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Smoking Status and Subjective Well-Being

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Abstract:

Background/aims: A debate is currently underway about the FDA's methods for evaluating anti-tobacco regulation. In particular, the US government requires a cost-benefit analysis for significant new regulations, which has led the FDA to consider potential lost subjective well-being (SWB) of ex-smokers as a cost of any proposed anti-tobacco policy. This practice, which significantly limits regulatory capacity, is premised on the assumption that there is in fact a loss in SWB among ex-smokers.

Methods: We analyze the relationship between SWB and smoking status using a longitudinal internet survey of over 5000 Dutch adults across five years. We control for socio-economic, demographic and health characteristics, and in a contribution to the literature we additionally control for two potential confounding personality characteristics, habitual use of external substances and sensitivity to stress. In another contribution, we estimate panel fixed effects models that additionally control for unobservable time-invariant characteristics.

Results: We find strong suggestive evidence that ex-smokers do not suffer a net loss in SWB. We also find no evidence that the change in SWB of those who quit smoking under stricter tobacco control policies is different from those who quit under a more relaxed regulatory environment. Furthermore, our cross-sectional estimates suggest that the increase in SWB from quitting smoking is not only statistically significant but also of a meaningful magnitude.

Conclusion: In sum, we find no empirical support for the proposition that ex-smokers suffer lower net subjective well-being compared to when they were smoking.

Key words: smoking status, cessation, subjective well-being
Word count: 3983

What This Study Adds

What is known:

- Many smokers fear their subjective well-being will fall if they quit smoking.
- The FDA's regulatory impact analysis *assumes* a fall in subjective well-being from policy-induced smoking cessation and proposes discounting the calculated benefits from tobacco control policies accordingly.

What important gaps in knowledge exist:

- Existing theory cannot unambiguously predict whether subjective well-being will rise or fall with smoking cessation.
- Empirical studies of the welfare effects of tobacco control policies yield mixed results. A limited literature that focuses on changes in individual subjective well-being associated with smoking status generally provides suggestive evidence that well-being increases after cessation, but these studies have been methodologically limited by the potential existence of unobservable confounding personality characteristics and reverse causality.

What this study adds:

- In an advance over previous studies, we control for many more socio-economic, demographic and health-related factors, and also for two potential confounding underlying personality characteristics, a tendency towards habitual use of external substances and a sensitivity to stress.
- This paper is also the first study in this literature to estimate panel data fixed effects models to control for time-invariant unobservable characteristics.
- This study includes robustness checks to further demonstrate that the results are unlikely to be driven by unobservable omitted variables.
- This study tests for heterogeneous effects by analyzing whether subjective well-being differs between those who quit during more relaxed tobacco control regimes and those who quit when tobacco control pressure was growing.

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Contributorship Statement: DW cleaned and merged publicly available survey data (different LISS modules) to create the master dataset. DW planned the study and conducted the statistical analysis. DW wrote up the paper and is the co-author responsible for the overall content.
FJC contributed to the analysis of FDA policy and theories of addiction. FJC provided valuable critical feedback on the structure of the analysis, the literature review, and theoretical discussion.

1. INTRODUCTION

The Family Smoking Prevention and Tobacco Control Act of 2009 gives the FDA regulatory authority over tobacco products, while Executive Order 12866 requires federal agencies to assess the costs and benefits of "significant regulatory actions." Recently, the latter requirement has been translated by the FDA into a proposal to discount by 70 percent the calculated benefits of its regulations that reduce tobacco to offset the fall in life satisfaction, or 'subjective well-being' (SWB), that smokers are expected to experience from quitting. Indeed, it is a common belief among smokers that quitting smoking will reduce their overall SWB, harming their ability to socialize and deal with stress[1]. However the FDA's proposal has alarmed a number of academics and policy makers, who point out that the proposed methods for measuring lost SWB among ex-smokers "threatens the F.D.A.'s ability to take strong actions against tobacco." (Chaloupka, as quoted in Tavernise[2]).

There is a growing body of scholarship on the determinants of SWB (other terms include 'life satisfaction' and/or 'happiness'; for a good survey see Di Tella and MacCulloch[3]), but competing theories provide contrasting predictions on whether changes in smoking status will increase or decrease SWB (e.g. Becker and Murphy[4], Gruber and Koszegi[5,6], Gul and Pesendorfer[7],Bernheim and Rangel[8], and Gruber and Mullainathan[9]). Furthermore, it is possible that the relationship between smoking status and SWB could be different for smokers who quit during periods with less regulatory pressure, and those who quit during periods with greater anti-tobacco pressure. For example, quitting smoking might lead to a lower increase (or decrease) in SWB for smokers who resist quitting until stronger anti-tobacco measures are enforced. Note that existing theory does not unambiguously predict which direction

this effect would go either; those that find it more difficult to quit could more highly value stronger tobacco restrictions and thus could thus enjoy larger increases in SWB after quitting.

