cigarettes (n = 3,828), smokeless tobacco (n = 6,199), or modern oral products (n = 338), each of whom had never used any of the three other categories.

Measuring HRQoL

The EQ-5D-5L assesses mobility, self-care, usual activities, pain or discomfort, and anxiety or depression, with five response levels; the 2019 U.S.^{1,2} EQ-5D-5L value set was used to derive EQ-5D-5L index scores. Participants rated their health on the day of assessment on the EQ-VAS, from 0 (worst health imaginable) to 100 (best health imaginable).²

Analysis

Weighted adjusted mean EQ-5D-5L index and EQ-VAS scores were estimated, along with weighted percentages of problems reported within each EQ-5D-5L dimension. Associations between product consumption and EQ-5D-5L index were examined.

All analyses were survey-weighted. Models were adjusted for age, sex, race or ethnicity, education, and income.

* Cigarettes included factory manufactured cigarettes and roll your own cigarettes. E-cigarettes included refillable and non-refillable vapor systems. Smokeless included snus, moist snuff, portion pack or pouch, and loose leaf. Modern oral included tobacco leaf-free oral nicotine (for example: pouches or dissolvable nicotine lozenge).

Results

Exclusive cigarette smokers had the lowest mean EQ-5D-5L index and EQ-VAS scores. Significant differences in mean EQ-5D-5L index and EQ-VAS scores were observed between cigarette and e-cigarette users and cigarette and smokeless users. Mean EQ-VAS was also significantly different between cigarettes and modern oral.

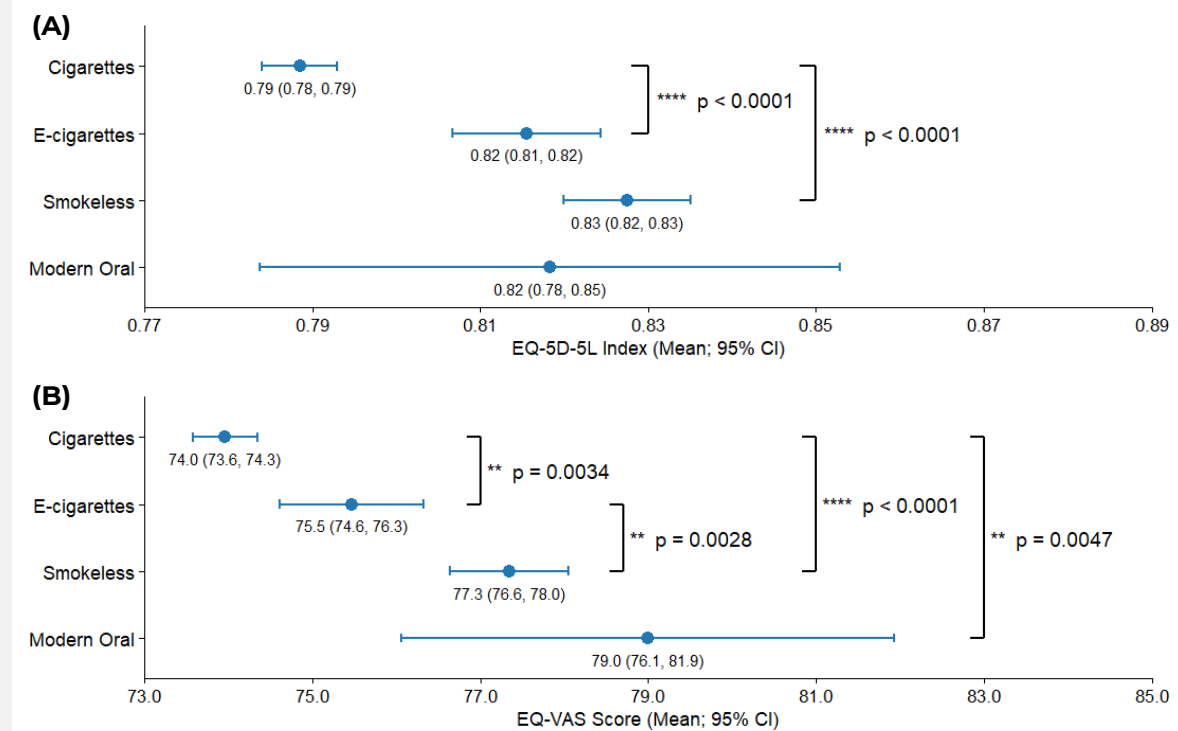


Figure 1. Adjusted mean (A) EQ-5D-5L Index and (B) EQ-VAS Scores among exclusive current established tobacco and nicotine product use groups. Notes*. Points represent the estimated adjusted mean, and horizontal lines represent the corresponding 95% confidence intervals (CI). P-values indicate comparisons between means after Bonferroni adjustment. The sample size for the modern oral group is smaller than that of the other three groups, resulting in wider confidence intervals and a larger standard error.

Exclusive cigarette users had the highest prevalence of problems with mobility, self-care, usual activities, and pain or discomfort.

Exclusive e-cigarette users had the highest prevalence of anxiety or depression, but the lowest prevalence of problems with mobility and self-care.

Exclusive smokeless tobacco users had the lowest prevalence of anxiety or depression and exclusive modern oral users had the lowest prevalence of pain or discomfort.

