Cigarette Price Elasticity of Demand for Young Adults in the United States: An Application of Panel Quantile Regression Analysis

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THIS WORK IS IN PROGRESS. RESULTS PRESENTED AND DISCUSSED ARE VERY PRELIMINARY AND REPRESENT ONLY THE FIRST STAGE OF OUR ANALYSES AS DESCRIBED IN THE OBJECTIVES.

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1. Introduction

Despite significant decline in smoking rates over the past 50 years (Figure 1, 17% in 2014 [1] compared with 43% in 1964 [2]), progress has stalled over the recent years [2] and the rapid rise of novel tobacco products, such as electronic cigarettes [3], threatens to undo these public health gains. Tobacco products are the leading cause of preventable and premature death in the United States. Smoking alone causes more deaths each year than AIDS/HIV, heroin, cocaine, and alcohol use, motor vehicle injuries, and firearm-related incidents combined [4]. An estimated 480,000 people die annually due to tobacco use and it annually costs the nation over $300 billion in direct medical costs and lost productivity [2, 5]. Cigarette smoking in US is the predominant cause of lung cancer [2, 5] and is also associated with other forms of cancers, as well as illnesses such as emphysema, cardiovascular diseases, and chronic bronchitis [6], and results in numerous acute and chronic emergency department visits as well as hospital admissions.

Sin taxes are major policy tools that have been used by the national and state governments to regulate industries, generate revenues, and reduce consumption of targeted products. In the United States, the federal excise tax on cigarettes has increased from 24 cents per pack in 1995 to $1.01 per pack in 2009, and the average state excise tax increased from 32.7 cents per pack to $1.20 per pack during the same period [7] currently ranging between $0.15 in Missouri to $4.35 in New York [8]. Such large contrast between state tax rates is primarily driven by the political and economic debate surrounding the tax increase. More specifically, those opposing tax increase argue that increased cigarette taxes decrease funding for state programs that rely on state cigarette taxes [9]. They also believe that cigarette taxes are regressive in nature and unfairly target poor since majority of smokers are low income [10]. On the other hand, those in support of increased cigarette taxes argue that because low income individuals are more responsive to price changes, higher taxes are likely to reduce cigarette consumption among low income smokers at a higher rate relative to higher income smokers and reduce health disparities associated with smoking [7].

Research suggests that heavy smokers may be less likely to reduce smoking as a response to higher prices (or taxes) due to nicotine addiction that is induced by heavy smoking [11]. However, the economic theory suggests heavy smokers and low income individuals to be more price sensitive since they spend higher portion of their income on cigarettes. Increasing prices of cigarettes through taxes has been shown to discourage smoking initiation among youth and young adults, prompt quit attempts, and reduce cigarette consumption and smoking-related death and disease [12-15].

The **motivation for this study** comes from multiple perspectives. *First*, smoking starts and is established primarily during adolescence; about 90% of initiation starts by age 18 and 99% by age 26. Over 3,800 young people under 18 years of age smoke their first cigarette every day and over 1,000 become daily smokers; the vast majority of these young Americans will become addicted to nicotine by young adulthood [16]. *Second*, smoking is also associated with alcohol and drug use (CITE) and other risky behaviors (CITE), which in turn increases risks of traffic fatalities and violent crimes [17-19]. *Third*, smoking and associated behaviors (e.g. alcohol consumption) may affect academic performance of these young individuals [20, 21]. *Finally*, previous individual-level analyses rely on standard econometric techniques that focus on average consumer behavior, thus overlooking the differential effects of taxes on the consumption behavior along the entire

distribution. To fill this gap, in addition to the standard econometric techniques, we employ a quantile regression framework, which estimates cigarette demand elasticities across different consumption levels.

The **objective of this study** is estimate the differential effects of higher cigarette prices and tobacco-control policies, such as taxes and smoke-free laws, on cigarette demand among youth and young adults in United States. To address this research question, we apply multiple modeling approaches to the data derived from the 1997-2013 National Longitudinal Survey of Youth (NLSY97) and tobacco-control policy data. More specifically, in the *first stage* analyze the cigarette demand for youth and young adults in the US by applying a pooled and panel quantile regression approach to the data from the NLSY97. In the *second stage*, we will merge data from NLSY97 with state and local level tobacco-control policy data to estimate cigarette price elasticity of demand for youth and young adults in the United States using similar pooled and panel quantile regression analysis.

In this study, we employ a panel quantile regression framework to estimate the demand for cigarettes among youth and young adults in the United States. Quantile regressions allow us to evaluate the income and demand elasticities across different consumption levels. This is in contrast to the previous literature where elasticity evaluation relies on the conditional mean effects of price, income and other determinants of cigarette demand. This latter approach does not recognize the heterogeneity across different consumption levels that may be a result of vast differences in terms of consumer income and preferences. Therefore, elasticity estimates that are obtained via standard econometric models will likely result in erroneous policy advices and biased forecasts of future demand for cigarettes.

