Urbanity and Obesity, Alcohol Abuse, and Smoking: A cross-sectional study of the Netherlands

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Abstract

Obesity, alcohol abuse, and smoking account for a significant fraction of all health-related problems around the world. Understanding which people are most at risk of consuming too much food, alcohol, and tobacco is valuable information for those attempting to tackle these problems. This paper attempts to estimate the effect urbanity has on the consumption of the three goods. Accordingly, the central research question states: “What is the relationship between urbanity and obesity, alcohol abuse, and smoking rates?”. Studying urbanity is especially relevant to modern society with cities growing ever larger and with an increasingly high percentage of the total population living in highly urban environments. Previous literature often examines differences in consumption of a single good or health problem between urban and rural areas. This research goes further by looking at a range of different goods allowing for comparisons and judgement in terms of consumption in general. This paper examines the relationship between urbanity and consumptive behaviour using both OLS and Logistic regressions looking at obesity, alcohol consumption, and tobacco consumption. The data is comprised of over 6000 respondents in the Netherlands between 2008 and 2018. The results suggest that urbanity does not promote consumption of any form. Urbanity is negatively correlated with obesity, uncorrelated with alcohol consumption and inconclusive regarding tobacco consumption. The main contribution of this paper to the current literature is that urbanity does not a have a unilateral effect on consumptive behaviour.

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1. Introduction

Obesity, alcohol abuse, and smoking rates are becoming increasingly alarming issues in many developing countries around the world. Obesity rates, in specific, are reaching unprecedented levels leading to much concern. As of 2002, problems of adiposity are affecting over 1.7 billion people and around 5% of deaths worldwide can be attributed to weight-related problems (Deitel, 2002). Alcohol consumption, too, is becoming an increasing contributor to worldwide deaths. Approximately 3% of deaths around the world can be attributed to alcohol-abuse (Rehm, 2014). Although smoking rates have decreased since the mid-20th century, deaths related to the consumption of tobacco still amount to 31% and 6% of all deaths, for men and women respectively (Jha, 2009). With the public health consequences being so high, it is important to understand which section of the population is most at risk of consuming these goods. A plethora of factors contribute to obesity, alcohol abuse, and smoking and identifying them all would require a tremendous list. This paper focusses on a single environmental factor that is becoming increasingly relevant: Urbanity. The United Nations (2018) population division estimate that, as of 2018, 55% of the world's population live in urban areas, and that the figure is expected to rise to 68% by 2050. Does the increasingly urban environment of the world accommodate or even promote consumptive behaviour?

The reasons and causes for why people, or societies in general, consume too much food, alcohol, and tobacco are numerous. This paper will attempt to identify whether a relationship exists between the consumption of these three goods and urbanity. This relationship is underexplored in current scientific literature. Research has yet to identify whether urbanity influences consumptive behaviour. Accordingly, the central research question states:

What is the relationship between urbanity and obesity, alcohol abuse, and smoking rates?

Obesity, in this paper, functions as an indicator for excessive food consumption. Several studies and relevant statistics point towards the fact that obesity is on the rise. This is true for many countries around the world. The unquestionable detrimental health effects of obesity promote the need for serious attention to the issue. Diabetes, high blood pressure, and high cholesterol are just a few of the potential consequences of obesity. If obesity rates continue to grow at the current rate, many countries across the (developed) world will soon be facing health crises. These arguments alone support the need to understand why people are getting fatter and which people are at greatest risk.

High levels of alcohol consumption and alcoholism are also major problems that modern society is faced with. The long-term effects of alcohol abuse are also unmistakably costly to the individual, including: disruption of brain development, liver damage and increased risk of several types of cancer.

Alcohol abuse not only has detrimental effects at the individual level, but also at a societal level. Violence and crime are just a subset of the societal problems that alcohol abuse can lead to (Greenfeld, 1998). Understanding disparities in drinking levels between urban and rural areas might help control the growth of the problem.

The prevalence of smokers has decreased over the last 60 years, yet tobacco consumption continues to have serious health problems on societies around the world (Peto et al., 2000). Smoking has many potential negative long-term health consequences. The consumption of tobacco increases the risk of many different types of cancer, with an especially large risk of leading to lung-related problems. Strokes and heart attacks are just a few more of the risks smoking bears with it. Uncovering differences in smoker prevalence between urban and rural areas could be of value to policy makers looking to tackle problems of high tobacco consumption.

Consumption, as a whole, is something economists and health specialists alike seek to understand. A person's surroundings may affect his/her consumption choices. Is there something about the urban (or perhaps the rural) environment which induces individuals to consume more? Before answering this question, the existence of a relationship needs to be determined, which is the aim of this research.

My research focusses on the Netherlands between 2008 and 2018. This research employs survey data on a subset of more than 6000 Dutch citizens to draw potential conclusions regarding the central question.

There are many reasons for why people become overweight. The National Health Service (NHS, 2016) states that the main two reasons for obesity are: poor diet and lack of physical activity. The latter is fairly straight-forward; not moving or exercising enough means you are not using up any of the energy you take in and hence is stored as fat. The poor diet aspect encompasses many more factors. The NHS lists the following important points:

1. Eating large amounts of processed or fast food
2. Eating out a lot
3. Eating larger portions than you need
4. Drinking too many sugary drinks
5. Comfort eating
6. Drinking too much alcohol

These 6 crucial factors all encompass some form of consumption. One of the questions that this paper explores is whether consumption of food differs by level of urbanity. This will be measured primarily by looking at overweight and obesity rates, as they provide a relatively strong indicator of food consumption. Section 2, the literature review, will explore what previous research has found regarding this topic.

People living in urban areas are more exposed to unhealthy and sedentary lifestyles. With supermarkets, fast-food chains, and an abundance of restaurants usually within walking distance you might expect urban residents to be at higher risk of the 6 points listed above. As explored in the next chapter, however, not all previous literature agrees with this statement. In my own research I examine the relationship between food consumption and urbanity with OLS regressions to estimate the effect of urbanity on BMI. I then test the relationship between urbanity and obesity with simple and multiple logistic regressions estimating the effect of urbanity on the probability of being overweight.

Like with food, the availability of alcohol dispensaries seems more abundant in urban areas. Bars, cafés, restaurants, and nightclubs are plentiful in densely populated cities. Supermarkets and liquor stores, too, are always within a close radius. Does this ease of availability also mean that the urban population consumes more alcohol? The existing literature does not paint a clear picture as I discuss in section 2. I perform OLS regressions to estimate the effect of urbanity on average number of alcoholic drinks consumed and simple and multiple Logistic regressions to determine the effect of urbanity on alcoholism.

The socio-economic environment of urban and rural areas might differ enough to cause a substantial difference in smoking prevalence. Again, accessibility of tobacco might differ by levels of urbanity, facilitating or impairing its consumption. Attitudes towards smoking, too, might differ from place to place. Perhaps the denser population of the city puts the individual in higher contact with other smokers, promoting is consumption. Or perhaps having many people around you who do not smoke deters your own consumption. The existing literature, finds that the rural population is more likely to smoke than the urban population. To test this relationship myself I perform OLS regressions to estimate the effect of urbanity on the average number of cigarettes smoked per day. I also perform, as before, simple and multiple Logistic regressions to estimate the effect of urbanity on smoking rates.

I find that urbanity does not affect the different forms of consumption homogenously. Urbanity neither promotes nor demotes consumption in its entirety. I find a negative correlation between urbanity and obesity, no correlation between urbanity and alcohol abuse, and an inconclusive relationship between urbanity and tobacco consumption.

The existing literature fails to provide a complete analysis of disparities in consumption between urban and rural areas. A large majority of the literature focusses on individual health issues, such as obesity or alcohol abuse, in rural and urban areas. My research deviates from the individual health aspects and attempts to provide a broader image of consumption by analysing relationships between urbanity and a set of goods commonly leading to health issues. Most research focussing on urbanity conducted so far focuses on a single phenomenon (Obesity, alcohol abuse, self-perceived health, etc.). I, on the other hand, focus on the consumption of three goods in an attempt to uncover similar trends between the three which might support that urbanity promotes (or demotes) consumption.

The following section presents previous research concerning greenspace, urbanity, and health. I present what other authors have written on relevant subjects and accordingly present a hypothesis. Sections 3 and 4 present an explanation of the data and the methodology I employ in my research, respectively. I then present my results split into three separate sections: Obesity, Alcohol abuse and cigarette consumption. Finally, in section 5 I present a critical conclusion of the gathered results.

2. Literature Review

The topic of urbanity and consumption is an area with lack of specific existing literature. Previous surrounding research primarily focuses on the relations between health and urbanity, and although abundant it is not unifying. A large amount of literature exists on the relations between urbanity and health, and greenspace and health.

In their study on a set of over 250,000 Dutch individuals, Maas, Verheij, Groenewegen, de Vries and Spreeuwenberg (2006) find that self-perceived general health tends to be better in less urban areas. Moreover, their results suggest that a greater percentage of greenspace in people's environment improves perceived health. In their conclusion, the authors state: "Our analyses show that health differences in residents of urban and rural municipalities are to a large extent explained by the amount of green space." (p.591). Hence, to understand the effects of urbanity on health it could be interesting and relevant to consider other existing literature on greenspace and health.

Sugiyama, Leslie, Giles-Corti and Owen (2007) find, based on an Australian sample of almost 2000 survey respondents, that perception of living in a 'green' environment has a positive correlation on both mental and physical health. They do, however, state that the association with mental health is stronger, considering that the effect on physical health can largely be attributed to a positive relation between green environments and recreational walking. In other words, when regressing physical health on greenness a significant positive effect is found. But when adding recreational walking to the regression, greenness loses its significance and walking is found to have a significant positive effect. This is suggestive that people in greener, more rural areas are more physically active and hence have better physical health. Finding a positive relationship between urbanity and obesity rates could then potentially be explained by physical activity levels and not food consumption.

Contrarily, in another paper based on data from the Netherlands, Groenewegen, van den Berg, Maas, Verheij and de Vries (2012) present evidence, based on survey responses from 300,000 Dutch citizens, that suggests that people living in greener areas do not perform significantly more physical activity. Rather, their evidence supports that the positive effect on health of greenness is due to reductions in stress and better social cohesion in green neighbourhoods.

Björk et al. conduct research based on a Swedish public health survey (with around 25,000 respondents) which presents evidence that access to natural environments does in fact promote time spent on physical activities as well as having a positive correlation with neighbourhood satisfaction. From this the authors draw that access to natural environments reduces obesity and stress. In line with this view; Ewing, Schmid, Killingsworth, Zlot, and Raudenbush (2003) find, based on a study of over 200,000 individuals in over 400 US counties, a negative correlation between urban sprawl and physical activity (namely time spent on recreational walking). Sarkar (2017) suggests a similar relationship in his UK-based research (with data on over 300,000 individuals) where he finds that individuals living in 'greener' areas are less at risk of being overweight or obese, claiming that "Any residential green space has an intrinsic activity-promoting potential"(p.8).

The literature seems to unilaterally agree that greenspace has a positive correlation with both physical and mental health, albeit hard to asses as a causal relationship. Mitchell and Popham (2007), based on an English census (of over 32,000 observations) also conclude a positive relationship between greenspace and population health. However, the authors find that the effect is not significant for all levels of urbanity or income. When accounting for urbanity, they only find a significant positive correlation between greenness and health at a moderate level of urbanity. Perhaps then, the effect of greenness is mediated through other factors, including urbanity.

In a third paper, de Vries, Verheij, Groenewegen, and Spreeuwenberg (2003) present self-reported health data for over 10,000 Dutch citizens in which, again, a positive relationship is found between quantity of greenspace and health. When controlling for urbanity, they mention that there is a possibility that greenspace might be an indicator for urbanity, that the effect of greenspace is part of the same mechanism as the effect of urbanity on health. This follows from Verheij's (1995) study which finds that people in highly urban areas are less healthy and at higher risk of both physical and mental illness.