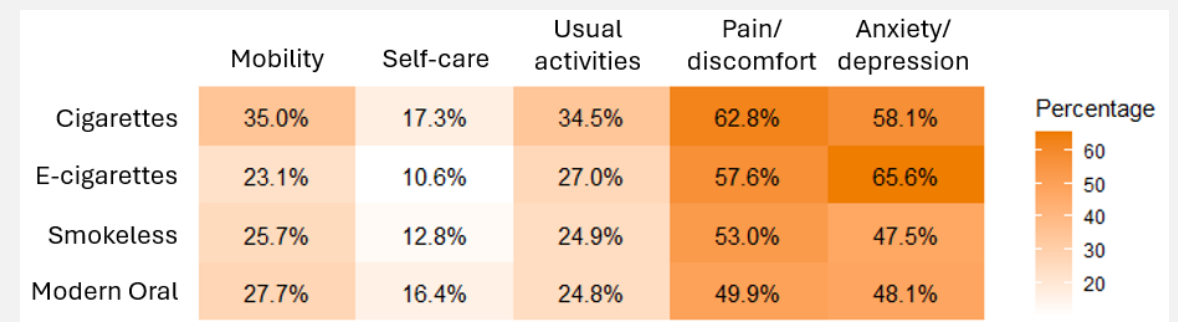


Figure 2. Percentages of respondents within each exclusive current established tobacco and nicotine product use group reporting problems in each EQ-5D-5L domain.

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- Herdman, M., Gudex, C., Lloyd, A., Janssen, M. F., Kind, P., Parkin, D., Badi, X. (2011). Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). *Quality of Life Research*, 20(10), 1727-1736. <https://doi.org/10.1007/s11136-011-9903-x>

Additional cigarette, e-cigarette, and smokeless tobacco uses per day are significantly associated with decreased EQ-5D-5L index.

Exclusive Current Established Tobacco Product Use Groups	Mean Number of Tobacco Products Used per Day* (SD)	Adjusted β (SE) [†]	p-value [†]
Cigarettes	11.4 (13.7)	-0.00095408 (0.00007118)	< 0.0001
E-cigarettes	21.1 (36.6)	-0.00023277 (0.00011421)	0.0416
Smokeless	5.3 (11.5)	-0.00134 (0.00034069)	< 0.0001
Modern Oral	4.6 (7.2)	0.00010990 (0.00267)	0.9672

Table 1. Daily mean product consumption and EQ-5D-5L index scores among exclusive current established tobacco and nicotine product use groups.

*Daily consumption was measured using product-specific units. Cigarette consumption was measured as cigarettes smoked per day, e-cigarette consumption as e-cigarette use occasions per day, smokeless tobacco consumption as times or pouches used per day, and modern oral consumption as pouches, lozenges, tablets, or gums used per day.
[†] β represents the adjusted change in EQ-5D-5L index score per additional product-specific unit used per day. The p-value tests whether β differs from zero.

Mean EQ-5D-5L index scores were generally similar between respondents reporting less than 1 year of use and those reporting 1 year or more within each product-use group.

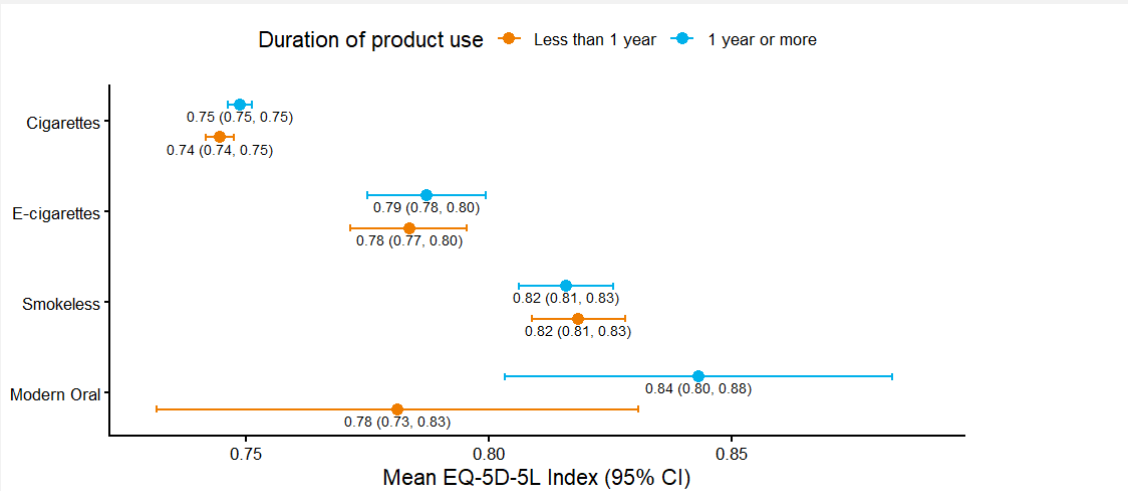


Figure 3. Mean EQ-5D-5L Index scores by duration of exclusive current established product use group.

Conclusion

There are meaningful differences in HRQoL across product-use groups, with exclusive cigarette smokers reporting lower HRQoL. This study places EQ-5D-5L outcomes as complementary measures in tobacco harm reduction research. The findings add to the growing body of evidence supporting tobacco harm reduction by demonstrating a pattern of HRQoL outcomes consistent with the continuum of risk across tobacco and nicotine product categories. However, the cross-sectional design precludes causal inference. Estimates among modern oral users should be interpreted cautiously given the relatively small sample size and associated variability.

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