This study makes multiple contributions to the literature. **First**, we use novel individual-level data to study the price elasticity of cigarette consumption among youth and young adults. These data constitute nationally representative longitudinal data, which have not been used in this context previously. **Second**, we exploit the longitudinal nature of the data to shed light on cigarette consumption along the entire distribution. Our previous findings show that estimation of elasticities across different consumption levels (quintiles), which is a more accurate representation of tobacco consumption patterns, should be an integral part of research endeavors. Our approach accounts for inherent differences in cigarette consumption among different users and has the promise of leading to more informed policies.

This paper is structured as follows. Section 2 provides an outline of study methodology. This is followed by a description of the data used in this study in Section 3 and presentation of results in Section 4. We conclude the study in Section 5.

2. Methods

Cigarette consumption model is specified as:

$$C_{ist} = f\left(Pc_{st}, TC_{st}, Z_s, X_{ist}, y_t\right) \quad (1)$$

where, C_{ist} represents cigarette consumption of an individual (i) living in state (s) at time (t), which is a function of cigarette prices (Pc_{st}), tobacco control policies (TC_{st}), state fixed effects (e.g.

unemployment, population of youth and young adults), individual and geographical characteristics (X_{ist}), and year fixed effects (y_t).

Two-part model with pooled quantile regression

To estimate the price elasticity of cigarette consumption among youth and young adults, a two part model is estimated. In the first part, individual decision to smoke or not is modeled based on a logistic regression model presented below:

$$D_{ist} = \beta_0 + \beta_1 \log\left(Pc_{ist}\right) + \beta_2 TC_{st} + \beta_3 Z_s + \beta_4 X_{ist} + \beta_5 y_t + \varepsilon_{ist} \qquad (2)$$

where D_{ist} is a binary variable indicating whether a person has reported smoking cigarettes in the past 30 days.

In the second part, monthly cigarette consumption is estimated via the OLS for the individuals who have reported having smoked during the past 30 days:

$$\log\left(C_{ist}\right) = \beta_0 + \beta_1 \log\left(Pc_{ist}\right) + \beta_2 TC_{st} + \beta_3 Z_s + \beta_4 X_{ist} + \beta_5 y_t + \varepsilon_{ist} \qquad (3)$$

Equation (3) estimates the conditional mean of the distribution. To obtain price elasticities at different consumption quantiles, we employ the pooled quantile regression model:

$$\log\left(C_{ist}\right) = \beta_0 + \beta_{1\tau} \log\left(Pc_{ist}\right) + \beta_{2\tau} TC_{st} + \beta_{3\tau} Z_s + \beta_{4\tau} X_{ist} + \beta_{5\tau} y_t + \varepsilon_{\tau ist} \qquad (4)$$

where the coefficient of interest $\beta_{1\tau}$ represents the price elasticity of tobacco demand for the τ^{th} conditional quantile.

Quantile regression for panel data

Equation (4) ignores unobserved consumer heterogeneity, which may include family's attitude towards smoking, personality type, etc. Therefore, we next adopt the method of the penalized quantile regression estimator for panel data offered by Koenker (2004), and further generalized by Lamarche (2010). The respective estimates are obtained via the minimization of the following objective function:

$$\sum_{j=1}^{J}\sum_{t=1}^{T}\sum_{i=1}^{N} \omega_j \rho_{\tau j}\left(y_{ist} - \delta\left(\tau_j\right)\log\left(Pc_{ist}\right) - x_{ist}^{'}\beta\left(\tau_j\right) - \alpha_i\right) + \lambda\sum_{i=1}^{N}\rho_{0.5}\left(\alpha_i\right) \qquad (5)$$

where $\rho_{\tau_j} = u\left(\tau_j - I\left(u \le 0\right)\right)$ is the quantile loss function, ω_j is a relative weight given to the *jth* quantile, α_i is individual fixed-effect, and λ is a tuning parameter. This proposed model estimates $\delta\left(\tau_j\right)$, $\beta\left(\tau_j\right)$, and α_i for the *J* quantiles in a simultaneous fashion. See Koenker (2004) and Lamarche (2010) for more details on modelling and estimation.

3. Data

Data on cigarette consumption, individual characteristics, health outcomes, and consumption of alcohol and drugs come from the **National Longitudinal Survey of Youth 1997** Cohort (NLSY97), which consists of a nationally representative sample of approximately 9,000 youths born between 1980 and 1984. At the time of Round 1 survey in 1997, respondents' ages ranged from 12 to 18 and the individuals continue to be interviewed on an annual basis. The respondents

were 28 to 34 at the time of their round 16 interviews (fielded in 2013-2014). At Round 1, 8,984 individuals were interviewed and almost 80 percent (7,141) of them were interviewed in round 16. Table 1 shows the descriptive statistics of dependent and independent variables used in our analyses.