As existing theory is inconclusive, whether quitting smoking increases or decreases SWB remains an empirical question. One approach, which has yielded mixed results, has been to test the welfare effects of tobacco control measures by exploiting the staggered nature of such policies across time and space to generate a source of exogenous variation (e.g. Gruber and Mullainathan[9], Brodeur[10], Leicester and Levell[11], Hinks and Katsaros[12], and Odermatt and Stutzer[13]).

Other studies have directly examined differences in SWB in individuals with different smoking status (for any reason) and have generally found that smokers enjoy lower levels of SWB than either ex-smokers or never-smokers, although these studies have faced challenges of limited data and endogenous confounding factors. For example, Piper *et al.*[1] study the SWB of quitters and smokers enrolled in a smoking cessation trial, finding overall SWB falls less for quitters than for continuing smokers. Shahab and West[14] analyze SWB data from a cross section of ex-smokers in the UK, finding that a large majority report feeling greater SWB after quitting. In a larger follow-up study using the same survey controlling for age, sex, social grade, and location, Shahab and West[15] find that ex-smokers enjoy higher levels of SWB than continuing smokers and report similar levels of SWB as never-smokers. However they also find that recent quitters report similar levels of SWB as current smokers, suggesting some transition costs in the short run. Similarly, Wang *et al.*[16] report from random telephone surveys conducted in Hong Kong that ex-smokers

report higher SWB than both current smokers and never-smokers (whose SWB levels are similar), but that current smokers who have never tried to quit have greater SWB than those that have tried and failed. Moore[17] analyzes a sample of 724 smokers over 11 years and finds decreases in SWB among those who increase their daily smoking frequency, even after controlling for self-reported health status. Finally, Stickly *et al*.[18] analyze a large cross-sectional survey of adults from across the former Soviet Union and find that ex-smokers enjoy significantly higher SWB than current smokers.

This study contributes to the literature by exploiting a high-quality longitudinal survey that allows us to address potential problems of omitted variables and reverse causality that have affected previous direct studies of smoking status and SWB. In particular we control not only for a wider range of socio-economic, demographic, and health-related characteristics, but also for two potential underlying confounding personality characteristics that have been omitted from the previous literature: a tendency towards habitual use of external substances and a sensitivity to stress. As we observe respondents over time we are further able to estimate panel models with fixed effects that control for all time invariant individual characteristics. Finally, the richness of the dataset allows us to run further robustness exercises to mitigate the likelihood of endogenous selection driving the results.

2. DATA AND METHOD

We analyze data that spans five years (2008-2012) from the Longitudinal Internet Studies for the Social Sciences (LISS) panel administered by CentERdata (Tilburg University, Netherlands). The LISS is an ongoing internet-based longitudinal survey of over 8000 individuals using a true probability sample drawn from the Dutch

population registers by Statistics Netherlands. Recruitment was by repeated contact via phone and/or in person, resulting in an enrollment rate of 48% of the total initial sample, including households with no pre-existing internet connection. Scherpenzeel[19] finds the LISS sample compares favorably to high-standard traditional surveys, with the exception that the LISS slightly underweights the elderly and those without internet connections – two subpopulations that significantly overlap (see Scherpenzeel[19] or www.lissdata.nl).

The LISS is an ongoing survey with multiple waves of question 'modules' sent to participants throughout the year. Respondents may only participate in a subset of modules and years, so we have an unbalanced panel. The primary modules used for this analysis were the Health module (for smoking and health information), collected in November and December, and the Personality and Income modules (for SWB information), collected in May-June and June-July, respectively. This temporal separation of the Health, Personality and Income modules has the significant advantage that respondents will not be primed by smoking and health questions to respond positively or negatively on the SWB questions. However it may also introduce some measurement error for one year for some respondents in the time series.

Specifically, the Health module of the LISS asks respondents "Have you ever smoked?" and "Do you smoke now?", thus we observe current smokers (*Smokenow*), ex-smokers (*Quitsmoke*), who are those who have smoked but do not smoke currently, and never-smokers. We do not observe how much ex-smokers used to smoke. Our measure of SWB is the average across responses (on a scale from 0 to 10)

to two questions from the Personality module; "On the whole, how happy would you say you are?" and "How satisfied are you with the life you lead at the moment?", and one question from the Income module, "Can you indicate, on a scale from 0 to 10, to what degree you consider yourself happy?". Not all respondents answered all three questions, but the results reported are robust to using different combinations of the SWB responses and the composite variable (Cronbach's alpha = 0.91) maximizes sample size. In addition, in the Personality module respondents were asked to rank, from 1 to 7 (lowest to highest) "How do you feel at the moment?" We use this variable, *Snapshot*, to test whether the short-run impact on SWB might be distinct from longer run effects. Respondents were also asked about SWB in other areas, such as their personal lives, financial situation, and career and we use these variables in a robustness exercise as explained below. In addition, in a novel contribution to this literature, we include two variables intended to measure underlying potentially confounding personality characteristics that may be correlated with both SWB and smoking status, including drinking habit (*Drink>=1*), indicating if they regularly consume one or more alcoholic drinks a day, and an index of sensitivity (*Stress Index*, Cronbach's alpha = 0.76), constructed as the average from respondents' ranking from 1 (very inaccurate) to 5 (very accurate) of whether they (a) `Get stressed out easily'; (b) `Am easily disturbed'; and (c) `Get irritated easily'.