A large majority of the existing literature suggests that quantity of accessible greenspace has a positive relationship with health. By logic, one would expect then that, on average, people living in rural areas are healthier than those living in highly urban areas. Interestingly enough, when focussing specifically on obesity as a measure of health, the majority of existing literature opposes this logic. The existing literature largely agrees that people living in highly urban areas are less at risk of suffering from adiposity than those living in rural areas. Perhaps then, the remaining cause of this paradox is that people living in rural areas are more likely to consume too much food.

Much of the existing literature on the topic (effect of urbanity on obesity) focuses on children and adolescents. The studies differ in their approaches and results:

Þorisdóttir, Kristjansson, Sigufsdottir, and Allegrante (2012) present a geographical approach of the problem. Analysing obesity rates by region and respective levels of urbanity for around 6000 children in Iceland. Presenting frequency counts and using chi-square tests they find that rural children have higher BMIs and suffer from higher overweight and obesity rates than children in urban areas. The analysis does not incorporate regressions of any sort and hence functions only as a geographically descriptive study. I aim to provide a more complete analysis of the relationship by performing statistical regressions. Other existing literature provides some examples of how this can be done.

Biehl, Hovengen, Grøholt, Hjelmesæth, Strand and Meyer (2013) find that children of families living in rural areas have both higher Body Mass Indexes (BMI) and Waist-Cirumferences (WC), two generally accepted measures of obesity. The research, based on around 3000 Norwegian 8 year olds, finds that children living in rural areas are 1.5 times more likely to be overweight or obese compared to their urban counterparts. Lutfiyya, Lipsky, Wisdom-Behounek, and Inpanbutr-Martinkus (2007) also conclude that living in rural areas might bring children at greater risk of obesity than children living in urban areas. The study using a national survey of more than 40,000 US children, aged 5 to 18, finds that rural children are 25% more likely to be overweight or obese than their urban counterparts. The study also predicts the effects of gender, age, hours spent watching TV, non-school hours spent on a computer, physical activity, household income, race and ethnicity. Even when accounting for all these factors, the authors state that the exact reason for why they find rural children to be at higher risk of adiposity is unclear. After finding similar results in a survey of Canadian adolescents, Bruner, Lawson, Pickett, Boyce, and Janssen (2008) state, like Lutiffya et al., their inability to identify factors that fully account for differences in obesity rates among rural and urban children.

A research based on over 3000 Swedish children by Moraeus, Lissner, Yngve, Poortvliet, Al-Ansari, and Sjöberg (2012) finds that the effect of urbanity on child obesity differs by gender. In the sample, urbanity had no significant correlation with obesity for girls. However, for boys, children living in rural and semi-urban areas had a significantly higher rate of being overweight or obese than those living in urban areas. Bahk and Khang (2016) perform a similar study, analysing the effect of urbanity and household income on children and adolescents (aged 10 to 19) by gender. Around 6000 Korean children participated in the study. The results conclude that boys from urban residencies or high-income households are at greater risk of adiposity whereas for girls the risk is greater for rural residencies or low-income households. Hence, higher urbanity correlates with higher obesity rates in boys and lower obesity rates in girls. One explanation they propose for this gender difference is that Korean boys and girls differ in body image perception and the corresponding weight control behaviour. In a similar study of 25,000 adolescents in Ontario, Canada, Ismailov and Leatherdale (2010) find yet other results. Namely, for females higher urbanity correlates with lower risk of being overweight or obese and insignificant relationship for males. Liu, Bennett, Harun, and Probst's (2008) results contradict these findings. From a survey of almost 50,000 US children they find that the risk of being overweight is greater for rural boys than urban boys whereas no distinguishable divergence exists for the girls. Their results "paradoxically" find that rural children are significantly more physically active than urban children. The gender disparity present in the above-mentioned articles supports the need to control for gender when interpreting the relationship between urbanity and obesity. Accordingly, in my research I check to see if I find the same disparities by regularly splitting regressions by gender or by adding gender as a control variable.

The existence of previous research on the relationship between urbanity and obesity amongst adults is far more limited. The existing literature for adults does, however, appear to mirror the conclusions of the literature on children and adolescents. Befort, Nazir and Perri (2012); Jackson, Doescher, Jerant and Hart (2005); and Patterson, Moore, Probst and Shinogle (2004) all conclude that among adults in the US, obesity is negatively correlated with urbanity. In other words, Overweight and obesity rates are more prevalent in rural areas.

Befort et al. use national statistics on around 9000 adults. They present chi-square tests to compare BMI and obesity rates, as well as several other (control) variables across rural and urban areas. They then provide several regressions: a multiple logistic regression controlling for demographic, diet and physical activity; a single logistic model with interaction terms between urbanity and all relevant covariates; and logistic models for each separate covariate.

Jackson et al. use health related data on around 350,000 individuals. The authors analyse the relationship between urbanity and obesity using logistic regressions adjusting for gender, age, race/ethnicity distributions and population of the surrounding area. Each of these variables is also interacted with urbanity.

Patterson et al. use a national health survey on around 32,000 adults to analyse the problem. After presenting basic descriptive statistics, the authors provide two multiple logistic regression models, one with interactions between urbanity and race/ethnicity and another including a list of independent control variables: race, gender, region, age, education, income, physical limitations, health, smoking and physical activity.

The use of socio-economic control variables can be supported by Stamatakis, Wardle and Cole (2010) and Rokholm, Baker and Sørensen (2010). Both articles show that children from lower socio-economic strata are at higher risk of obesity problems. Drenowski and Darmon (2005) also study the relationship between obesity rates and income groups. In their study of the United States, they find that lower income groups have higher obesity rates. The primary cause which they present is the high price of healthy foods. Healthy, nutritious foods tend to be more expensive whereas energy dense, high-sugar, high-fat content foods are cheaper and more accessible to lower income groups. Similarly, Stroehla, Malcoe and Velie (2005) and Liese, Weis, Pluto, Smith and Lawson (2007) find that in rural areas of the US access to healthy food sources are much more limited. Stores or supermarkets offering low cost, healthy foods are sparse whilst the smaller convenience stores, with a smaller availability of healthy alternatives are limited.

To contribute to the, relatively expansive, literature concerning urbanity and obesity I attempt to justify existing relationships through the promotion of consumptive behaviour by the urban (or rural) environment. I use obesity as a measure of food consumption. To do so I perform OLS regressions to estimate the effect of urbanity on BMI and both simple and multiple Logistic regressions to estimate the effect of urbanity and obesity risk. To further research consumption, I also consider alcohol and tobacco consumption and their potential disparities between rural and urban areas.

Previous research finds that alcohol abuse is prevalent among a wide range of people from different cultures, age classes, socio-economic classes and professions. Suddendorf (1989) and Cloninger, Bohman, and Sigvardsson (1981) discuss that biological background as well as social and cultural environment affect the risk of alcoholism amongst individuals. Beckman (1979) finds that both past and present environment affect alcohol abuse. If what these authors have found is accurate and representative, perhaps the environment in terms of urbanity could also have a significant effect on the risk of alcohol abuse.

The existing literature in terms of the effect of urban environment on alcohol consumption and abuse does not all point to the same conclusions. Dixon and Chartier (2016) find that, in the US, urban residents have both a higher percentage of abstinence as well as heavy drinking as compared to the countryside. Donnermeyer (1993) as well as Weisheit and Donnermeyer (2000), however, find no difference between alcohol consumption between urban youth and rural youth, in the US. Their papers provide purely descriptive analyses, without any further use of statistical analysis. Park et al. (1990), on the other hand, perform a multiple logistic regression to estimate the effect of a set of sociodemographic factors on Alcoholic Liver Disease (ALD) and find that heavy alcohol use is more abundant in urban areas of Korea as compared to rural areas. Although they do not analyse differences in alcohol abstinence between urban and rural areas, Park et al.'s findings on heavy alcohol use are in line with Dixon and Chartier's findings.

In my research I go one step further than the previous literature by combining and adapting methodologies. I perform both OLS regressions to test the relationship between urbanity and the quantity of alcoholic drinks and (simple and multiple) Logistic regressions to estimate the effect of urbanity on heavy alcohol use. Doing so allows me to consider both aggregate quantity of alcohol consumed as well as the probability of alcoholism by level of urbanity.

Like with obesity and excessive drinking, there are many factors that influence whether an individual smokes or not. Nizami, Sobani, Raza, Baloch and Khan (2011) find that the main reasons people start smoking are stress and peer pressure. On the other hand, McAlister, Krosnick and Milburn (1984) find that social environment influences the decision to smoke. Perhaps, social environment should also take into account urbanity of residence. Weisheit and Donnermeyer (2000); Plotnikoff, Bercovitz and Loucaides (2004); and Kim, Bahk, Yoon, Yun and Khang (2017) explore whether a disparity exists in smoking prevalence between urban and rural areas. Weisheit and Donnermeyer find that rural youth are more likely to smoke cigarettes than urban youth. Plotnikoff et al., too, find that students from rural areas are more likely to have tried smoking compared to students from urban areas. Kim et al. find that among men smoking prevalence is higher in semi-urban areas than urban and rural areas. Whereas for women, smoking prevalence is lower in rural areas than in semi-urban and urban areas. The last three mentioned papers all examine differences in smoking prevalence between urban and rural areas but do not perform any regressions in an attempt to estimate a statistically significant effect of urbanity on smoking.

To contribute to the existing literature, I attempt to estimate the effect of urbanity on cigarette consumption using statistical regressions. I use OLS regressions to estimate how urbanity effects average daily cigarette consumption and use both simple and multiple Logistic regressions to estimate the effect of urbanity on smoking rates. As with alcohol, employing the different types of regression allow for an analysis of both total tobacco consumption as well as total abstinence.

In my paper, I work with data on a set of adults living in the Netherlands. As presented in this literature review, several studies have been performed on the relationship between greenspace and health in the Netherlands. However, as of now, no existing literature explores the relationship between urbanity and adiposity, alcohol consumption, or cigarette consumption in the Netherlands, specifically. The Netherlands is a small and very densely populated country unlike the majority of countries where similar studies have been performed. This paper will seek to answer whether a small, densely populated country such as the Netherlands exhibits similar results.

Furthermore, my paper will adopt a different statistical methodology to the existing literature. The majority of the statistical analyses in the existing literature on the relationship, specifically between urbanity and adiposity, employ a set of control variables including demographic, socio-economic and behavioural covariates. There is no universally agreed upon set of control variables which should be used when estimating the effect of urbanity on obesity, alcohol consumption, tobacco consumption. Hence, many of the authors who do research in this topic end up using slightly different variables. With the exception of papers which employ no control variables, all of the papers mentioned in the literature review employ a subset of the following control variables: Gender, age, maternal education, parental education, income, employment status, marital status, health insurance status, smoking, race, ethnicity, physical activity, physical limitations, diet, BMI, hours spent watching TV and computers and perception of body weight. With urbanity being the variable of primary interest, I will not select any variables from the list which correlate with both urbanity and any of the dependent variables. I explain which control variables I use more specifically in my Methodology (section 4).

Perhaps most importantly, the literature is not able to conclusively explain why disparities in consumption rates occur at different levels of urbanity. Literature on greenspace suggests that more greenspace leads to better health, yet urban studies primarily show that rural inhabitants are more likely to be obese. Furthermore, some studies conclude that although rural inhabitants are more physically active, they are still more at risk of being overweight. Others yet claim social coherence to be a strong contributing factor, or the availability of healthy food, or the predisposition to exercise more. Like the papers before it, my paper will attempt to identify correlations without being able to pinpoint exact reasons for their (in-)existence.

Based on the existing literature my primary hypothesis is that urbanity does not promote the consumption of food, alcohol, and tobacco equally. The supporting literature suggests that I should find a negative correlation between urbanity and food consumption, a positive correlation between urbanity and alcohol consumption, and a negative correlation between urbanity and tobacco consumption. Although the literature does not universally agree on the hypotheses I make per type of consumption above, I base my predictions on the studies which most resemble my own research techniques.