Dependent variable in this study is represented by two measures. The first measures whether or not respondent has smoked in the 30 days prior to the interview and the second one measures the total cigarette consumption per month. Each year NLSY97 asks respondents if they have smoked cigarettes in the past 30 days prior to the survey. Subsequently, if the responded indicates having smoked in the past 30 days, they are regarded as current smokers and asked about how many cigarettes they usually smoke each day during those past 30 days. We calculate monthly cigarette consumption by multiplying number of days smoked in the past 30 days and the usual number of cigarettes smoked per day. In our sample, over 32% indicated having smoked cigarettes during the past 30 days and in average they have smoked 238 (sd=268) cigarettes per month (Table 1).

Independent variables for this study are derived from NLSY97 questionnaires that measure socio-economic and demographic characteristics of the respondents, their household composition, household income, use of alcohol and drugs. In our sample, male (51%) and female (49%) respondents were almost evenly represented with an average age of 22 years. Majority of respondents (52%) were white, 26% were black, and 21% were Hispanic. Average household size of the respondents was 3.7 and almost half (43%) resided in households with over $50,000 income.

We use *parental education* attainment, a proxy for family socioeconomic status (SES). Education attainment of both parents was almost equally distributed across educational attainment categories with fathers having slightly higher likelihood of having attained at least college degree. We use *family risk* to measure risk associated with lack of material resources, the characteristics of the neighborhood, and the home environment that have been shown to predict multiple adolescent and youth behaviors such as drug abuse, teen pregnancy, and delinquency [22-24]. In our sample, almost everyone was from low risk family. We have also included an indicator to capture respondents' intention towards weight loss. Past research has shown that youth and young adults may use smoking as a coping mechanism for possible weight gain. A large number of respondents have reported that they were trying to lose weight (41%).

We are also controlling for drinking and drug use since research shows that smoking may be associated with alcohol consumption and drug use. We are using the number of days in the past 30 days respondent has indicated having consumed one or more drinks to measure their alcohol use (mean=3.7, sd=5.9) as well as the number of days in the past 30 days they have consumed five or more drinks per day (mean=1.3, sd=3.4). We are also using the number of days in the last 30 days the respondent have reported having used marijuana (mean=1.8, sd=6.2) as a proxy for their drug use behavior.

4. Empirical Results

Results from two-part and pooled quantile regression

We start our analyses with a two-part model to determine participants' smoking behavior. We first estimate a linear probability model of one's decision to smoke per eq. 2. Then, we estimate the second part of the model that describes respondents' smoking behavior conditional on the respondent being a current smoker. For this, we estimate eq. 3 using OLS. Results of the two-part model are presented in Tables 2 and 3. More specifically, Table 2 reports results of the linear probability model and Table 3 reports results from pooled OLS. Coefficient estimates are highly consistent across different model specifications, which is an indication of robustness of our results. Furthermore, signs on statistically significant variables are according to our expectations. For example, increase in income is associated with declining intentions to smoke as well as the quantity of smoking. These results are consistent with evidence that smokers are primarily characterized with lower socio-economic status (SES).

We have also found positive and significant associations between being a current smoker and alcohol and marijuana consumption (Table 2). However, results were mixed in the smoking quantity models (Table 3). For example, smoking quantity was negatively correlated with not-heavy drinking but was positively correlated with heavy drinking (5 and more drinks per day) and marijuana use.

Results also show that smoking intention likelihood and quantity are increasing with age however at a declining rate. Additionally, age dummy to control for respondents turning 18 years of age, which is the legal age in almost all states for purchasing tobacco products, is positively associated with smoking intention (Table 2). This indicates that as respondents turn 18 years of age they become legally eligible to purchase cigarettes and also this is the age that many of them will move away from home, and hence, increasing the possibility of engaging in 'sin' behaviors. Results also indicate that those 18 years of age and older consumed lower quantities of cigarettes (Table 3). A potential explanation can be the fact that as they turn 18 and move away from home, their disposable income shrinks as they are now responsible for additional expenses (e.g. housing) that was not available before. Hence, less resources are available for other purchases, including cigarettes. Additionally, in recent years more and more universities and colleges are becoming tobacco-free or smoke-free. Therefore, individuals who choose to pursue higher education in institutions with such policies are likely to significantly reduce their smoking. Furthermore, the ever-increasing awareness and negative image of smoking and smokers are also likely contributors of lower quantities of cigarette consumption among young adults.