Following the literature on SWB we additionally control for a number of socio-economic and demographic characteristics, including sex, age, age-squared, marital status, education, employment status, household size, household income, number of children, whether the respondent lives in an urban neighborhood, and whether there is a problem with crime in the neighborhood. Given that a number of studies have found

that ex-smokers have improved health-related quality of life (e.g. Shields *et al.*[20]) we additionally control in some specifications for self-reported levels of health of the respondent (varying from health is rated 'poor' to health is rated 'excellent'). We include all respondents born before 1990 (i.e. over 17 in 2007 when the survey started) ending up with a total sample size of 5227. Table 1 in the Tables appendix includes definitions and summary statistics. The average SWB of current smokers (7.23) is lower than that for ex-smokers (overall average 7.53), but as illustrated in Table 1 these two groups differ across multiple dimensions; current smokers on average are older, in worse health, less educated, and more likely to be unemployed. These differences highlight the importance of controlling for as wide a range of socio-economic and demographic variables as possible in the analysis to control for possible confounding variables.

2.1 Cross-Sectional Estimation

Initially we model the average SWB of individual *i* as a function of their smoking status and a set of socio-economic, demographic, and health related control variables. We take the overall average value of each variable over time for each individual. Thus our basic estimating equation is:

(1) $$SWB_i = \gamma + \beta_1 quitsmoke_i + \beta_2 smokenow_i + \sum_q \beta_q X_{qi} + \tau_i$$

where γ is the intercept term, X_{qi} corresponds to control variable q for individual i, β_q is the corresponding coefficient of X_{qi} and τ_i is the error term. The primary coefficients of interest are β_1 and β_2, which correspond to the average differences in SWB between never-smokers and ex-smokers (*quitsmoke*), and never-smokers and current smokers (*smokenow*), respectively.

There are several potential sources of bias in our estimates of β_1 and β_2: first, if there are unobservable characteristics that are correlated with both smoking status and SWB, this will create an omitted variable bias. The most likely candidate is some kind of underlying tendency towards habitual reliance on external substances, which could lead both to smoking and to lower SWB via other habitual behaviors. To capture this characteristic, at least to some extent, we control for daily drinking (*Drink>=1*). An analysis of pairwise correlation between *daily drinking* and smoking status confirms that the variable captures a common tendency of those who have smoked; the correlation between daily drinkers and both current smokers and ex-smokers is positive and highly statistically significant, with correlation coefficients of 0.107 and 0.132, respectively ($p<0.001$ for both). On the other hand, the correlation between daily drinkers and never-smokers is negative and significant, with a correlation coefficient of -0.223 ($p<0.001$). As a robustness test we also include our control for susceptibility to stress (*Stress Index*) in some regressions; as we discuss below, sensitivity to stress could either be an underlying common characteristic of ever-smokers, or it could represent a *mechanism* through which smoking is related to SWB (e.g. Piper *et al.*[1]).

Second, it is possible that the effect on SWB for those who resist quitting until regulatory restrictions increase is different from those who quit under a more lenient regime. The Dutch extended a smoking ban to bars and restaurants in 2008, implying that respondents who quit before the LISS survey started did so under less regulatory pressure, while 'new' quitters (*Newquit*) who were smokers at least through 2007 felt more tobacco control pressure. Thus we also test whether there is any indication that the smoking status-SWB relationship is changing over time as tobacco control

measures get progressively more aggressive. A test of whether the coefficient on '*Newquit*' is different from that on '*Quitsmoke*' can also be interpreted as a test of whether the benchmark results are sensitive to the choice of binary or continuous value coding of *Quitsmoke* for those who quit during the sample.

Finally, if lower (or higher) SWB leads to smoking (or quitting) then the estimates will be biased by reverse causality. While we cannot rule out this possibility completely, to mitigate the likelihood of this form of endogeneity we run some robustness checks to test whether smoking status is related to measures of SWB in realms of life that could plausibly be correlated with secular differences in overall SWB , and where we either would or would not expect a relationship with smoking. These robustness exercises could thus be thought of as a type of placebo test; if we observe a correlation between smoking and SWB in a realm of life where it is unexpected, we might suspect an unobserved factor driving the results.