3. Data and Descriptive Statistics

3.1 Data source

In this paper I make use of data of the LISS (Longitudinal Internet Studies for the Social sciences) panel administered by CentERdata (Tilburg University, The Netherlands). The LISS panel is a representative sample of Dutch individuals who participate in monthly Internet surveys. The panel is based on a true probability sample of households drawn from the population register. Households that could not otherwise participate are provided with a computer and Internet connection. A longitudinal survey is fielded in the panel every year, covering a large variety of domains including work, education, income, housing, time use, political views, values and personality.

Data on height, weight, weekly number of alcoholic drinks, daily cigarettes smoked and level of urbanity of residence is extracted from the survey to pursue the research question. Additional data on miscellaneous individual characteristics are also obtained to be used as control variables.

3.2 Defining Variables

The regressions concerning obesity (food consumption) used in this paper primarily focus on Body Mass Index (BMI) as the dependent variable. The following standard definition of BMI is used:

$$BMI = \frac{weight}{height^2}$$

Where, weight is measured in Kilograms (Kg) and height is measured in metres (m). Individuals can be split up into four different weight categories:

- **Underweight**: BMI < 18.5 kg/m^2
- **Normal-weight**: 18.5 kg/m^2 ≤ BMI < 25 kg/m^2
- **Overweight**: 25 kg/m^2 ≤ BMI < 30 kg/m^2
- **Obese**: BMI ≥ 30 kg/m^2

For the regressions concerning alcohol-abuse, the dependent variable is number of weekly drinks. The survey presents how many glasses of different types of the alcoholic drink each individual drank in the last week, such as: beer, wine, and spirits. Using these values and the common measurement of standard drinks I construct the number of total drinks in the week. Although crude, I take the individuals response of number of drinks in the last week to represent a weekly average.

When defining an 'alcoholic' I use the National Institute on Alcohol Abuse and Alcoholism's definition of a drinker at high risk of developing Alcohol Use Disorder. This means that for women, individuals drinking 7 or more standard alcoholic drinks per week on average are considered 'alcoholics'. Similarly, for men, individuals drinking 14 or more standard alcoholic drinks on a weekly basis are defined as 'alcoholics'.

Finally, for the analyses of smoking, the dependent variable will generally take on the value of average number of cigarettes smoked per day. The respondents of the survey were asked to fill in whether they smoke and, if they do, the average number of cigarettes they smoke on a daily basis.

The primary independent variable of interest in the models presented throughout this paper is urbanity. Urbanity, in the dataset, is defined on a 5-point scale, based on the number of addresses per square kilometre in the surroundings. Where:

- 1 = **Not Urban** (less than 500)
- 2 = **Slightly Urban** (500 to 1000)
- 3 = **Moderately Urban** (1000 to 1500)
- 4 = **Very Urban** (1500 to 2500)
- 5 = **Extremely Urban** (2500 or more)

This paper employs both OLS regressions as well as Logistic regressions. The OLS regressions primarily use BMI, number of alcoholic drinks, and number of cigarettes as the dependent variables whereas the Logistic regressions use overweight, alcoholic, and smoker as the dependent variable. For the Logistic regressions regarding food consumption, overweight takes into account both the '**Overweight**' and '**Obese**' categories as defined above, in other words: all individuals with a BMI higher or equal to 25. The borderline for the definition of an alcoholic for the alcoholic regression is for men 14 or more drinks per week and for women 7 or more drinks per week, as defined by the National Institute on Alcohol Abuse and Alcoholism. Finally, the smoker Logistic regressions will simply define a smoker as someone who, when responding to the survey, indicated he or she was still smoking.

3.3 Sample Selection

The data gathered spans over a 10-year period between February 2008 and February 2018, where respondents are asked to fill in the survey on a monthly basis. Each of the, more than 6000, individuals filled in the survey at least once within the 10-year period. Others filled it in multiple times. This allows use of panel data, but will not be used in this research. The most recent data for each individual is used. All previous observations are thus dropped from the sample effectively transforming the data into cross-sectional data.

Furthermore, the data contains some evident reporting mistakes in height and weight in the survey leading to unrealistic BMI values. To limit the extent of measurement errors, all observations with BMI higher than 60 and lower than 10 are dropped from the relevant sample. Similarly, some unrealistic values of daily cigarette consumptions were dropped.

Control variables are added to the regressions. The control variables used are: Gender, Age, Origin, and Religion. These variables are summarized in section 3.4. Adding these control variables necessitates dropping some observations due to missing data. This reduces the sample by around 300 observations. The Origin variable separates individuals based on their immigration background. The six categories are: Dutch background; first generation foreign, Western background; first generation foreign, non-Western background; second generation foreign, Western background; second generation foreign, non-Western background, and unknown origin or missing information. The survey identifies 16 categories of religion which each individual falls into. For the regressions to come, dummy variables are created for each different category of origin and religion.

3.4 Descriptive Statistics

Table 1 presents the descriptive statistics for Height, Weight, BMI, Average Daily Cigarettes Smoked, Average Number of Weekly Alcoholic Drinks, Urbanity of Residence, Age, and Gender. The average height of the sample is 174cm tall, with the shortest individual being 145cm tall and the tallest 207cm tall. The average weight of the sample equals 77kg. BMI values fall between a range of 12 to 60 kg/m^2, with the average lying at the threshold of classifying as 'overweight', at a BMI of 25 kg/m^2. The average person in the sample smokes 8 cigarettes a day. This seems like a high value, but is most likely due to a heteroskedastic distribution. The high standard deviation supports this, as well as the maximum of 75 cigarettes per day showing that outliers in the upper quartile surely bring the average up. Around 1000 of the respondents did not fill in how many drinks they consume per week, explaining why the frequency of Weekly Drinks is lower than the other variables. The average person drinks 3 drinks per week and the heaviest drinker drinks 47 drinks per week. Urbanity ranges from 1 to 5 as described in section 3.2. The mean level of urbanity equals close to 3, indicating that the average lies at the 'Moderately Urban' level. The respondents fall between an age range of 17 to 104, with the average respondent being 52 years old. The Gender variable equals 0 when indicating female and 1 when indicating male. Hence, approximately 46 percent of the population consists of males.

The data is not evenly spread over levels of urbanity, weight class, drinkers, and smokers but relatively large samples exist for each category. Frequency tables for a range of relevant variables can be found in Appendix 1. From the observed population: approximately 45% belong to either 'Overweight' or 'Obese', 23% smoke, 72% have at least one alcoholic drink on a weekly basis, and 4% are defined as alcoholic.

The number of people who fall into each origin and religion category are shown in Table 2 and Table 3, respectively. 68% of the respondents are of Dutch background and less than 7% are of foreign descent. Over half of the respondents indicate that they are not religious. Of those who are religious, the majority fall into either the category 'Roman Catholic' or 'Protestant'.

Table 1. Summary Statistics Main Variables

Variable	**Frequency**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Height	6636	174.42	9.47	145	207
Weight	6636	76.52	15.21	35	180
BMI	6636	25.09	4.28	12.40	59.77
Cigarettes	6636	7.50	9.65	0	75
Weekly Drinks	5678	2.99	3.89	0	47
Urbanity	6636	2.99	1.28	1	5
Age	6636	52.11	16.00	17	104
Gender	6636	0.46	0.50	0	1

Table 2. Frequency Table Origin

Origin	**Frequency**	**Percentage**
Dutch Background	4530	68.26
First Generation Foreign, Western Background	120	1.81
First Generation Foreign, Non-Western Background	128	1.93
Second Generation Foreign, Western Background	236	3.56
Second Generation Foreign, Non-Western Background	61	0.92
Unknown Origin or Missing Information	1561	23.52
Total	6636	100.00

Table 3. Frequency Table Religion

Religion	**Frequency**	**Percentage**
Roman Catholic	1324	20.97
Protestant	414	6.56
Eastern Orthodox	8	0.13
Evangelical or Pentecostal	60	0.95
Dutch Reformed	276	4.37
Reformed Church in the Netherlands	214	3.39
Other Christian Community	130	2.06
Hindu	8	0.13
Buddhist	4	0.06
Other Eastern Religion	4	0.06
Jewish	7	0.11
Muslim	90	1.43
Humanist	5	0.08
Other Non-Christian Religion	23	0.36
Not Religious	3730	59.08
Uncertain	17	0.27
Total	6314	100.00

Figures 1, 2, and 3 provide visual descriptive statistics: the fraction of individuals who are categorised as being overweight, alcoholic, and who smoke, respectively, by level of urbanity. Looking at Figure 1 we see what appears to be a decreasing trend in obesity rates from low to high levels of urbanity. The 'Not Urban' level of urbanity has an obesity rate almost 10 percentage points higher than the 'Extremely Urban' level. In Figure 2 we do not see a clear increasing or decreasing trend in alcoholism from low to high levels of urbanity. Apparent, however is a spike in alcoholic rates in the 'Slightly Urban' level of urbanity. Similarly, in Figure 3, we observe a spike in smoking rates at the 'Extremely Urban' level as compared to the other four levels of urbanity. Appendix 3 provides additional visual descriptive statistics. More specifically, Figures 4 and 5 show the average weekly alcohol consumption by level of urbanity and average daily cigarette consumption by level of urbanity, respectively. Neither of these two graphs show a clear pattern which might suggest a clear relationship between urbanity and alcohol and cigarette consumption.