Estimates in eq. 3 (Table 3) focus on the conditional mean, which, as described earlier, does not recognize the heterogeneity across different consumption levels and is likely to result in erroneous policy advices and biased forecasts of future demand for cigarettes. Hence, to yield more accurate estimates (i.e. estimate elasticities across different consumption levels), we are estimating eq. 4 by using pooled quantile regression. Results are presented in Table 4. We can clearly see significant differences in estimates across quantiles. For example, one of the main variables of interest, household income, changes significantly across quantiles and indicates that smokers at the higher

quantiles (i.e. heavy smokers) are facing smaller income elasticity compared to 'light' smokers in the lower quantiles. We also observe varying estimates of age variables across quantiles.

Results from Quantile regression for panel data

Tables 4-6 present results from the regression models for the panel data. Tables 4 and 5 are estimated for various sets of fixed effects controlling for the respondent id, year,-fixed 75^{th} effects, gender, and race). Results in Tables 4 and 5 indicate that income is not associated with smoking intention or quantity. Results, similar to pooled regression results, show that smoking likelihood and quantity are increasing with age, however, at a declining rate.

Quantile regression results for panel data (Table 6) report significant associate between income and cigarette consumption only for the smokers at the 75^{th} quantile. Smokers in this quantile are characterized with high levels of smoking, therefore, despite earlier findings indicating that income is negatively associated with smoking, we hypothesize that smokers in this quantile are also becoming (or are) nicotine dependent, therefore, we see a positive association.

Higher levels of education are negatively associated with smoking decisions across all models specifications and estimation approaches and indicate that through schooling these individuals are exposed to multiple health promotion and antismoking information and knowledge, which nudges them towards a healthier behavior.

5. Conclusions and Discussion

Given the significant health and financial burden associated with tobacco in the United States and worldwide, a considerable research has been devoted to understanding economic and behavioral determinants of smoking. In the past, individual-level studies have relied on standard econometric techniques that focus on average consumer behavior, thus overlooking the differential effects on the consumption behavior along the entire distribution. This study extended existing literature and fills this gap by adopting a more accurate estimation technique, a quantile regression framework, which estimates cigarette demand elasticities across different consumption levels. Furthermore, we have used a rich nationally representative panel data on youth and young adult smoking and other health behaviors, which, to our knowledge, has not yet been utilized to such extent.

Finally, this study is a work in progress. We are working on incorporating environmental and policy measures into our models to account for tobacco-control policies and prices. Once complete, our results will inform policymakers of the differential effects of higher cigarette prices and tobacco-control policies, such as taxes and smoke-free laws, on cigarette demand among youth and young adults in United States.