2.3 Fixed-Effects Panel Data Estimation

As we observe individuals over time (though not all respondents answered in all years), we can also examine the change in reported net SWB of individuals as they transition between smoking and quitting by estimating a panel regression which includes individual intercepts ('fixed effects'). Thus our second estimating equation takes the form:

(2) $SWB_{it} = \gamma + \beta_1 quitsmoke_{it} + \beta_2 smokenow_{it} + \sum_q \beta_q X_{qit} + \omega_{it}$, where $\omega_{it} = \nu_i + \varepsilon_{it}$. The use of fixed effects (ν_i) implies we compare the change in SWB *of the same individual* as they transition from smoking to non-smoking status. Thus if

individuals who manage to quit smoking are intrinsically different from those who find it more difficult, or if lower SWB itself led to smoking, this difference will not present a confounding factor for the results. Nevertheless there are still several caveats to keep in mind. First, as only a small proportion of the sample change smoking status during the survey period, the effective sample size is much smaller. Second, while we control for time-varying drinking habits and time-varying sensitivity to stress, we cannot entirely exclude the possibility of other unobservable time-varying confounding factors (uncorrelated with our controls) creating an endogeneity bias. Finally, as the health modules and personality modules were not administered simultaneously, respondents who quit between July and November will be misclassified for that year (but will be correctly classified both before and after the transition year).

3. RESULTS

3.1 Differences between average individual SWB (cross-sectional results)

The results from the cross-sectional regressions are presented in Tables 2 and 3 in the Tables appendix. Column (1) in table 2 is the benchmark SWB regression; consistent with other studies the control variables display the expected sign and most are statistically significant. Notably, Q*uitsmoke* is not statistically significant, however, indicating that ex-smokers enjoy equal level of SWB as never-smokers, while *Smokenow* is negative and statistically significant, suggesting that current smokers are less satisfied than never-smokers. The F-test of whether *Quitsmoke=Smokenow* rejects this hypothesis with $p<0.01$. Thus we conclude that the population of smokers who have quit are no less satisfied with their life than non-smokers, and considerably more satisfied then current smokers.

In Table 2 column (2) we additionally control for *Stress Index*, which, as expected, is negative and significantly related to SWB. A sensitivity to stress could potentially represent an omitted variable in regression (1) if it were an underlying characteristic that predisposed some to smoke (or be less able to quit) and also lowered SWB. However self-reported sensitivity could also capture a *mechanism* through which smoking and SWB are linked, for example if smoking made people less subject to stress (e.g. Piper *et al*.[1]). In column (2) we observe the inclusion of *Stress Index* makes *Smokenow* even more negative and significant, suggesting the former interpretation may be more accurate.

Many studies have found that quitting smoking improves health, so perhaps quitting increases SWB as a result of health improvements, but still reduces SWB as a result of other consequences of quitting smoking (such as via reduced ability to deal with stress), with the two effects essentially cancelling each other out. Thus in Table 2 regression (3) we omit *Stress Index* but control for self-reported health status, from 'poor' (*health1*) to 'excellent' (*health5*) and find *Quitsmoke* is positive and highly statistically significant, while *Smokenow* is not statistically different from zero. These results indicate that, on average, for given levels of health ex-smokers are happier than both current smokers and non-smokers (although the F-test for *Quitsmoke=Smokenow* is significant only at 15%). This also suggests that the lower SWB of current smokers observed in regression (1) could largely be due to the reduced health effects of smoking.

In Table 2 column (4) we control for both health status and *Stress Index* and note that

the latter variable's inclusion has very little effect on the magnitude of the coefficients on *Quitsmoke* and *Smokenow*. This is important, as it suggests that, after controlling for health indicators, *Stress Index* (and, notably, any other potential omitted unobservable characteristics correlated with it) is not very correlated with smoking status. In addition the coefficients on *Quitsmoke* and *Smokenow* are now highly statistically significantly different from each other ($p<0.01$). The results from Table 2 regressions (1) and (3) are also interesting from the perspective that it is difficult to see how they could be generated by reverse causality, where lower SWB caused smoking. Specifically, the negative coefficient on *Smokenow* in regression (1) loses statistical significance (and even switches signs) once health is controlled for, strongly suggesting that the lower observed SWB of smokers is due to worse health, not endogeneity bias. Moreover, the coefficients on *Quitsmoke* are positive in comparison to the control group of permanent non-smokers; this result would not be expected if (exogenously) lower SWB drove smoking (or reduced ability to quit) unless the lower SWB simultaneously resolved (and even improved) when they did quit.

The Dutch extended a smoking ban to bars and restaurants in 2008, so in Table 2 regression (5) we test the hypothesis that the relationship between smoking status and SWB may differ conditional on the strength of the regulatory regime, with a stronger or weaker response for smokers who quit during periods of lower tobacco control pressure (prior to the LISS survey), compared to those that quit under increasing tobacco control pressure during the LISS survey (*Newquit*). However we find no evidence of this type of heterogeneous response; there is no statistically significant difference in the SWB of respondents who quit post-2007 and those who quit before

the survey started.

