

InferiorGood-18-290

Behavioral Economic Methods for Assessing Tobacco Product Abuse Liability; Study 7

Statistical Analyses Plan

3/16/2018

Statistical Analysis Plan

The consumption results of the assigned cigarette purchased in the Electronic Tobacco Marketplace will be analyzed using the demand function (Koffarnus, Franck, Stein, & Bickel, 2015):

$$Q = Q_0 * 10^{k(e^{-\alpha Q_0 C} - 1)}$$

Where Q is consumption of the commodity, C is the price, Q_0 is the derived initial consumption without cost constraints (demand intensity), k is the span of the function in logarithmic units, and α is the demand elasticity. Q and C are determined by the data and k is set to a constant determined empirically by the actual data, leaving only Q_0 and α as free parameters to be fitted. Analysis will proceed by fitting the above equation to individual participant data, then comparing demand intensity and elasticity across time (through sessions) and between groups using mixed-effects modeling. A random effect will be included to model repeated measures on participants, and socio-economic and other demographic variables will be statistically screened for inclusion using model-based hypothesis tests.

In order to measure the substitutability of the unassigned cigarette, the consumption results of the unassigned cigarette purchased in the Electronic Tobacco Marketplace will be analyzed using the substitution function (Hursh and Roma, 2008):

$$Q = Q_{alone} * 10^{I * e^{-\beta C}}$$

In this equation, Q_{alone} represents the maximum consumption of the fixed-price commodity (e.g., assigned cigarette) when the primary commodity has a price high enough to drive consumption to zero, β is the sensitivity of fixed-price commodity consumption to the price of the primary commodity, I is an interaction parameter that indicates whether the fixed-price

commodity is a substitute (positive β value), complement (negative β value), or independent (β value near zero) and Q and C represent consumption of the fixed-price commodity and cost of the primary commodity, respectively, and are known from date. This equation has three parameters (Q_{alone} , β , and β) that will be estimated from the experimental data using nonlinear regression. Analyses will proceed with the substitution equation being fit to individual subject data to generate subject-specific estimates of the maximum consumption, interaction, and sensitivity. These values will then be further analyzed to satisfy the goals of each experiment. Similar to the demand for the assigned cigarette, mixed model regression analyses will be used to include demographics and other covariates.