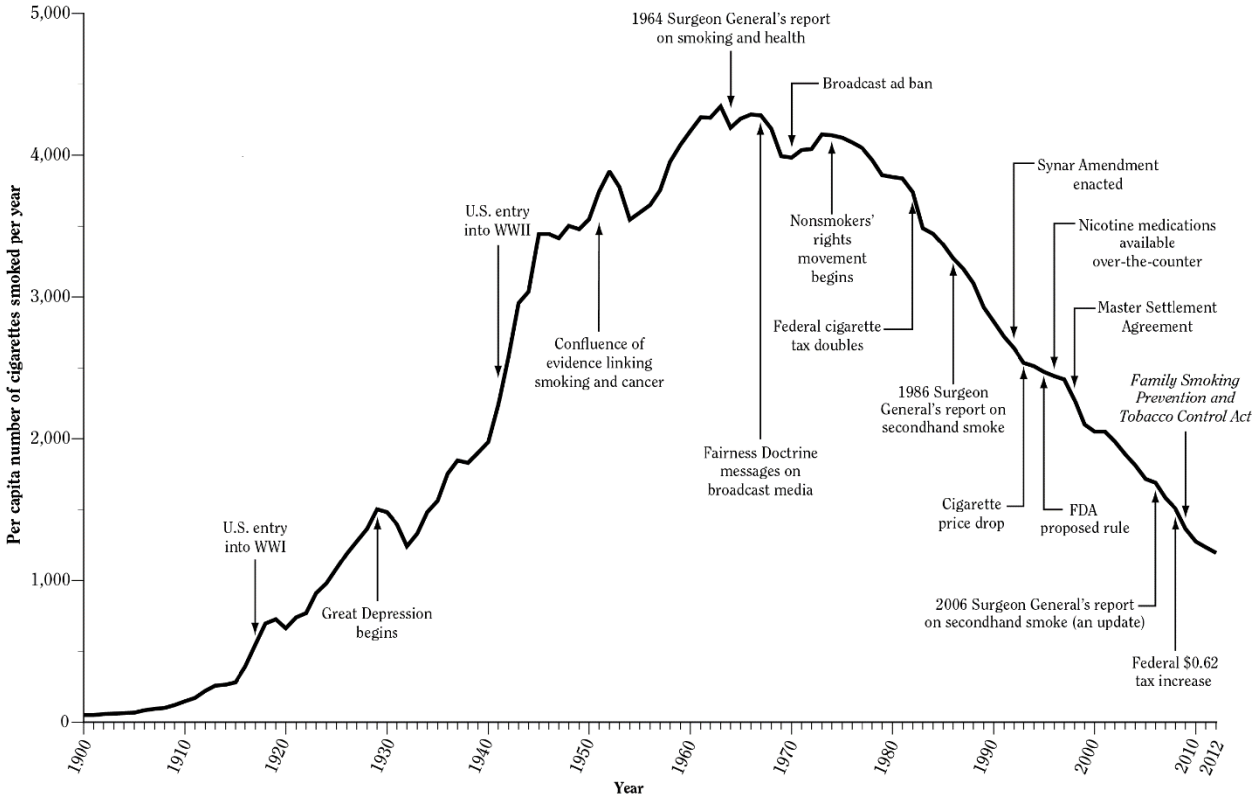

Figure 1. Annual adult per capita cigarette consumption and major smoking and health events in United States, 1900-2012

Source: U.S. Department of Health and Human Services (2014) [2]

Table 1. Summary Statistics

Variable	Mean	Std. Dev.	CV
Dependent variable			
Current smoker status (*yes/no*)	0.326	0.469	1.437
Cigarettes per month	238.499	268.364	1.125
Independent variables			
Household income			
< $7,500	0.111	0.314	2.831
$ 7,500 - 24,999	0.201	0.401	1.991
$ 25,000 - 29,999	0.055	0.227	4.157
$ 30,000 - 49,999	0.202	0.401	1.990
$ 50,000 and over	0.431	0.495	1.148
Education			
No education	0.339	0.474	1.395
GED or high school	0.512	0.500	0.977
Some college	0.036	0.185	5.212
College graduate & more	0.113	0.317	2.796
Marital status			
Not married	0.770	0.421	0.546
Married	0.194	0.395	2.039
Separated, widowed, divorced	0.036	0.186	5.169
Black	0.260	0.439	1.687
Hispanic	0.212	0.408	1.930
Mixed race	0.009	0.096	10.356
White	0.519	0.500	0.962
Male	0.512	0.500	0.976
Female	0.488	0.500	1.024
Household size	3.659	1.736	0.474
Age	22.199	5.001	0.225
Age (over 18)	0.792	0.406	0.513
Days drinking per month	3.662	5.965	1.629
Days drinking 5+ per month	1.335	3.411	2.554
Days smoked marijuana per month	1.818	6.223	3.423
Family risk			
Low risk	0.994	0.075	0.075
High risk	0.006	0.075	13.257
Father's education			
No education	0.121	0.327	2.689
GED or high school	0.419	0.493	1.178
Some college	0.215	0.411	1.908
College graduate & more	0.244	0.430	1.759
Mother's education			
No education	0.115	0.319	2.773
GED or high school	0.470	0.499	1.063
Some college	0.236	0.424	1.801
College graduate & more	0.180	0.384	2.137
Weight loss intention			
Lose weight	0.414	0.493	1.189
Gain weight	0.143	0.350	2.446
Stay the same	0.230	0.421	1.832
Doing nothing	0.213	0.409	1.922

Note: CV represents the coefficient of variation.