Nevertheless, we may still be concerned that the results are being at least partially driven by some underlying unobserved characteristic (uncorrelated with *Drink>1* and *Stress Index*) that affects both SWB and smoking habits. We can check for this phenomenon to some extent in a type of placebo test by looking at SWB in other realms of life that might be expected to be affected by underlying secular differences in overall life-satisfaction. Thus in Table 3, columns (1), (2) and (3) we estimate the effects of smoking on reported SWB in three specific realms of life: the respondent's personal life, financial situation, and career progression, respectively. In column (1) we find that ex-smokers are significantly happier in their personal lives than never-smokers, and also statistically significantly happier than current smokers. Regression (2) suggests current smokers are statistically significantly less satisfied than either never-smokers or ex-smokers (who are equally satisfied) with their finances. Table 3 column (3) confirms that there are no statistically significant differences between groups in their satisfaction with career progression; this result is reassuring, as we would not expect there to be given that we are controlling for hours and household income. Thus the results in Table 3 confirm that we find effects of quitting smoking on SWB in those dimensions of life where we expect them, and not where we don't (the results are robust to the exclusion of *Stress Index*, not reported).

Finally, the analysis presented in Tables 2 and 3 also allows us to compare the SWB effects of quitting smoking with those from other significant life events. For example, the increase in overall SWB (Table 2) from quitting smoking is just under a fourth of that enjoyed by being married. Alternatively, the increase in personal SWB (Table 3)

among quitters roughly corresponds to the increased satisfaction experienced by residents of highly urban neighborhoods. Overall, the evidence suggests that the cross-sectional difference in SWB between smokers, never-smokers, and ex-smokers is not only statistically significant but also quite substantial, with the latter enjoying non-trivially higher levels of SWB.

3.2 Change in SWB within individuals over time (panel fixed effects results)

As our data is longitudinal in nature we can also examine the change over time in SWB for respondents who quit smoking. We include both individual fixed effects that control for unobservable time-invariant characteristics, as well as time-varying observables. In Table 4 column (1) we find no statistically significant difference associated with quitting, a result that remains robust when we additionally control for (time-varying) *Stress Index* in column (2) and (time-varying) health in column (3). In column (4) we model (short-run) *immediate* well-being (*Snapshot*), but still soundly reject (p=0.409) any differences in smoking status. Finally, in Table 4 column (5) we investigate the determinants of time-varying susceptibility towards stress (*Stress Index*) and find no evidence that quitting smoking increases sensitivity to stress; in fact the only control with any explanatory power is exposure to a crime in the neighbourhood.

These fixed effects panel analyses are derived from limited data and are subject to measurement error, so we interpret the results with caution. Notably, however, overall we find no evidence that quitting smoking *reduces* net SWB.

4. DISCUSSION

In this paper we contribute to the growing literature on SWB and smoking status by analyzing self-reported data from a large, high quality longitudinal survey with several advantages. First, we control for a wider range of socio-economic, demographic, and health variables that includes two potentially confounding personality characteristics omitted from previous studies: a tendency towards habitual external dependence (i.e. daily drinking) and a sensitivity to stress. Second, as the SWB questions were administered independently from smoking questions, potential priming biases are eliminated. Third, we examine the shorter term effects of quitting in the time series using individual fixed effects that control for unobservable individual time-invariant characteristics. Finally, additional robustness tests suggest our results are not likely due to reverse causality or other omitted variables.

We present strong suggestive evidence that ex-smokers do not suffer a net loss of SWB. Furthermore, our cross-sectional estimates suggest that the increase in SWB from quitting smoking is not only statistically significant but also of a meaningful magnitude. These results should provide confidence and some comfort to those smokers who would like to quit but fear the psychological consequences. The findings also have important implications for the approach the FDA is using to assess the costs and benefits of its regulatory actions on tobacco products. Specifically, our analysis suggests that the FDA's current approach of offsetting benefits from tobacco control measures based on an assumption of overall lost SWB of ex-smokers is not supported by the data. Nor do we find evidence that the increase in SWB for those who quit smoking under stricter tobacco control policies is less than for those who quit under a more relaxed regulatory environment.

While our results are robust to numerous controls and auxiliary tests, this is still an observational study and we cannot entirely rule out the possibility of selection based on unobservable characteristics not correlated with our socio-economic, demographic, health, or psychometric controls. Future research on smoking status and SWB that exploits a plausibly exogenous shock to individual tobacco access would be helpful for addressing this shortcoming. Observational studies may be more feasible, however, and our analysis suggests that future surveys should collect both health and psychometric data in addition to as wide a range as possible of socio-economic variables. Finally, comprehensive surveys that follow individuals over a longer time period would be extremely useful for identifying the within-individual effects of quitting smoking, both the short and longer term as well as across different types of smokers.