Figure 1. Percentage of Overweight Individuals per Level of Urbanity

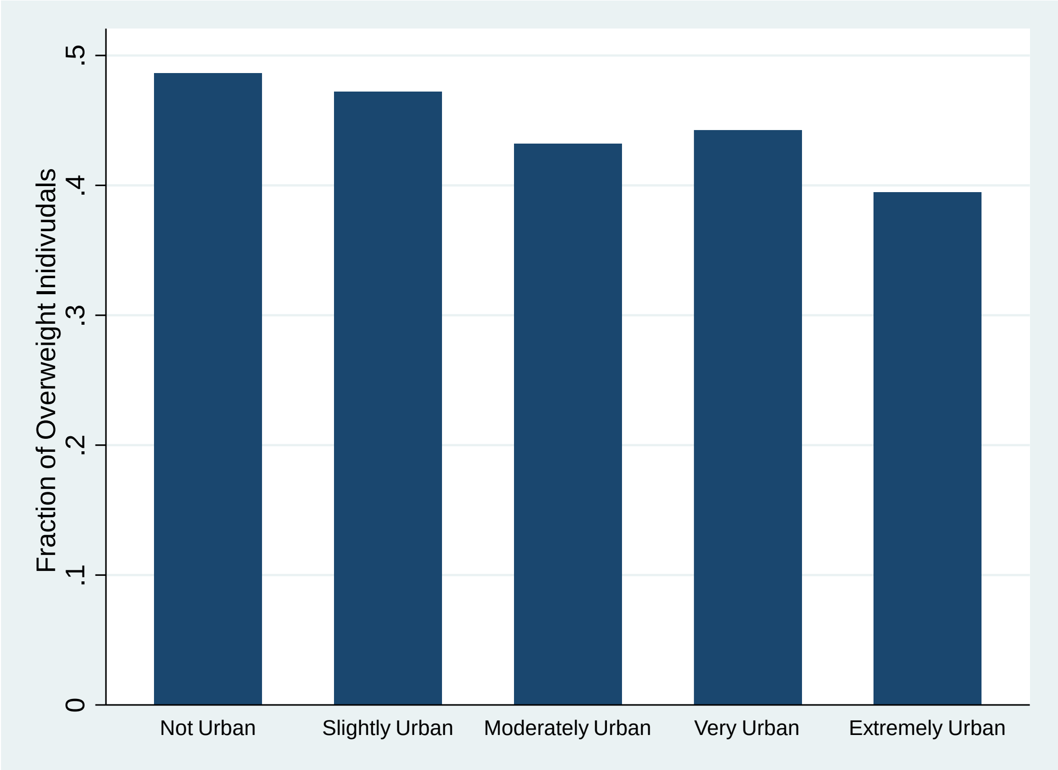


Figure 2. Percentage of Alcoholic Individuals per Level of Urbanity

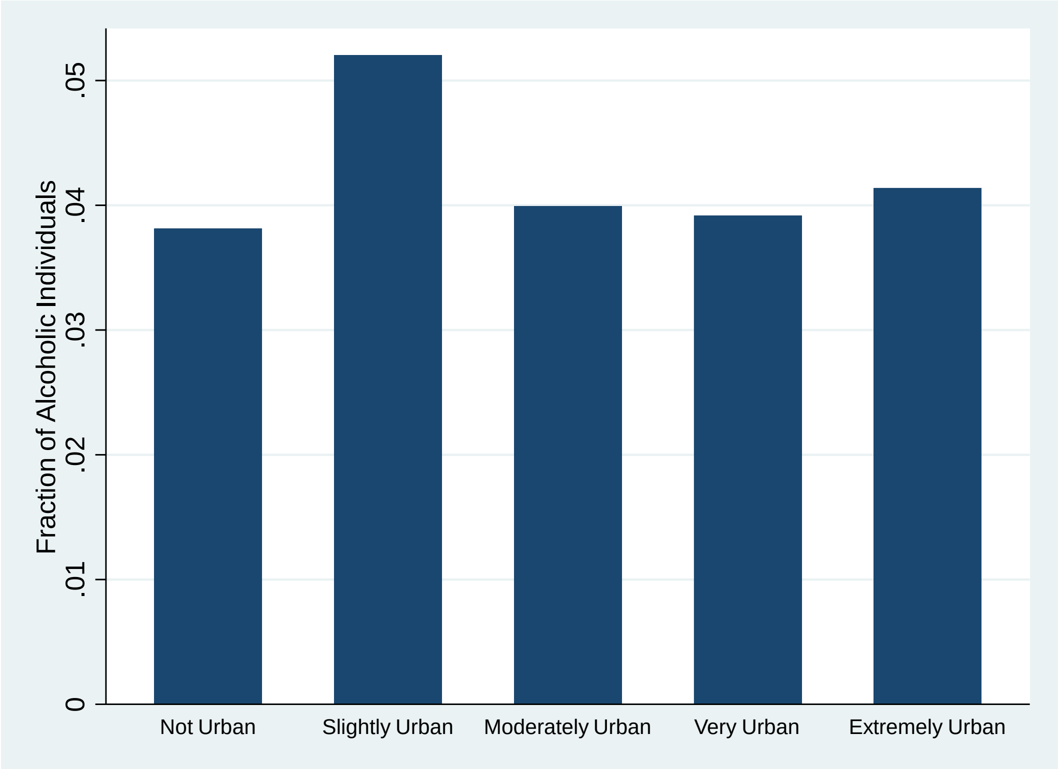
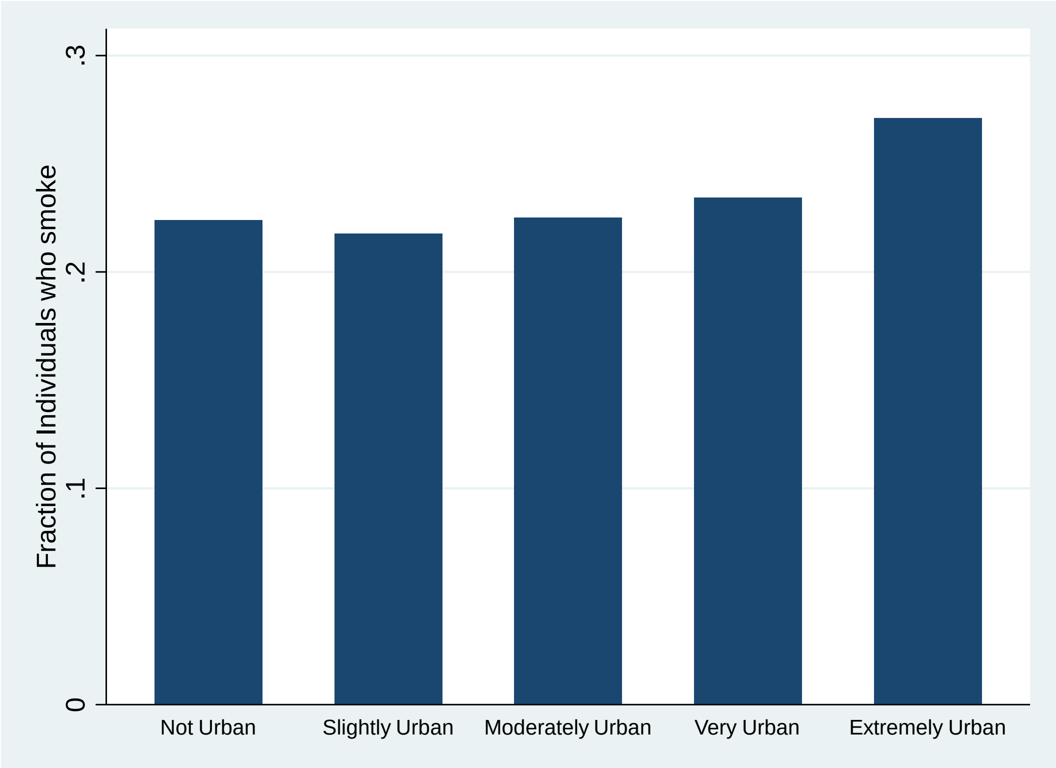


Figure 3. Percentage of Individuals who smoke per Level of Urbanity



The descriptive statistics suggest that consumption of food scales negatively with urbanity. Tobacco and alcohol consumption rates, however, do not show a similar trend with urbanity. However, drawing any conclusions based solely on the descriptive statistics would be fallacious. The statistical analyses to come will test whether statistically significant relationships can be found between urbanity and the different forms of consumption.

4. Methodology

The analyses used in this paper attempt to predict Obesity, Alcohol Abuse, and Smoking rates as a function of urbanity. To do so I present both OLS regressions and Logistic regressions. Looking at the OLS regressions first, each of the three forms of consumption is modelled using the following dependent variables:

1) **BMI**
2) **Average number of Alcoholic drinks per week**
3) **Average number of cigarettes smoker per day**

To model the relationship between each of the above listed dependent variables and the independent variable (Urbanity) using OLS regressions, the following regressions are used:

1) $\boldsymbol{BMI_i = \alpha + \beta Urbanity_i + \epsilon_i}$
2) $\boldsymbol{Alcoholic\ Drinks_i = \alpha + \beta Urbanity_i + \epsilon_i}$
3) $\boldsymbol{Cigarettes_i = \alpha + \beta Urbanity_i + \epsilon_i}$

Where, α indicates the constant of the model, β estimates the effect of increasing Urbanity on consumption, and ε_i indicates the error term.

Looking at the Logistic regressions, the three forms of consumption are modelled using the following dependent variables:

1) **Overweight**
2) **Alcoholic**
3) **Smoker**

Where, 'Overweight' takes value 1 if the individual belongs to either the 'overweight' or 'obese' category as defined in section 3.2, and 0 otherwise. 'Alcoholic' takes value 1 if the individual is defined as an alcoholic as explained in section 3.2., and 0 otherwise. Finally, a smoker is defined, very simply, as someone who indicates he/she is an active smoker when responding to the survey. I present both simple Logistic regressions, where urbanity is the sole predictor of consumption, and multiple Logistic regressions, where a set of control variables is added as described below. To model the relationship between each of the above listed dependent variables and the independent variable (Urbanity) using Logistic regressions, the following regressions are used:

1) $\boldsymbol{Overweight_i = \alpha + \beta Urbanity_i + \epsilon_i}$
2) $\boldsymbol{Alcoholic_i = \alpha + \beta Urbanity_i + \epsilon_i}$
3) $\boldsymbol{Smoker_i = \alpha + \beta Urbanity_i + \epsilon_i}$

Where, as before, α indicates the constant of the model, β estimates the effect of increasing Urbanity on consumption, and ε_i indicates the error term.

For each form of consumption, I perform four OLS regressions and four Logistic regressions. First, I predict consumption with a single variable: Urbanity. I then split up the population into Male and Female and repeat the basic regression. As the existing literature suggests, there is likely to be a disparity between men and women on the effects of urbanity on consumption, which I attempt to replicate. Finally, I perform a regression including a set of control variables, as presented in section 3.3. I perform each of these four regressions for both OLS regressions and Logistic regressions, using the dependent variables listed above.

To prevent bias in the regression, the error term (ε) must not correlate with the independent variable (*Urbanity).* Hence, when choosing which control variables to use and which to omit I make sure that the selected variables do not correlate with urbanity. In other words, I only choose variables which indicate characteristics of the individual determined before he/she chooses a level of urbanity to live in. The existing literature which perform similar regressions, with control variables, often employ many variables which I omit due to covariance with the dependent variable of primary interest. The control variables that I use are *Religion, Origin, Age* and *Gender*. The control variables, which other authors have included but which I omit include: Income, physical activity, and health insurance status.

Including the control variables, the regression equation becomes:

$$Consumption_{gi} = \alpha + \beta Urbanity_i + \gamma Gender_i + \delta Age_i + \pi Origin_i + \theta Religion_i + \epsilon_i$$

Where $Consupmtion_{gi}$ represents the consumption of good *g* (food/alcohol/cigarettes) by individual *i.* Considering *Origin* and *Religion* are categorical variables, I create dummy variables for each origin and religion. The coefficients (γ,δ,π,θ) for the four control variables will not be further analysed in the paper. They are employed to isolate a 'causal' effect of urbanity on consumption. The extent to which any relationship found can be considered causal is questionable however. The effects might be due to differences in the type of people who live in different levels of urbanity, and not due to the environmental effect of urbanity itself. For example, if a relationship between income and consumption exists, and a relationship between urbanity and income; then a relationship between urbanity and consumption might be apparent, but would not represent a causal effect but a mediating effect. These analyses, then, do not attempt to uncover a causal effect, but simply a statistically significant correlation. As such, I also do not focus specifically on the 'size' of the effect of urbanity on consumption, but rather on the significance and its nature (whether we observe a positive or negative correlation).

5. Empirical Results

5.1 Interpreting the Results

Subsections 5.2, 5.3, and 5.4 present the results of the effect of urbanity on the consumption of food, alcohol, and tobacco, respectively. In each subsection 2 tables are presented: the OLS regressions and the Logistic regressions. Each of these tables presents the results from 4 different models used to estimate the effect of urbanity on consumption. Each column in the table presents a different model. The significance of reported coefficients is tested using t-tests.

Model 1 regresses consumption on urbanity with no individual control variables. Models 2 and 3 do the same, but split by gender. Model 2 drops all females from the sample and Model 3 drops all males from the sample, allowing for cross-gender comparisons. Model 4 adds the set of control variables to the regression. Each table also presents the number of observations used per regression. For Models 2 and 3 this simply shows how many men and women there are in the sample. For Model 4, the number of observations decreases because data on the control variables was not available for all respondents. Respondents with missing data for any of the control variables are dropped from the observed sample. The full regressions can be found in Appendix 2, including coefficients for all additional control variables, t/z values, 95% confidence intervals, goodness of fit measures, and constants.

5.2 Urbanity and Obesity

Table 4 presents the results from the four OLS models analysing the relationship between urbanity and BMI.

Model 1 finds a statistically significant negative relationship between urbanity and BMI, albeit a small effect. This model suggests then, that people living in higher levels of urbanity, in general, have a lower BMI than those living in lower levels, suggesting that urban residents are likely to consume less food than rural residents. Models 2 and 3 show that the negative relationship exists for both men and women and that a stronger negative relationship exists for men than for women. When adding the set of control variables, the urbanity coefficient remains negative and statistically significant. Table 4, overall, suggests that people living in more urban areas have lower BMIs than their rural counterparts, this is true for both men and women.