Table 2. Results from pooled regression, limited probability model

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Income (log)	-0.011	-0.017	-0.017	-0.015	-0.013	-0.013
	(7.31)**	(11.04)**	(11.06)**	(7.40)**	(5.02)**	(4.75)**
Education (ref. no education)						
GED or high school	-0.185	-0.189	-0.180	-0.180	-0.190	-0.194
	(35.38)**	(35.91)**	(34.57)**	(24.76)**	(17.74)**	(17.92)**
Some college	-0.308	-0.311	-0.294	-0.328	-0.342	-0.349
	(33.84)**	(33.01)**	(31.64)**	(25.22)**	(20.37)**	(20.62)**
College graduate & more	-0.402	-0.412	-0.390	-0.388	-0.380	-0.382
	(57.71)**	(57.73)**	(55.24)**	(38.92)**	(27.67)**	(27.63)**
Married (ref.=not married)	-0.102	-0.070	-0.058	-0.041	-0.036	-0.038
	(23.76)**	(15.68)**	(13.30)**	(6.45)**	(4.64)**	(4.83)**
Separated, widowed, divorced	0.063	0.077	0.089	0.070	0.055	0.057
	(7.02)**	(7.99)**	(9.26)**	(4.82)**	(2.85)**	(2.90)**
Race (ref. Black) Hispanic	0.017	0.000	0.006	-0.001	-0.021	-0.017
	(3.42)**	(0.03)	(1.27)	(0.21)	(1.98)*	(1.62)
Mixed race	0.158	0.118	0.119	0.147	0.084	0.090
	(9.16)**	(6.74)**	(6.89)**	(5.78)**	(2.45)*	(2.62)**
White	0.175	0.138	0.139	0.116	0.104	0.108
	(41.91)**	(32.30)**	(33.06)**	(19.67)**	(12.32)**	(12.62)**
Age	0.086	0.068	0.073	0.063	0.070	0.072
	(14.96)**	(9.18)**	(10.10)**	(4.91)**	(4.37)**	(4.42)**
Age^2	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(13.60)**	(7.92)**	(8.70)**	(4.81)**	(4.01)**	(4.08)**
Age (over 18)	0.093	0.075	0.072	-0.014	-0.029	-0.027
	(7.28)**	(5.91)**	(5.77)**	(0.66)	(0.98)	(0.92)
Female (ref. male)	-0.049	-0.008	-0.000	-0.009	-0.009	-0.009
	(14.83)**	(2.30)*	(0.04)	(1.96)	(1.50)	(1.42)
Household size	-0.006	-0.001	-0.000	-0.000	-0.003	-0.004
	(5.35)**	(1.35)	(0.46)	(0.10)	(1.74)	(1.82)
Year	-0.007	-0.006	-0.007	0.002	-0.004	-0.003
	(5.75)**	(4.77)**	(5.99)**	(0.72)	(1.10)	(1.00)
Days drinking per month		0.014	0.012	0.013	0.011	0.011
		(38.20)**	(33.75)**	(24.30)**	(17.55)**	(17.43)**
Days drinking 5+ drinks		0.013	0.011	0.011	0.012	0.012
		(21.27)**	(17.72)**	(12.46)**	(11.36)**	(11.39)**
Days smoked marijuana/mos.			0.012	0.012	0.014	0.013
			(45.48)**	(33.98)**	(29.61)**	(29.40)**
Family risk				-0.006	-0.168	-0.162
				(0.21)	(3.63)**	(3.47)**
Father's education (ref. no educ) GED or high school					0.015	0.014
					(1.36)	(1.26)
Some college					0.008	0.005
					(0.66)	(0.43)
College graduate and more					-0.049	-0.052
					(3.65)**	(3.89)**
Father's education (ref. no educ) GED or high school					0.015	0.013
					(1.30)	(1.12)
Some college					0.011	0.011
					(0.87)	(0.87)
College graduate and more					0.011	0.009
					(0.79)	(0.65)
Weight loss intention (ref. Lose weight)						0.011
Gain weight						(1.10)
Stay the same						-0.028
						(3.69)**
Doing nothing						0.013
						(1.66)
Intercept	12.942	11.107	13.730	-4.032	6.881	6.208
	(5.57)**	(4.68)**	(5.87)**	(0.78)	(1.07)	(0.96)
R^2	0.08	0.15	0.17	0.18	0.19	0.19
N	78,189	71,071	70,988	35,106	22,007	21,807