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Tables

Table 1: Variable names, definitions and summary statistics

		Never Smoked		**Quit before 2008**		**New Quit (Quit after 2008)**		**Smoke Now**	
	Continuous Variables								
Variable	Definition	Obs..	Mean (S.D.)	Obs.	Mean (S.D.)	Obs.	Mean (S.D.)	Obs.	Mean (S.D.)
SWB (composite)	Overall subjective well-being, 0-10	1,817	7.49 (1.04)	1,628	7.57 (1.04)	900	7.45 (1.11)	882	7.23 (1.24)
Snapshot	Immediate subjective well-being, 1-7	1,804	5.63 (0.84)	1,625	5.72 (0.87)	900	5.59 (0.85)	877	5.55 (0.97)
Personal SWB	Satisfaction with Personal life (0-10)	1,800	7.89 (1.47)	1,620	8.12 (1.44)	899	7.99 (1.44)	873	7.68 (1.73)
Financial SWB	Satisfaction with financial life (0-10)	1,663	6.76 (1.60)	1,495	7.00 (1.47)	872	6.61 (1.64)	803	6.24 (1.81)
Career SWB	Satisfaction with career situation (0-10)	1,463	7.28 (1.40)	1,089	7.37 (1.41)	678	7.20 (1.45)	686	7.06 (1.70)
Stress Index (composite)	Sensitivity to stress (1-5)	1,803	2.63 (0.73)	1,625	2.60 (0.70)	900	2.66 (0.73)	877	2.55 (0.75)
Age	Age of respondent	1,817	44 (14.2)	1,628	55 (13.1)	900	48 (15.3)	882	48 (12.8)
hh_size	Size of household	1,817	2.77 (1.38)	1,628	2.42 (1.15)	900	2.49 (1.21)	882	2.27 (1.21)
hh_numkids	Number of children in the household	1,817	1.04 (1.17)	1,628	0.64 (0.98)	900	0.79 (1.00)	882	0.65 (0.95)
hh_income	Monthly household income (€)	1,817	3030 (4054)	1,628	3040 (2356)	900	3289 (9901)	882	2665 (3429)
hours	Weekly hours worked	1,817	31 (13.3)	1,628	33 (12.7)	900	31 (12.7)	882	33 (13.0)
Dichotomous Variables (value=1 if average over time >0.5, Obs = 5227)									
Variable	Definition	Percent		Percent		Percent		Percent	
drinks≥1	Daily drinker	7.2%		27.2%		16.7%		26.2%	
male	Gender is male	44.7%		55.7%		51.3%		54.9%	
educ1	Not high school graduate	0.4%		0.8%		0.4%		1.1%	
educ2	Graduated high school	10.5%		7.7%		8.7%		9.0%	
educ3	Grad vocational college	54.4%		48.0%		52.6%		46.6%	
educ4	Graduated university	13.4%		9.8%		7.8%		6.2%	
married	married	57.3%		69.0%		53.9%		46.0%	
unemployed	unemployed	2.0%		1.5%		1.9%		4.8%	
housewife	housewife	12.3%		10.3%		11.8%		10.1%	
student	student	5.1%		0.1%		3.7%		1.7%	
retired	retired	11.0%		29.3%		17.9%		12.4%	
health1	Health rated 'poor'	0.6%		1.5%		0.8%		1.0%	
health2	Health rated 'moderate'	10.0%		16.2%		14.9%		18.6%	
health3	Health rated 'good'	64.8%		67.3%		68.7%		72.1%	
health4	Health rated 'very good'	25.3%		20.1%		17.3%		12.6%	
health5	Health is rated 'excellent'	6.7%		3.6%		3.8%		3.1%	
religion	Member of organized religion	42.0%		40.2%		38.0%		29.6%	
crime	Neighbourhood has a problem with crime	8.3%		8.5%		7.7%		9.2%	
urban	Neighbourhood ‘very urban’ or ‘quite urban’	40.6%		39.1%		41.1%		44.1%	
rural	Neighbourhood is ‘rural’	14.5%		14.7%		15.6%		14.1%	

Table 2: Smoking status and Overal Subjective Well-Being (cross-sectional regression on sample averages)