In Table 5 I use Logistic regressions to analyse the effect of urbanity on the probability of being overweight or obese. This gives further indication of how food consumption correlates with urbanity. The results from Table 5 support what I have found thus far. All four models show a negative relationship between urbanity and the probability of the individual to be overweight or obese, which is statistically significant. Again, the negative relationship is stronger for men than it is for women.

Table 4. OLS Regressions: Effect of Urbanity on BMI

	BMI			
	(1)	**(2)**	**(3)**	**(4)**
	Without Controls	**Without Controls (Only Men)**	**Without Controls (Only Women)**	**With Controls**
Urbanity	- 0.17195***	-0.20606**	- 0.14968**	- 0.15500***
	(0.0411)	(0.0536)	(0.061)	(0.0420)
N	6636	3076	3560	6314
R^2	0.0026	0.0048	0.0017	0.0657

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. The results presented are gathered using OLS regressions. Standard errors are presented between parentheses below the relevant coefficient.

Table 5. Logistic Regressions: Effect of Urbanity on Probability of being Overweight

	Overweight			
	(1)	**(2)**	**(3)**	**(4)**
	Without Controls	**Without Controls (Only Men)**	**Without Controls (Only Women)**	**With Controls**
Urbanity	- 0.08099***	-0.11202***	- 0.05974**	- 0.07801***
	(0.0194)	(0.0283)	(0.0269)	(0.0210)
N	6636	3076	3560	6310
Pseudo R^2	0.0019	0.0037	0.0010	0.0432

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. The results presented are gathered using logit regressions. Standard errors are presented between parentheses below the relevant coefficient. The dependent variable in this regression, 'Overweight', is the probability that the individual is classified as either 'Overweight' or 'Obese' as defined in section 3.2.

Consumption, in terms of food (as measured by BMI and probability of being overweight), is more prominent in less urban areas. All eight of the above-mentioned regressions suggest a negative relationship between urbanity and adiposity. Perhaps most importantly, a significant negative relationship persists when adding the set of control variables. BMI and probability of being overweight cannot be solely described by predetermined personal characteristics. An individual's environment seems to affect his/her food consumption habits. These results support my hypothesis that higher levels of urbanity would display lower levels of adiposity. These results support the findings of much of the existing literature including Befort, Nazir and Perri (2012); Jackson et al. (2005); and Patterson et al. (2004).

5.3 Urbanity and Alcohol Abuse

Table 6 presents the results of the OLS regressions performed to analyse the relationship between urbanity and alcohol consumption in terms of average number of alcoholic drinks per week. In Table 7 I present Logistic regressions for the relationship between urbanity and alcoholism based on the definition of an alcoholic as presented in section 3.2.

Unlike the obesity results, the results from Table 6 and Table 7 show no effects significantly different from zero for the relationship between urbanity and alcohol consumption. Both the OLS regressions and the Logistic regressions all show a non-significant effect of urbanity on alcohol consumption.

Due to the insignificance of all the coefficients, not much can be said about any relationship other than that alcohol consumption does not seem to correlate with urbanity.

Perhaps the decision to abstain completely from alcohol is a personal decision, unaffected by environmental factors such as urbanity. If this were the case, omitting non-drinkers from the sample might unearth a relationship for the remaining population. I test for the existence of this relationship, but the coefficient of urbanity remains insignificant when omitting non-drinkers (the regression can be found in Appendix 2, Table 26).

Table 6. OLS Regressions: Effect of Urbanity on Average Weekly Alcoholic Drinks

	Average Weekly Alcoholic Drinks			
	(1)	**(2)**	**(3)**	**(4)**
	Without Controls	**Without Controls (Only Men)**	**Without Controls (Only Women)**	**With Controls**
Urbanity	0.56613	- 0.03367	0.01912	- 0.02011
	(0.0405)	(0.0716)	(0.0341)	(0.0391)
N	5678	2747	2931	5678
R^2	0.0000	0.0001	0.0001	0.1129

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. The results presented are gathered using OLS regressions. Standard errors are presented between parentheses below the relevant coefficient.

Table 7. Logistic Regressions: Effect of Urbanity on Probability of being Alcoholic

	Alcoholic			
	(1)	**(2)**	**(3)**	**(4)**
	Without Controls	**Without Controls (Only Men)**	**Without Controls (Only Women)**	**With Controls**
Urbanity	- 0.03059	- 0.08064	0.02606	- 0.04942
	(0.0516)	(0.0697)	(0.0768)	(0.0530)
N	5678	2747	2931	5368
Pseudo R^2	0.0002	0.0013	0.0001	0.1102

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The results presented are gathered using logit regressions. Standard errors are presented between parentheses below the relevant coefficient. The dependent variable in this regression, 'Alcoholic', is the probability that the individual is defined as an alcoholic as defined in section 3.2.

Although the relationship between urbanity and alcohol consumption is not the same as the relationship between urbanity and food consumption, as predicted in the hypothesis, the lack of a correlation is not as expected. In section 2 I predicted, based on relevant existing literature, that urbanity would correlate positively with alcohol consumption. But, similar to Donnermeyer's (1993) and Weisheit and Donnermeyer's (2000) results, I find no relationship between urbanity and alcohol consumption or alcohol abuse.

5.4 Urbanity and Smoking

Table 8 presents the results from the OLS regressions of urbanity and quantity of cigarettes smoked. Column 1 from the table shows us that when regressing the average daily cigarettes smoked on urbanity there is a positive significant correlation. Column 1 suggests that people in higher levels of urbanity consume more cigarettes on average than those in lower levels of urbanity. More specifically, people in the highest level of urbanity smoke, on average, almost one cigarette more per day than those living in the lowest levels of urbanity. Columns 2 and 3 show that there is a disparity between men and women when it comes to the effect of urbanity on smoking. The coefficient in column 2 shows a non-significant positive correlation between urbanity and smoking for men. Column 3 shows a significant positive correlation between urbanity and smoking for women. Hence, the effect of living in the countryside or in the city has a stronger effect on tobacco consumption for women than for men. Finally, column 4 shows that when adding the set of control variables the urbanity coefficient remains significantly positive. In any case, the coefficients from these regressions show that although, in most cases, the relationship is significant it is also a relatively small effect. From Table 8 it would appear that living in an urban environment leads to individuals smoking more cigarettes as compared to those in rural areas.

Table 9 provides the results of Logistic regressions where the dependent variable is whether someone smokes or not. Showing a similar trend to Table 8, column 1 of Table 9 (the regression without the addition of any control variables) shows that the probability of smoking is higher for urban individuals than for rural individuals. Like before, the coefficient for men, as shown in column 2, is statistically insignificant whereas for women, as shown in column 3, is significantly positive. Interestingly, when adding the set of control variables to the regression, the coefficient for urbanity becomes statistically insignificant. When controlling for gender, age, religion, and ethnicity, urbanity no longer has a distinguishable relationship with whether an individual smokes or not.

Table 8. OLS Regressions: Effect of Urbanity on Average Daily Cigarettes

	Average Daily Cigarettes			
	(1)	**(2)**	**(3)**	**(4)**
	Without Controls	**Without Controls (Only Men)**	**Without Controls (Only Women)**	**With Controls**
Urbanity	0.18443***	0.13590	0.22309***	0.14931**
	(0.0646)	(0.1008)	(0.0833)	(0.0671)
N	6636	3076	3560	6314
R^2	0.0012	0.0006	0.0020	0.0169

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. The results presented are gathered using OLS regressions. Standard errors are presented between parentheses below the relevant coefficient.

Table 9. Logistic Regression: Effect of Urbanity on Probability of smoking

	Smoker			
	(1)	**(2)**	**(3)**	**(4)**
	Without Controls	**Without Controls (Only Men)**	**Without Controls (Only Women)**	**With Controls**
Urbanity	0.05738**	0.02224	0.08917***	0.03838
	(0.0228)	(0.0325)	(0.0321)	(0.0243)
N	6636	3076	3560	6310
Pseudo R^2	0.0009	0.0001	0.0021	0.0144

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. The results presented are gathered using logit regressions. Standard errors are presented between parentheses below the relevant coefficient. The dependent variable in this regression, 'Smoker', is the probability that the individual is an active smoker.

As explained for alcohol in section 5.2, perhaps the decision to smoke, too, is unaffected by urbanity, but the consequent level of consumption is. I perform two OLS regressions on the relationship between urbanity and cigarette consumption, limiting the sample to smokers only, one without control variables and one with. Doing so results in an insignificant coefficient, however. The regressions can be found in Appendix 2, Table 35 and Table 36.

Table 8 concludes a positive relationship between urbanity and average cigarette consumption. Assuming column 4 reveals the least biased estimate of the effect of urbanity, Table 9 concludes that urbanity does not correlate with smoking rates. If urbanity does not affect smoking rates but does affect average cigarette consumption, I expect a significant positive correlation between urbanity and cigarette consumption when omitting non-smokers. This is not the case however, as shown in Tables 35 and 36 in Appendix 2.

The lack of a distinguishable effect of urbanity on cigarette consumption is not in line with the hypothesis. The hypothesis predicted a negative relationship between urbanity and smoking rates, with several previous researches having found such a relationship. These findings do not fall in line with those of previous research, as summarized in section 2, the Literature review.

6. Conclusion and Discussion

In this paper I attempted to find differences in consumptive behaviour between urban and rural environments by answering the following central research question:

What is the relationship between urbanity and obesity, alcohol abuse, and smoking rates?

A question of whether urban environments promote or demote consumptive behaviour. Based on the different relationships found between urbanity and the different forms of consumption, it is too simple to think that urbanity might promote or demote consumption universally. There appears to be different patterns based on the type of good in question. The results clearly indicate that the effect of urbanity on consumption is not uniform over food, alcohol, and cigarettes. The study finds a negative relationship between urbanity and food consumption, no relationship between urbanity and alcohol consumption, and an inconclusive positive relationship between urbanity and cigarette consumption. Differences in obesity rates or smoking rates between rural and urban areas, cannot then be justified by the promotion of consumptive behaviour of the urban environment.

Looking first at the relationship between urbanity and adiposity, the results from this experiment support the findings from previous literature including: Befort, Nazir, and Perri (2012); Lutifyya et al. (2007); Moraeus et al. (2012); Bruner et al. (2008); Ismailov and Heatherdale (2010); Liu et al. (2008) and Patterson et al. (2004). Obesity is a more prevalent phenomenon among rural adults than among urban adults. This study finds that urbanity has a negative correlation with both BMI as well as probability of being overweight or obese. The results suggest that food consumption seems to be promoted by rural environments.

This paper finds no statistically significant relationship between urbanity and alcohol consumption. The linear regressions of urbanity on number of weekly alcoholic drinks as well as the logistic regressions of urbanity on probability of being an alcoholic both result in insignificant results. The same insignificance persists when considering only the people who drink. Urban environments neither promote nor demote alcohol consumption as compared to rural environments; people's alcohol consumption is not affected by urbanity. Donnermeyer (1993) and Weisheit and Donnermeyer (2000), too, find that alcohol abuse is not different between urban and rural areas.

In terms of cigarette consumption, urbanity leads to inconclusive results. More specifically, this paper finds a positive relationship between the average amount of cigarettes smoked by individuals and urbanity. The probability that an individual smokes, however, is not correlated with urbanity. Logically, this might suggest that looking at only the people who smoke, people living in urban areas smoke more cigarettes per day than people living in rural areas. However, I check whether cigarette consumption scales with urbanity when considering only smokers and find no correlation. The positive relationship between cigarette consumption and urbanity when considering all individuals can therefore not be justified and is not meaningful. Like with alcohol consumption, no conclusive relationship between cigarette consumption and urbanity can be drawn. Interestingly, the existing literature does not support my findings. Unlike previous research, I investigate both smoking rates and average cigarette consumption. Perhaps if previous literature had done the same in their researches they too would have found similar inconclusive results.