* p<0.05; ** p<0.01

Table 3. Results from pooled regression, OLS

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Income (*log*)	-0.035	-0.037	-0.037	-0.033	-0.040	-0.034
	(3.40)**	(3.55)**	(3.64)**	(2.29)*	(2.08)*	(1.72)
Education (ref. no education)	-0.580	-0.583	-0.575	-0.661	-0.559	-0.572
	(19.22)**	(19.11)**	(18.96)**	(15.48)**	(8.64)**	(8.81)**
GED or high school	-1.055	-1.054	-1.026	-1.213	-0.807	-0.829
	(15.46)**	(15.33)**	(15.00)**	(11.85)**	(5.95)**	(6.06)**
Some college	-2.062	-2.047	-2.015	-2.214	-1.869	-1.837
	(40.22)**	(39.40)**	(38.96)**	(29.74)**	(18.50)**	(18.14)**
Married (ref.=not married)	0.034	0.057	0.090	0.175	0.133	0.116
	(1.06)	(1.76)	(2.81)**	(3.68)**	(2.14)*	(1.87)
Separated, widowed, divorced	0.253	0.273	0.306	0.442	0.404	0.401
	(4.57)**	(4.87)**	(5.50)**	(5.00)**	(3.25)**	(3.20)**
Race (ref. Black) Hispanic	-0.644	-0.669	-0.640	-0.555	-0.512	-0.504
	(17.39)**	(17.83)**	(17.14)**	(10.29)**	(5.99)**	(5.83)**
Mixed race	0.445	0.422	0.425	0.774	1.167	1.172
	(4.00)**	(3.77)**	(3.82)**	(4.97)**	(4.92)**	(4.94)**
White	0.673	0.639	0.653	0.740	0.765	0.728
	(22.35)**	(20.90)**	(21.44)**	(17.41)**	(11.68)**	(10.95)**
Age	0.297	0.309	0.344	0.315	0.278	0.246
	(6.04)**	(6.23)**	(6.97)**	(3.52)**	(2.33)*	(2.06)*
Age^2	-0.005	-0.005	-0.005	-0.005	-0.004	-0.004
	(4.68)**	(4.91)**	(5.54)**	(2.72)**	(1.76)	(1.54)
Age (over 18)	0.017	-0.002	0.003	-0.355	-0.486	-0.456
	(0.21)	(0.02)	(0.04)	(2.67)**	(2.57)*	(2.42)*
Female (ref. male)	-0.096	-0.071	-0.039	-0.050	-0.163	-0.118
	(4.23)**	(3.06)**	(1.68)	(1.52)	(3.65)**	(2.51)*
Household size	0.005	0.005	0.007	0.012	0.014	0.017
	(0.63)	(0.64)	(0.94)	(1.12)	(0.97)	(1.17)
Year	-0.016	-0.014	-0.019	-0.007	-0.013	-0.008
	(2.04)*	(1.76)	(2.45)*	(0.40)	(0.54)	(0.32)
Days drinking per month		-0.010	-0.013	-0.013	-0.010	-0.009
		(4.90)**	(6.31)**	(4.18)**	(2.42)*	(2.30)*
Days drinking 5+ drinks		0.030	0.027	0.023	0.019	0.021
		(9.31)**	(8.30)**	(5.15)**	(3.27)**	(3.50)**
Days smoked marijuana/mos.			0.022	0.022	0.025	0.025
			(17.06)**	(12.56)**	(10.92)**	(10.71)**
1.familyrisk_d				0.290	-0.184	-0.261
				(1.45)	(0.51)	(0.73)
Father's education (ref. no educ) GED or High school					0.239	0.230
					(2.91)**	(2.80)**
Some college					-0.003	0.006
					(0.04)	(0.06)
College graduate and more					-0.494	-0.507
					(4.98)**	(5.11)**
Father's education (ref. no educ) GED or High school					0.170	0.163
					(1.95)	(1.87)
Some college					0.056	0.047
					(0.59)	(0.50)
College graduate and more					-0.185	-0.219
					(1.77)	(2.09)*
Weight loss intention (ref. Lose weight)						0.095
Gain weight						(1.32)
Stay the same						0.096
						(1.67)
Doing nothing						0.385
						(6.86)**
Intercept	33.285	28.821	39.233	15.419	27.435	17.074
	(2.13)*	(1.83)	(2.50)*	(0.43)	(0.58)	(0.36)
R^2	0.12	0.13	0.14	0.15	0.18	0.18
N	24,996	24,656	24,613	11,923	7,164	7,115

* p<0.05; ** p<0.01

Table 4. Results from pooled regression, Quantile regression

Variable	10th quantile	25th quantile	50th quantile	75th quantile	90th quantile
Income (log)	-0.068	-0.082	-0.011	-0.007	-0.000
	(2.15)*	(3.81)**	(0.99)	(0.82)	(0.00)
Education (ref. no education)					
GED or high school	-1.255	-0.892	-0.421	-0.176	-0.095
	(13.53)**	(14.05)**	(13.42)**	(7.16)**	(4.80)**
Some college	-1.914	-1.760	-0.822	-0.505	-0.095
	(9.12)**	(12.26)**	(11.57)**	(9.08)**	(2.12)*
College graduate and more	-2.914	-3.364	-2.174	-1.087	-0.383
	(18.48)**	(31.19)**	(40.74)**	(25.98)**	(11.36)**
Marital Status (ref. not married)					
Married	-0.030	0.058	0.034	0.045	-0.000
	(0.30)	(0.86)	(1.02)	(1.73)	(0.00)
Separated, widowed, divorced	0.559	0.352	0.132	0.052	-0.000
	(3.28)**	(3.02)**	(2.29)*	(1.15)	(0.00)
Race (ref. Black)					
Hispanic	-0.888	-1.164	-0.779	-0.221	-0.095
	(7.80)**	(14.93)**	(20.20)**	(7.31)**	(3.91)**
Mixed race	0.374	0.775	0.418	0.233	-0.000
	(1.09)	(3.31)**	(3.61)**	(2.57)*	(0.00)
White	0.501	1.032	0.811	0.636	0.288
	(5.41)**	(16.29)**	(25.86)**	(25.87)**	(14.51)**
Age	0.620	0.604	0.283	0.092	-0.000
	(4.10)**	(5.84)**	(5.53)**	(2.29)*	(0.00)
Age^2	-0.011	-0.010	-0.005	-0.001	0.000
	(3.54)**	(4.90)**	(4.39)**	(1.74)	(0.00)
Age (over 18)	0.159	-0.070	-0.061	0.007	0.095
	(0.61)	(0.40)	(0.70)	(0.11)	(1.72)
Female (ref. male)	0.014	-0.095	-0.142	-0.188	0.000
	(0.21)	(1.99)*	(6.04)**	(10.21)**	(0.00)
Household size	0.039	0.002	-0.010	-0.007	-0.000
	(1.77)	(0.10)	(1.39)	(1.13)	(0.00)
Year	0.005	-0.008	-0.021	-0.004	0.000
	(0.22)	(0.50)	(2.53)*	(0.61)	(0.00)
Intercept	-16.211	13.411	43.185	12.494	6.109
	(0.34)	(0.41)	(2.65)**	(0.98)	(0.59)
N	24,996	24,996	24,996	24,996	24,996