	(1) SWB	(2) SWB	(3) SWB	(4) SWB	(5) SWB
Quitsmoke	0.025	0.046	0.082**	0.087**	0.086**
	(0.032)	(0.031)	(0.029)	(0.029)	(0.030)
Smokenow	-0.103*	-0.140**	0.023	-0.026	-0.026
	(0.047)	(0.045)	(0.044)	(0.043)	(0.043)
Newquit					0.007
					(0.046)
Drinks≥1	-0.073	-0.018	-0.116**	-0.069	-0.069
	(0.046)	(0.044)	(0.043)	(0.042)	(0.042)
Stress Index		-0.501***		-0.363***	-0.363***
		(0.022)		(0.020)	(0.021)
health1			-2.079***	-1.949***	-1.948***
			(0.342)	(0.319)	(0.319)
health2			-0.904***	-0.758***	-0.759***
			(0.064)	(0.061)	(0.061)
health4			0.548***	0.429***	0.429***
			(0.040)	(0.039)	(0.039)
health5			1.033***	0.858***	0.859***
			(0.069)	(0.068)	(0.068)
age	-0.021*	-0.030***	-0.014	-0.022**	-0.022**
	(0.009)	(0.008)	(0.008)	(0.007)	(0.007)
age^2	0.000	0.000**	0.000*	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
male	-0.045	-0.161***	-0.089**	-0.165***	-0.166***
	(0.036)	(0.034)	(0.032)	(0.032)	(0.032)
educ1	-0.010	-0.016	-0.040	-0.031	-0.031
	(0.199)	(0.186)	(0.165)	(0.159)	(0.159)
educ2	-0.046	-0.083	-0.110	-0.122*	-0.122*
	(0.061)	(0.057)	(0.057)	(0.054)	(0.055)
educ3	0.063	0.009	-0.031	-0.054	-0.054
	(0.039)	(0.037)	(0.035)	(0.034)	(0.034)
educ4	0.056	-0.009	-0.052	-0.077	-0.077
	(0.056)	(0.053)	(0.050)	(0.048)	(0.048)
married	0.311***	0.317***	0.288***	0.295***	0.295***
	(0.042)	(0.041)	(0.039)	(0.038)	(0.039)
unemployed	-0.354*	-0.275	-0.272	-0.227	-0.227
	(0.164)	(0.156)	(0.149)	(0.146)	(0.146)
housewife	0.133*	0.180**	0.107	0.146**	0.145*
	(0.064)	(0.059)	(0.059)	(0.056)	(0.057)
student	0.064	0.041	0.044	0.031	0.032
	(0.123)	(0.118)	(0.110)	(0.107)	(0.107)
retired	0.274***	0.267***	0.191**	0.197**	0.197**
	(0.072)	(0.066)	(0.064)	(0.061)	(0.061)
hh_size	0.088	0.098*	0.146**	0.145**	0.145**
	(0.051)	(0.049)	(0.046)	(0.045)	(0.045)
hh_numkids	-0.141**	-0.156**	-0.209***	-0.209***	-0.209***
	(0.054)	(0.052)	(0.048)	(0.047)	(0.047)
ln(hhincome)	0.412***	0.360***	0.277***	0.260***	0.260***
	(0.044)	(0.041)	(0.038)	(0.036)	(0.036)
hours	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
religion	0.025	0.023	0.038	0.034	0.034
	(0.033)	(0.031)	(0.030)	(0.029)	(0.029)
crime	-0.393***	-0.291***	-0.247***	-0.195**	-0.195**
	(0.073)	(0.067)	(0.064)	(0.062)	(0.062)

urban	0.035	0.037	0.030	0.034	0.034
	(0.037)	(0.035)	(0.034)	(0.033)	(0.033)
rural	0.083	0.062	0.050	0.040	0.040
	(0.048)	(0.046)	(0.044)	(0.042)	(0.042)
constant	4.508***	6.603***	5.219***	6.636***	6.634***
	(0.354)	(0.339)	(0.310)	(0.307)	(0.308)
p-value($\beta_1=\beta_2$)	0.004	0.000	0.1510	0.005	0.007
R^2	0.1102	0.2126	0.2631	0.3132	0.3132
N	5227	5,205	5,227	5,205	5,205

Please note: Robust standard errors clustered at the household level in parentheses;
*p<0 .05, **p<0.01 ***p<.001

Table 3: Smoking status and Life Satisfaction in Specific Realms of Life (cross-sectional)

	(1) Personal SWB	(2) Financial SWB	(3) Career SWB
Quitsmoke	0.148***	-0.011	-0.043
	(0.042)	(0.047)	(0.047)
Smokenow	0.020	-0.246***	-0.105
	(0.065)	(0.068)	(0.073)
Drinks≥1	-0.118	-0.018	0.043
	(0.062)	(0.065)	(0.074)
Stress Index	-0.352***	-0.211***	-0.373***
	(0.029)	(0.032)	(0.035)
health1	-0.396	-1.998***	-1.122*
	(0.330)	(0.348)	(0.463)
health2	-0.454***	-0.817***	-0.507***
	(0.087)	(0.093)	(0.110)
health4	0.352***	0.428***	0.248***
	(0.060)	(0.068)	(0.068)
health5	0.610***	0.573***	0.520***
	(0.108)	(0.129)	(0.114)
age	-0.044***	-0.023*	-0.054**
	(0.011)	(0.011)	(0.020)
age^2	0.000***	0.000***	0.001**
	(0.000)	(0.000)	(0.000)
male	-0.184***	0.017	-0.333***
	(0.048)	(0.051)	(0.052)
educ1	0.169	-0.193	-0.163
	(0.245)	(0.313)	(0.260)
educ2	-0.196*	0.190*	-0.194*
	(0.076)	(0.085)	(0.092)
educ3	-0.168***	0.198***	0.008
	(0.049)	(0.053)	(0.062)
educ4	-0.204**	0.292***	-0.172
	(0.071)	(0.085)	(0.090)
married	0.682***	0.196**	0.172**
	(0.058)	(0.062)	(0.064)
unemployed	-0.401*	-1.323***	-1.399***
	(0.201)	(0.214)	(0.316)
housewife	-0.038	0.368***	-0.298*
	(0.077)	(0.095)	(0.132)
student	-0.308	-0.174	-0.464*
	(0.177)	(0.188)	(0.213)
retired	0.158	0.222*	0.363*
	(0.090)	(0.092)	(0.177)
hh_size	0.725***	-0.305***	-0.255**
	(0.069)	(0.074)	(0.079)
hh_numkids	-0.806***	0.140	0.206*
	(0.071)	(0.077)	(0.083)
ln(hhincome)	0.004	1.078***	0.537***
	(0.051)	(0.079)	(0.073)
hours	0.001	-0.002	0.011***
	(0.002)	(0.002)	(0.002)
religion	0.027	0.068	0.095
	(0.043)	(0.046)	(0.050)
crime	-0.323***	-0.447***	-0.151
	(0.097)	(0.103)	(0.106)