Understanding the driving forces behind consumer behaviour is relevant to economists and policy makers alike. These findings provide further insight into the nature of consumption. Although the urban environment facilitates a sedentary lifestyle, it does not promote all forms of consumption. The extremely urban areas even show lower degrees of food consumption than non-urban areas. The knowledge that urbanity does not correlate with all forms of consumption might be important information to economists studying potential determinants.

Some aspects of the available data limit the degree to which these conclusions can be taken as scientifically significant. Firstly, all the data used in this research has been based on self-reported data from a survey. The subjective data accommodates the possibility of measurement errors in the form of insincere answers or (accidental) reporting errors. For example, would a heavy alcoholic or smoker happily reveal how many alcoholic drinks or cigarettes he consumes in a week? The results of this paper rely on the truthfulness of the respondents and hence may not represent the real world as accurately as desired. In an ideal research I would personally measure and record all the relevant data. But the scale of the data needed makes this an unrealistic experiment.

Most importantly, perhaps, amongst the limitations of this paper is my definition and analysis of consumption. Consumption is a very vast topic, and I limit my analysis to three goods (food, alcohol, and cigarettes) for simplicity and availability of data. In my analysis of food consumption I focus on BMI as a measure of obesity. BMI is, generally speaking, seen as a straightforward tool to measure obesity but as such it is also a crude tool. Primarily, it fails to distinguish muscle mass from fat. As such it does not always indicate whether a person is genuinely living an unhealthy lifestyle and consuming too much food. The survey used for this research asked respondents the quantity of alcoholic drinks they had consumed in the last week, and for my analyses of alcohol consumption, I assume this as an indication of a weekly average for each individual, which is also a crude assumption to make. Unfortunately, the available data did not permit for a more accurate representation. Furthermore, it is important to note that the relationships I find are specific to the Netherlands and hence unlikely to be able to be extrapolated to any country of the world. Many economic, political, and social factors are likely to change the relationships by country. Clearly, the conclusions I draw are limited in scope.

A further limitation of the data is that studied individuals in urban and rural areas differ in more aspects than considered in the research. Surely people living in urban areas are different in some respects compared to people living in rural areas. Perhaps, for example, attitudes and mentalities differ by level of urbanity, this is something that could potentially explain or contribute to the results we find. However relevant, these kinds of characteristics are very hard to observe and measure. Also, perception and attitudes towards obesity, alcohol, and smoking might differ by urbanity. This research does not consider that such differences might lead to individuals sorting into the different levels of urbanity.

The methodology used in this paper, too, has its limitations which limit the validity of the findings. Another important issue with this research is that I am unable to talk about a causal relationship between urbanity and obesity, alcohol abuse, and smoking rates. Urbanity surely encompasses many other factors which also affect consumptive behaviour leading to mediation of these other effects. This research, along with many of the researches before it, fails to isolate a potential effect of the urban environment on consumption. Rather, it describes a relationship between people living in different levels of urbanity and their consumptive behaviour. Another question that needs to be asked is whether the methodology suffers from reverse causality. Does urbanity demote consumptive behaviour or do people with highly consumptive behaviour prefer to live in rural areas? Learning which genuinely leads to which is a difficult task, but it is reasonable to assume that people are unlikely to decide where to live based on their consumptive behaviour, whereas their behaviour is likely to be influenced by their environment.

Much previous literature, especially in the domain of obesity and urbanity, has found correlations between the two without attempting to provide explanations. In this paper, I analysed several forms of consumption with the aim of attempting to find a relationship between urbanity and consumptive behaviour. Although my results suggest that such a relationship does not exist, my research contributes to the existing literature in that I cross off a potential explanation to the phenomenon. Further research is needed to find a functional statistical explanation of the apparent phenomena, with a focus on why obesity rates are higher in rural areas. Or perhaps a refined approach of the one used in this paper is needed. Perhaps my definitions of consumption are misleading, and in reality urbanity (or rurality) does in fact promote consumption. Although the data might be hard to come by, it would be interesting to analyse expenditures over levels of urbanity. A direct perception of consumption levels would be the easiest way to compare consumptive behaviour between levels of urbanity. Further research could also consider replicating my research over a large set of different countries. Do we find the same patterns around the world? Perhaps the density of the Netherlands means that the difference between rural and urban areas is very different from a less compact country (for example Canada).

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APPENDICES

Appendix 1: Additional Descriptive Statistics

Table 10. Frequency Table Urbanity

Urban Character of Place of Residence	Frequency	Percent
Extremely Urban	874	13.17
Very Urban	1758	26.49
Moderately Urban	1475	22.23
Slightly Urban	1511	22.77
Not Urban	1018	15.34
Total	6636	100.0

Table 11. Frequency Table Weight Class

Weight Class	Frequency	Percent
Under-weight	162	2.44
Normal Weight	3506	52.83
Over-weight	2234	33.66
Obese	734	11.06
Total	6636	100.0

Table 12. Frequency Table Consumption of at least one alcoholic drink

Drinks?	Frequency	Percent
Yes	4109	72.37
No	1,569	27.63
Total	5678	100.0

Table 13. Frequency Table Alcoholic

Alcoholic?	Frequency	Percent
Yes	241	4.24
No	5,437	95.76
Total	5678	100.0

Table 14. Frequency Table Smokers

Smoker?	Frequency	Percent
Yes	5,098	76.82
No	1,538	23.18
Total	6636	100.0

Appendix 2: Complete Regressions

Table 15. OLS Regression: Effect of Urbanity on BMI

Number of Observations	=	6636
F(1, 6634)	=	17.53
Prob > F	=	0.0000
R-Squared	=	0.0026
Adjusted R-Squared	=	0.0025
Root MSE	=	4.2751

Independent Variable	**BMI**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	- 0.1719529	0.0410675	- 4.19	0.000	- 0.2524585	- 0.0914474
Constant	25.60226	0.1336809	191.52	0.000	25.34021	25.86432

Table 16. OLS Regression: Effect of Urbanity on BMI (men)

Number of Observations	=	3076
F(1, 3074)	=	14.78
Prob > F	=	0.0001
R-Squared	=	0.0048
Adjusted R-Squared	=	0.0045
Root MSE	=	3.8103

Independent Variable	**BMI**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	- 0.2060619	0.0535917	- 3.85	0.000	- 0.3111411	- 0.1009827
Constant	26.0353	0.1756723	148.20	0.000	25.69086	26.37975

Table 17. OLS Regression: Effect of Urbanity on BMI (women)

Number of Observations	=	3560
F(1, 3558)	=	6.06
Prob > F	=	0.0139
R-Squared	=	0.0017
Adjusted R-Squared	=	0.0014
Root MSE	=	4.6212

Independent Variable	**BMI**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	- 0.1496759	0.0607918	- 2.46	0.014	- 0.2688663	- 0.0304856
Constant	25.25076	0.1966795	128.39	0.000	24.86514	25.63638

Table 18. OLS Regression: Effect of Urbanity on BMI (with controls)

Number of Observations	=	6314
F(23, 6290)	=	19.22
Prob > F	=	0.0000
R-Squared	=	0.0657
Adjusted R-Squared	=	0.0623
Root MSE	=	4.1453

Independent Variable	**BMI**					
	Coefficient	**Standard Error**	**T**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	- 0.1550007	0.0420334	-3.69	0.000	- 0.2374005	- 0.0726008
Age	0.0625709	0.0034061	18.37	0.000	0.0558938	0.069248
Male	0.4719369	0.1051737	4.49	0.000	0.2657606	0.6781132
Dutch Background	- 0.2943616	0.1310166	- 2.25	0.025	- 0.5511989	- 0.0375243
First Generation Foreigner, Western	- 0.4923576	0.3986982	- 1.23	0.217	- 1.273942	0.2892269
First Generation Foreigner, Non-Western	0.5421376	0.4408193	1.23	0.219	- 0.3220186	1.406294
Second Generation Foreigner, Western	- 0.1770989	0.2961662	- 0.60	0.550	- 0.7576857	0.4034878
Second Generation Foreigner, Non-Western	- 0.7735225	0.5948963	- 1.30	0.194	- 1.939722	0.3926772
Roman Catholic	0.0051354	0.1363074	0.04	0.970	- 0.2620736	0.2723444
Protestant	- 0.2736935	0.2179186	- 1.26	0.209	- 0.7008882	0.1535012
Orthodox	- 0.9389634	1.479422	- 0.63	0.526	- 3.839136	1.961209
Evangelical or Pentecostal	0.1431754	0.5400318	0.27	0.791	- 0.9154712	1.201822
Dutch Reformed	0.4810275	0.2608756	1.84	0.065	- 0.0303778	0.9924328
Reformed Church in the Netherlands	- 0.4958371	0.292737	- 1.69	0.090	- 1.069702	0.0780274
Other Christian Community	0.3421194	0.3706468	0.92	0.356	- 0.3844749	1.068714
Hindu	- 2.222475	1.513789	- 1.47	0.142	- 5.190018	0.745068
Buddhist	- 3.258852	2.076514	- 1.57	0.117	- 7.329528	0.8118231
Other Eastern Religion	- 0.0166827	2.076077	- 0.01	0.994	- 4.086502	4.053137
Jewish	1.610886	1.574258	1.02	0.306	- 1.475196	4.696968
Muslim	- 0.3653524	0.522562	- 0.70	0.484	- 1.389752	0.6590474
Humanist	1.163759	1.856261	0.63	0.531	- 2.475147	4.802664
Other Non-Christian Religion	0.5882479	0.8674989	0.68	0.498	- 1.112346	2.288842
Uncertain of Religion	- 1.753261	1.009151	- 1.74	0.082	- 3.731542	0.2250202
Constant	22.2892	0.2414141	92.33	0.000	21.81594	22.76245

Table 19. Logistic Regression: Effect of Urbanity on probability of being Overweight

Number of Observations	=	6636
LR chi^2 (1)	=	17.53
Prob > chi^2	=	0.0000
Pseudo R-Squared	=	0.0019
Root MSE	=	-4553.9692

Independent Variable	**Overweight**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	- 0.0809875	0.0193638	- 4.18	0.000	- 0.1189399	- 0.0430351
Constant	0.0301439	0.062778	0.48	0.631	- 0.0928986	0.1531865

Table 20. Logistic Regression: Effect of Urbanity on Probability of being Overweight (men)

Number of Observations	=	3076
LR chi^2 (1)	=	15.78
Prob > chi^2	=	0.0001
Pseudo R-Squared	=	0.0037
Root MSE	=	-2124.2073

Independent Variable	**Overweight**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	- 0.1120175	0.0282679	- 3.96	0.000	- 0.1674216	- 0.0566135
Constant	0.3458057	0.0926589	3.73	0.000	0.1641976	0.5274138

Table 21. Logistic Regression: Effect of Urbanity on Probability of being Overweight (women)

Number of Observations	=	3560
LR chi^2 (1)	=	4.94
Prob > chi^2	=	0.0262
Pseudo R-Squared	=	0.0010
Root MSE	=	-2393.4491

Independent Variable	**Overweight**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	- 0.0597419	0.0268822	- 2.22	0.026	- 0.11243	- 0.0070539
Constant	- 0.228378	0.086489	- 2.64	0.008	- 0.3978932	- 0.0588627

Table 22. Logistic Regression: Effect of Urbanity on Probability of being Overweight (with controls)

Number of Observations	=	6310
LR chi² (22)	=	375.06
Prob > chi²	=	0.0000
Pseudo R-Squared	=	0.0432
Root MSE	=	-4153.3083