* $p<0.05$; ** $p<0.01$

Table 5. Results from panel regression, limited probability model

Variable	Model 1	Model 2	Model 3	Model 4
Income (log)	0.001	0.001	0.001	0.001
Education (ref. no education)				
	(0.65)	(0.57)	(0.57)	(0.57)
GED or high school	0.006	-0.001	-0.001	-0.001
	(0.89)	(0.19)	(0.19)	(0.19)
Some college	-0.013	-0.022	-0.022	-0.022
	(1.24)	(2.01)*	(2.01)*	(2.01)*
College graduate & more	-0.013	-0.021	-0.021	-0.021
	(1.40)	(2.28)*	(2.28)*	(2.28)*
Marital status (ref. not married)				
Married	-0.059	-0.059	-0.059	-0.059
	(13.59)**	(13.67)**	(13.67)**	(13.67)**
Separated, widowed, divorced	0.015	0.016	0.016	0.016
	(1.74)	(1.85)	(1.85)	(1.85)
Age	0.041	0.026	0.026	0.026
	(10.89)**	(3.55)**	(3.55)**	(3.55)**
Age^2	-0.001	-0.001	-0.001	-0.001
	(12.25)**	(6.64)**	(6.64)**	(6.64)**
Age (over 18)	0.058	0.014	0.014	0.014
	(6.24)**	(1.09)	(1.09)	(1.09)
Household size	0.000	0.000	0.000	0.000
	(0.01)	(0.18)	(0.18)	(0.18)
R^2	0.65	0.65	0.65	0.65
N	77,949	77,949	77,949	77,949

* $p<0.05$; ** $p<0.01$

Table 6. Results from panel regression, Fixed effects model

Variable	Model 1	Model 2	Model 3	Model 4
Income (log)	0.004	0.004	0.004	0.004
	(0.46)	(0.50)	(0.50)	(0.50)
Education (ref. no education)				
GED or high school	0.029	0.017	0.017	0.017
	(0.70)	(0.39)	(0.39)	(0.39)
Some college	0.020	-0.000	-0.000	-0.000
	(0.26)	(0.00)	(0.00)	(0.00)
College graduate and more	-0.289	-0.304	-0.304	-0.304
	(4.62)**	(4.82)**	(4.82)**	(4.82)**
Marital status (ref. not married)				
Married	-0.193	-0.197	-0.197	-0.197
	(6.09)**	(6.20)**	(6.20)**	(6.20)**
Separated, widowed, divorced	0.040	0.040	0.040	0.040
	(0.75)	(0.74)	(0.74)	(0.74)
Age	0.267	0.274	0.274	0.274
	(8.26)**	(5.13)**	(5.13)**	(5.13)**
Age^2	-0.005	-0.006	-0.006	-0.006
	(8.01)**	(6.82)**	(6.82)**	(6.82)**
Age (over 18)	0.150	0.091	0.091	0.091
	(2.56)*	(1.22)	(1.22)	(1.22)
Household size	0.002	0.002	0.002	0.002
	(0.25)	(0.34)	(0.34)	(0.34)
R^2	0.71	0.71	0.71	0.71
N	24,118	24,118	24,118	24,118

* $p<0.05$; ** $p<0.01$

Table 7. Results from panel regression, Quantile regression

Variable	10th quantile	25th quantile	50th quantile	75th quantile	90th quantile
Income (log)	-0.003	0.017	0.009	0.019**	0.000
Education (ref. no education)					
educ_r2	-0.044	-0.229	-0.050	-0.057	0.000
educ_r3	-0.408	-0.442*	-0.098	-0.125	0.000
educ_r4	-0.584**	-0.814***	-0.272**	-0.295***	0.046
Marital status (ref. not married)					
marital_r2	-0.020	0.038	0.026	0.042	0.000
marital_r3	0.155	0.196	0.230***	0.091	0.020
Age	0.106	0.123	0.095	0.044	0.078***
Age^2	-0.009*	-0.006	0.000	0.000	0.000
Age (over 18)	1.257***	0.889*	0.324	0.246	0.003
Household size	-0.001	-0.015	-0.007	-0.013*	0.000

*p<.1; ** p<.05; *** p<.01

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