urban	0.126**	-0.063	-0.029
	(0.048)	(0.051)	(0.056)
rural	0.022	0.046	0.077
	(0.062)	(0.068)	(0.071)
constant	8.380***	-0.569	5.177***
	(0.443)	(0.595)	(0.646)
p-value($\beta_1=\beta_2$)	0.0306	0.0001	0.3756
R^2	0.2356	0.2985	0.1735
N	5,174	4,813	3,897

Please note: Robust standard errors clustered at the household level in parentheses;
*p<0 .05, **p<0.01 ***p<.001

Table 4: Smoking Status and Life Satisfaction (panel FE regressions)

	(1) SWB	(2) SWB	(3) SWB	(4) Snapshot	(5) Stress index
Quitsmoke	-0.084	-0.133	-0.137	0.054	0.007
	(0.058)	(0.097)	(0.098)	(0.100)	(0.033)
Smokenow	-0.079	-0.129	-0.146	0.130	
	(0.081)	(0.123)	(0.123)	(0.128)	
Drinks≥1	0.014	-0.001	-0.013	-0.101	-0.033
	(0.045)	(0.065)	(0.065)	(0.066)	(0.037)
Stress Index		-0.216***	-0.217***	-0.242***	
		(0.035)	(0.035)	(0.037)	
health1			-0.138	-0.175	0.008
			(0.242)	(0.237)	(0.087)
health2			-0.149*	-0.209**	0.007
			(0.060)	(0.071)	(0.033)
health4			0.009	0.051	-0.023
			(0.044)	(0.048)	(0.027)
health5			0.109	0.114	0.047
			(0.089)	(0.092)	(0.052)
married	0.463**	0.564***	0.556**	0.419*	0.105
	(0.149)	(0.171)	(0.172)	(0.165)	(0.069)
unemployed	0.007	-0.001	0.004	-0.035	-0.035
	(0.108)	(0.157)	(0.156)	(0.141)	(0.062)
housewife	0.028	0.153	0.153	0.173	0.013
	(0.065)	(0.112)	(0.112)	(0.113)	(0.055)
student	0.235	0.215	0.224	0.010	-0.089
	(0.163)	(0.239)	(0.240)	(0.228)	(0.070)
retired	-0.044	-0.118	-0.118	-0.059	-0.077
	(0.064)	(0.100)	(0.100)	(0.105)	(0.051)
hh_size	0.050	0.010	0.014	-0.023	-0.001
	(0.065)	(0.082)	(0.083)	(0.089)	(0.046)
hh_numkids	-0.009	-0.045	-0.053	-0.002	0.026
	(0.055)	(0.078)	(0.078)	(0.097)	(0.050)
ln(hhincome)	0.155*	0.084	0.081	0.049	-0.058
	(0.067)	(0.087)	(0.087)	(0.083)	(0.042)
crime	-0.000	0.099	0.099	0.021	0.076*
	(0.047)	(0.065)	(0.066)	(0.074)	(0.033)
urban	-0.273	-0.399*	-0.404*	-0.073	0.145
	(0.151)	(0.199)	(0.202)	(0.207)	(0.126)
rural	-0.095	-0.084	-0.087	0.012	0.121
	(0.141)	(0.167)	(0.167)	(0.190)	(0.108)
Fixed Effects	Y	Y	Y	Y	Y
p-value($\beta_1=\beta_2$)	0.9277	0.9589	0.9141	0.4087	
R^2	0.0532	0.0939	0.1171	0.1462	0.0014
N	11,316	7,500	7,500	7,525	7,525

Please note: Robust standard errors clustered at the household in parentheses;
*p<0.05, **p<0.01 ***p<.001

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