Independent Variable	**Overweight**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	- 0.0780118	0.0210357	- 3.71	0.000	- 0.119241	- 0.0367825
Age	0.027156	0.001747	15.54	0.000	0.023732	0.03058
Male	0.3618025	0.0524257	6.90	0.000	0.25905	0.464555
Dutch Background	- 0.0850032	0.0654518	- 1.30	0.194	- 0.2132863	0.04328
First Generation Foreigner, Western	- 0.2876876	0.2014332	- 1.43	0.153	- 0.6824895	0.1071143
First Generation Foreigner, Non-Western	0.179449	0.2226316	0.81	0.420	- 0.256901	0.6157989
Second Generation Foreigner, Western	- 0.1245658	0.1481053	- 0.84	0.400	- 0.414847	0.1657153
Second Generation Foreigner, Non-Western	- 0.450107	0.3381644	- 1.33	0.183	- 1.112897	0.2126831
Roman Catholic	0.0187241	0.0676363	0.28	0.782	- 0.1138405	0.1512888
Protestant	- 0.1662794	0.1086782	- 1.53	0.126	- 0.3792847	0.0467259
Orthodox	- 0.2009989	0.7635386	- 0.26	0.792	- 1.697507	1.295509
Evangelical or Pentecostal	0.0910657	0.2680643	0.34	0.734	- 0.4343307	0.616462
Dutch Reformed	0.060201	0.1293789	0.47	0.642	- 0.193377	0.3137791
Reformed Church in the Netherlands	- 0.2112723	0.1482576	- 1.43	0.154	- 0.5018519	0.0793074
Other Christian Community	- 0.0632629	0.1864186	- 0.34	0.734	- 0.4286366	0.3021108
Hindu	- 0.3428454	0.7659223	- 0.45	0.654	- 1.844026	1.158335
Buddhist	0	(omitted)				
Other Eastern Religion	1.37681	1.17613	1.17	0.242	- 0.9283629	3.681984
Jewish	2.34443	1.095346	2.14	0.032	0.1975912	4.49127
Muslim	- 0.1978	0.2764274	- 0.72	0.474	- 0.7395877	0.3439878
Humanist	0.4587832	0.9219249	0.50	0.619	- 1.348157	2.265723
Other Non-Christian Religion	- 0.1085959	0.439236	- 0.25	0.805	- 0.9694827	0.7522908
Uncertain of Religion	- 1.184163	0.5906238	- 2.00	0.045	- 2.341764	- 0.0265613
Constant	- 1.489747	0.1222709	- 12.18	0.000	- 1.729393	- 1.2501

Table 23. OLS Regression: Effect of Urbanity on Alcohol Consumption

Number of Observations	=	5678
F(1, 5676)	=	0.04
Prob > F	=	0.8468
R-Squared	=	0.0000
Adjusted R-Squared	=	- 0.0002
Root MSE	=	3.8943

Independent Variable	**Average Number of Alcoholic Drinks per Week**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	0.0078264	0.0405079	0.19	0.847	- 0.0715845	0.0872374
Constant	2.96533	0.1316694	22.52	0.000	2.707208	3.223453

Table 24. OLS Regression: Effect of Urbanity on Alcohol Consumption (men)

Number of Observations	=	2747
F(1, 2745)	=	0.22
Prob > F	=	0.6381
R-Squared	=	0.0001
Adjusted R-Squared	=	- 0.0003
Root MSE	=	4.8018

Independent Variable	**Average Number of Alcoholic Drinks per Week**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	-.0336735	.0715921	-0.47	0.638	-.1740534	.1067064
Constant	4.206995	.2342919	17.96	0.000	3.747588	4.666401

Table 25. OLS Regression: Effect of Urbanity on Alcohol Consumption (women)

Number of Observations	=	2931
F(1, 2929)	=	0.31
Prob > F	=	0.5749
R-Squared	=	0.0001
Adjusted R-Squared	=	- 0.0002
Root MSE	=	2.3477

Independent Variable	**Average Number of Alcoholic Drinks per Week**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	0.0191229	0.0340966	0.56	0.575	- 0.0477328	0.0859787
Constant	1.885231	0.110118	17.12	0.000	1.669314	2.101147

Table 26. OLS Regression: Effect of Urbanity on Alcohol Consumption (Drinkers only)

Number of Observations	**=**	4109
F(1, 4107)	=	0.32
Prob > F	=	0.5744
R-Squared	=	0.0001
Adjusted R-Squared	=	- 0.0002
Root MSE	=	4.0302

Independent Variable	**Average Number of Alcoholic Drinks per Week**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	0.0276809	0.0492858	0.56	0.574	- 0.068946	0.1243079
Constant	4.047387	0.1598976	25.31	0.000	3.733901	4.360873

Table 27. OLS Regression: Effect of Urbanity on Alcohol Consumption (with controls)

Number of Observations	=	5678
F(23, 5654)	=	31.28
Prob > F	=	0.0000
R-Squared	=	0.1129
Adjusted R-Squared	=	0.1093
Root MSE	=	3.6751

Independent Variable	**Average Number of Alcoholic Drinks per Week**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	- 0.0201071	0.039102	- 0.51	0.607	- 0.0967621	0.0565478
Age	- 0.0386137	0.0031722	- 12.17	0.000	- 0.0448325	- 0.0323949
Male	2.235287	0.0980616	22.79	0.000	2.043049	2.427525
Dutch Background	0.4459402	0.1218222	3.66	0.000	0.207122	0.6847584
First Generation Foreigner, Western	- 0.1319477	0.3751596	- 0.35	0.725	- 0.8674045	0.603509
First Generation Foreigner, Non-Western	- 0.6266138	0.473079	- 1.32	0.185	- 1.55403	0.3008024
Second Generation Foreigner, Western	0.0931913	0.2781368	0.34	0.738	- 0.4520634	0.6384461
Second Generation Foreigner, Non-Western	- 0.3169244	0.6466304	- 0.49	0.624	- 1.584568	0.9507193
Roman Catholic	0.0665106	0.1259691	0.53	0.598	- 0.1804372	0.3134584
Protestant	- 0.30292	0.2025627	- 1.50	0.135	- 0.7000205	0.0941805
Orthodox	- 2.005967	1.315746	- 1.52	0.127	- 4.585333	0.5733994
Evangelical or Pentecostal	- 1.578359	0.529021	- 2.98	0.003	- 2.615443	- 0.5412747
Dutch Reformed	- 0.7014942	0.2460937	- 2.85	0.004	- 1.183932	- 0.2190561
Reformed Church in the Netherlands	- 1.117588	0.273803	- 4.08	0.000	- 1.654347	- 0.580829
Other Christian Community	- 1.16414	0.3601638	- 3.23	0.001	- 1.870199	- 0.4580805
Hindu	- 0.9458792	1.445235	- 0.65	0.513	- 3.779094	1.887336
Buddhist	- 1.320512	2.122914	- 0.62	0.534	- 5.482237	2.841213
Other Eastern Religion	- 3.096218	2.605381	- 1.19	0.235	- 8.203764	2.011329
Jewish	- 2.345287	1.506173	- 1.56	0.119	- 5.297964	0.607391
Muslim	- 1.130268	0.7824258	- 1.44	0.149	- 2.664123	0.4035867
Humanist	0.6621093	1.64594	0.40	0.688	- 2.564565	3.888783
Other Non-Christian Religion	0.0169346	0.8688205	0.02	0.984	- 1.686287	1.720156
Uncertain of Religion	0.8286408	1.022317	0.81	0.418	- 1.175492	2.832774
Constant	3.812584	0.225596	16.90	0.000	3.370329	4.254839

Table 28. Logistic Regression: Effect of Urbanity on Probability of Being Alcoholic

Number of Observations	=	5678
LR chi^2 **(1)**	=	0.35
Prob > chi^2	=	0.5532
Pseudo R-Squared	=	0.0002
Root MSE	=	-997.08899

Independent Variable	**Alcoholic**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	- 0.0305901	0.0515806	- 0.59	0.553	- 0.1316862	0.070506
Constant	- 3.02543	0.1655095	- 18.28	0.000	- 3.349823	- 2.701038

Table 29. Logistic Regression: Effect of Urbanity on Probability of Being Alcoholic (men)

Number of Observations	=	2747
LR chi^2 **(1)**	=	1.34
Prob > chi^2	=	0.2478
Pseudo R-Squared	=	0.0013
Root MSE	=	-528.78974

Independent Variable	**Alcoholic**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	- 0.0805354	0.0697221	- 1.16	0.248	- 0.2171881	0.0561173
Constant	- 2.748447	0.2205445	- 12.46	0.000	- 3.180707	- 2.316188

Table 30. Logistic Regression: Effect of Urbanity on Probability of Being Alcoholic (women)

Number of Observations	=	2931
LR chi^2 **(1)**	=	0.12
Prob > chi^2	=	0.7343
Pseudo R-Squared	=	0.0001
Root MSE	=	-465.69088

Independent Variable	**Alcoholic**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	0.0260592	0.0768005	0.34	0.734	- 0.1244671	0.1765854
Constant	- 3.331721	0.2507659	- 13.29	0.000	- 3.823213	- 2.840229

Number of Observations	=	5368
LR chi² (1)	=	216.82
Prob > chi²	=	0.0000
Pseudo R-Squared	=	0.1102
Root MSE	=	-875.01842

Table 31. Logistic Regression: Effect of Urbanity on Probability of Being Alcoholic (with controls)

Independent Variable	**Alcoholic**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	- 0.0494244	0.0530431	- 0.93	0.351	- 0.1533869	0.0545382
Age	- 0.0627251	0.0050136	- 12.51	0.000	- 0.0725516	- 0.0528985
Male	0.3689393	0.1362175	2.71	0.007	0.1019578	0.6359207
Dutch Background	0.5954234	0.1799422	3.31	0.001	0.2427432	0.9481035
First Generation Foreigner, Western	0	(omitted)				
First Generation Foreigner, Non-Western	- 0.5908877	1.036464	- 0.57	0.569	- 2.622319	1.440544
Second Generation Foreigner, Western	0.1710431	0.4259712	0.40	0.688	- 0.6638452	1.005931
Second Generation Foreigner, Non-Western	0.3338016	0.769318	0.43	0.664	- 1.174034	1.841637
Roman Catholic	0.4348658	0.1656418	2.63	0.009	0.1102138	0.7595178
Protestant	- 0.9237998	0.463503	- 1.99	0.046	- 1.832249	- 0.0153506
Orthodox	0	(omitted)				
Evangelical or Pentecostal	0	(omitted)				
Dutch Reformed	- 0.614824	0.46675	- 1.32	0.188	- 1.529637	0.2999893
Reformed Church in the Netherlands	- 0.9047687	0.5183907	- 1.75	0.081	- 1.920796	0.1112584
Other Christian Community	0	(omitted)				
Hindu	0	(omitted)				
Buddhist	0	(omitted)				
Other Eastern Religion	0	(omitted)				
Jewish	0	(omitted)				
Muslim	0	(omitted)				
Humanist	0	(omitted)				
Other Non-Christian Religion	0.3055939	1.069068	0.29	0.775	- 1.789741	2.400929
Uncertain of Religion	0.7544273	1.127879	0.67	0.504	- 1.456175	2.96503
Constant	- 0.6866595	0.3035689	- 2.26	0.024	- 1.281644	- 0.0916754

Table 32. OLS Regression: Effect of Urbanity on Cigarette Consumption

Number of Observations	=	6636
F(1, 6634)	=	8.14
Prob > F	=	0.0043
R-Squared	=	0.0012
Adjusted R-Squared	=	0.0011
Root MSE	=	6.73

Independent Variable	**Average Number of Cigarettes Smoked per Day**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	0.1844267	0.0646499	2.85	0.004	0.057692	0.3111613
Constant	2.413351	0.2104451	11.47	0.000	2.000811	2.825891

Table 33. OLS Regression: Effect of Urbanity on Cigarette Consumption (men)

Number of Observations	=	3076
F(1, 3074)	=	1.82
Prob > F	=	0.1775
R-Squared	=	0.0006
Adjusted R-Squared	=	0.0003
Root MSE	=	7.1639

Independent Variable	**Average Number of Cigarettes Smoked per Day**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	0.1358954	0.1007584	1.35	0.178	- 0.0616653	0.333456
Constant	2.725257	0.3302836	8.25	0.000	2.077658	3.372856

Table 34. OLS Regression: Effect of Urbanity on Cigarette Consumption (women)

Number of Observations	=	3560
F(1, 3558)	=	7.18
Prob > F	=	0.0074
R-Squared	=	0.0020
Adjusted R-Squared	=	0.0017
Root MSE	=	6.3294

Independent Variable	**Average Number of Cigarettes Smoked per Day**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	0.2230916	0.0832632	2.68	0.007	0.0598432	0.3863399
Constant	2.155374	0.269381	8.00	0.000	1.627217	2.68353

Table 35. OLS Regression: Effect of Urbanity on Cigarette Consumption (Smokers only)

Number of Observations	=	1538
F (1, 1536)	=	1.89
Prob > F	=	0.1698
R-Squared	=	0.0012
Adjusted R-Squared	=	0.0006
Root MSE	=	8.3571

Independent Variable	**Average Number of Cigarettes Smoked per Day**					
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	0.2253674	0.1640731	1.37	0.170	- 0.0964635	0.5471984
Constant	12.10429	0.5462716	22.16	0.000	11.03277	13.1758

Table 36. OLS Regression: Effect of Urbanity on Cigarette Consumption (Smokers only with controls)

Number of Observations	=	1433
F (22, 1410)	=	2.95
Prob > F	=	0.0000
R-Squared	=	0.0440
Adjusted R-Squared	=	0.0291
Root MSE	=	8.2152

Independent Variable	**Average Number of Cigarettes Smoked per Day**					
	Coefficient	**Standard Error**	**T**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	0.2305494	0.1718474	1.34	0.180	- 0.1065546	0.5676534
Age	0.0619468	0.0154186	4.02	0.000	0.0317009	0.0921926
Male	- 0.4830553	0.4370694	- 1.11	0.269	- 1.340432	0.374321
Dutch Background	- 0.2218737	0.5448044	- 0.41	0.684	- 1.290588	0.8468406
First Generation Foreigner, Western	- 0.163095	1.552907	- 0.11	0.916	- 3.209353	2.883163
First Generation Foreigner, Non-Western	- 3.889705	2.13106	- 1.83	0.068	- 8.070094	0.290685
Second Generation Foreigner, Western	0.5238468	1.24654	0.42	0.674	- 1.921426	2.96912
Second Generation Foreigner, Non-Western	- 6.548841	2.398547	- 2.73	0.006	- 11.25395	- 1.843737
Roman Catholic	- 1.064198	0.5853383	- 1.82	0.069	- 2.212426	0.0840298
Protestant	- 3.244992	1.130524	- 2.87	0.004	- 5.462682	- 1.027302
Orthodox	- 2.917524	5.915605	- 0.49	0.622	- 14.52186	8.686809
Evangelical or Pentecostal	- 4.323607	3.697778	- 1.17	0.243	- 11.57734	2.930131
Dutch Reformed	- 1.445895	1.217885	- 1.19	0.235	- 3.834956	0.943167
Reformed Church in the Netherlands	- 1.355352	1.404957	- 0.96	0.335	- 4.111384	1.40068
Other Christian Community	- 5.756025	2.219856	- 2.59	0.010	- 10.1106	- 1.401448
Hindu	- 1.839926	6.182202	- 0.30	0.766	- 13.96723	10.28738
Buddhist	1.598899	8.224545	0.19	0.846	- 14.53476	17.73256
Other Eastern Religion	0	(omitted)				
Jewish	- 0.6701006	5.825161	- 0.12	0.908	- 12.09702	10.75681
Muslim	2.498194	2.297826	1.09	0.277	- 2.009332	7.00572
Humanist	21.21782	5.82474	3.64	0.000	9.791731	32.64391
Other Non-Christian Religion	0.6176836	3.689909	0.17	0.867	- 6.620619	7.855986
Uncertain of Religion	2.343825	3.174443	0.74	0.460	- 3.883314	8.570964
Constant	9.82147	1.029637	9.54	0.000	7.801685	11.84126

Table 37. OLS Regression: Effect of Urbanity on Cigarette Consumption (with controls)

Number of Observations	=	6314
F(23, 6290)	=	4.70
Prob > F	=	0.0000
R-Squared	=	0.0169
Adjusted R-Squared	=	0.0133
Root MSE	=	6.6187

Independent Variable	**Average Number of Cigarettes Smoked per Day**				
	Coefficient	**Standard Error**	**t**	**P > |t|**	**[95% Confidence Interval]**	
Urbanity	0.1493088	0.067114	2.22	0.026	0.0177425	0.280875
Age	0.0015357	0.0054385	0.28	0.778	- 0.0091255	0.012197
Male	0.200016	0.1679289	1.19	0.234	- 0.1291819	0.5292139
Dutch Background	- 0.0833313	0.2091918	- 0.40	0.690	- 0.4934187	0.326756
First Generation Foreigner, Western	0.2403058	0.6365941	0.38	0.706	- 1.007636	1.488247
First Generation Foreigner, Non-Western	- 1.188772	0.7038479	- 1.69	0.091	- 2.568554	0.1910102
Second Generation Foreigner, Western	- 0.1352481	0.4728831	- 0.29	0.775	- 1.06226	0.791764
Second Generation Foreigner, Non-Western	- 1.89035	0.9498598	- 1.99	0.047	- 3.752399	- 0.0283003
Roman Catholic	- 0.8541621	0.2176395	- 3.92	0.000	- 1.28081	- 0.4275144
Protestant	- 1.950193	0.3479465	- 5.60	0.000	- 2.632287	- 1.268099
Orthodox	- 1.236093	2.362166	- 0.52	0.601	- 5.866746	3.394559
Evangelical or Pentecostal	- 2.562978	0.8622588	- 2.97	0.003	- 4.2533	- 0.8726567
Dutch Reformed	- 1.216894	0.4165353	- 2.92	0.003	- 2.033445	- 0.4003422
Reformed Church in the Netherlands	- 1.346595	0.4674078	- 2.88	0.004	- 2.262873	- 0.4303159
Other Christian Community	- 2.618091	0.5918049	- 4.42	0.000	- 3.778231	- 1.457951
Hindu	- 0.5787481	2.417039	- 0.24	0.811	- 5.316969	4.159473
Buddhist	0.6244271	3.315531	0.19	0.851	- 5.875145	7.123999
Other Eastern Religion	- 3.528993	3.314834	- 1.06	0.287	- 10.0272	2.969213
Jewish	0.3831471	2.513588	0.15	0.879	- 4.544343	5.310637
Muslim	0.2739289	0.8343651	0.33	0.743	- 1.361711	1.909569
Humanist	10.48576	2.963858	3.54	0.000	4.675585	16.29593
Other Non-Christian Religion	- 0.4537074	1.385119	- 0.33	0.743	- 3.169014	2.261599
Uncertain of Religion	2.859787	1.611293	1.77	0.076	- 0.2988973	6.018472
Constant	2.849309	0.3854613	7.39	0.000	2.093673	3.604944

Table 38. Logistic Regression: Effect of Urbanity on Probability of being an Active Smoker

Number of Observations	=	6636
LR chi^2 (1)	=	6.34
Prob > chi^2	=	0.0118
Pseudo R-Squared	=	0.0009
Root MSE	=	-3589.5731

Independent Variable	**Smoker**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	0.0573786	0.0228188	2.51	0.012	0.0126546	0.1021026
Constant	- 1.371589	0.0753134	- 18.21	0.000	- 1.5192	- 1.223977

Table 39. Logistic Regression: Effect of Urbanity on Probability of being an Active Smoker (men)

Number of Observations	=	3076
LR chi^2 (1)	=	0.47
Prob > chi^2	=	0.4940
Pseudo R-Squared	=	0.0001
Root MSE	=	-1727.3083

Independent Variable	**Smoker**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	0.0222439	0.032532	0.68	0.494	- 0.0415177	0.0860055
Constant	- 1.169395	0.1071782	- 10.91	0.000	- 1.37946	- 0.9593291

Table 40. Logistic Regression: Effect of Urbanity on Probability of being an Active Smoker (women)

Number of Observations	=	3560
LR chi^2 (1)	=	7.76
Prob > chi^2	=	0.0053
Pseudo R-Squared	=	0.0021
Root MSE	=	-1856.3493

Independent Variable	**Smoker**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	0.0891729	0.0320765	2.78	0.005	0.0263041	0.1520418
Constant	- 1.554594	0.1061453	- 14.65	0.000	- 1.762635	- 1.346553

Table 41. Logistic Regression: Effect of Urbanity on Probability of being an Active Smoker (with controls)

Number of Observations	=	6310
LR chi² (22)	=	97.21
Prob > chi²	=	0.0000
Pseudo R-Squared	=	0.0144
Root MSE	=	-3331.9644

Independent Variable	**Smoker**					
	Coefficient	**Standard Error**	**z**	**P > |z|**	**[95% Confidence Interval]**	
Urbanity	0.0383792	0.0243179	1.58	0.115	- 0.0092829	0.0860414
Age	- 0.0049919	0.0019798	- 2.52	0.012	- 0.0088723	- 0.0011116
Male	0.1555767	0.0608475	2.56	0.011	0.0363179	0.2748355
Dutch Background	- 0.0236159	0.0753378	- 0.31	0.754	- 0.1712753	0.1240435
First Generation Foreigner, Western	0.1471807	0.2216413	0.66	0.507	- 0.2872284	0.5815897
First Generation Foreigner, Non-Western	- 0.2287002	0.2644927	- 0.86	0.387	- 0.7470964	0.2896959
Second Generation Foreigner, Western	- 0.0958046	0.1729597	- 0.55	0.580	- 0.4347994	0.2431903
Second Generation Foreigner, Non-Western	- 0.108909	0.3387944	- 0.32	0.748	- 0.7729338	0.5551158
Roman Catholic	- 0.2734885	0.0803625	- 3.40	0.001	- 0.4309961	- 0.1159809
Protestant	- 0.7098193	0.1490393	- 4.76	0.000	- 1.001931	- 0.4177077
Orthodox	- 0.0951334	0.8259701	- 0.12	0.908	- 1.714005	1.523738
Evangelical or Pentecostal	- 1.30989	0.4690921	- 2.79	0.005	- 2.229294	- 0.3904866
Dutch Reformed	- 0.4171647	0.1632633	- 2.56	0.011	- 0.7371548	- 0.0971746
Reformed Church in the Netherlands	- 0.5150207	0.1874136	- 2.75	0.006	- 0.8823446	- 0.1476969
Other Christian Community	- 1.040814	0.285964	- 3.64	0.000	- 1.601293	- 0.4803346
Hindu	0.0811765	0.8481777	0.10	0.924	- 1.581221	1.743574
Buddhist	- 0.0291439	1.159622	- 0.03	0.980	- 2.301961	2.243673
Other Eastern Religion	0	(omitted)				
Jewish	0.0612967	0.843379	0.07	0.942	- 1.591696	1.714289
Muslim	- 0.0764285	0.2996512	- 0.26	0.799	- 0.6637341	0.5108771
Humanist	0.7077436	0.9157185	0.77	0.440	- 1.087032	2.502519
Other Non-Christian Religion	- 0.2011428	0.5080505	- 0.40	0.692	- 1.196904	0.794618
Uncertain of Religion	0.7452873	0.4960659	1.50	0.133	- 0.2269841	1.717559
Constant	- 0.9815553	0.139472	- 7.04	0.000	- 1.254915	- 0.7081953

Appendix 3: Additional Graphs

Figure 4. Average Weekly Alcohol Consumption per Level of Urbanity

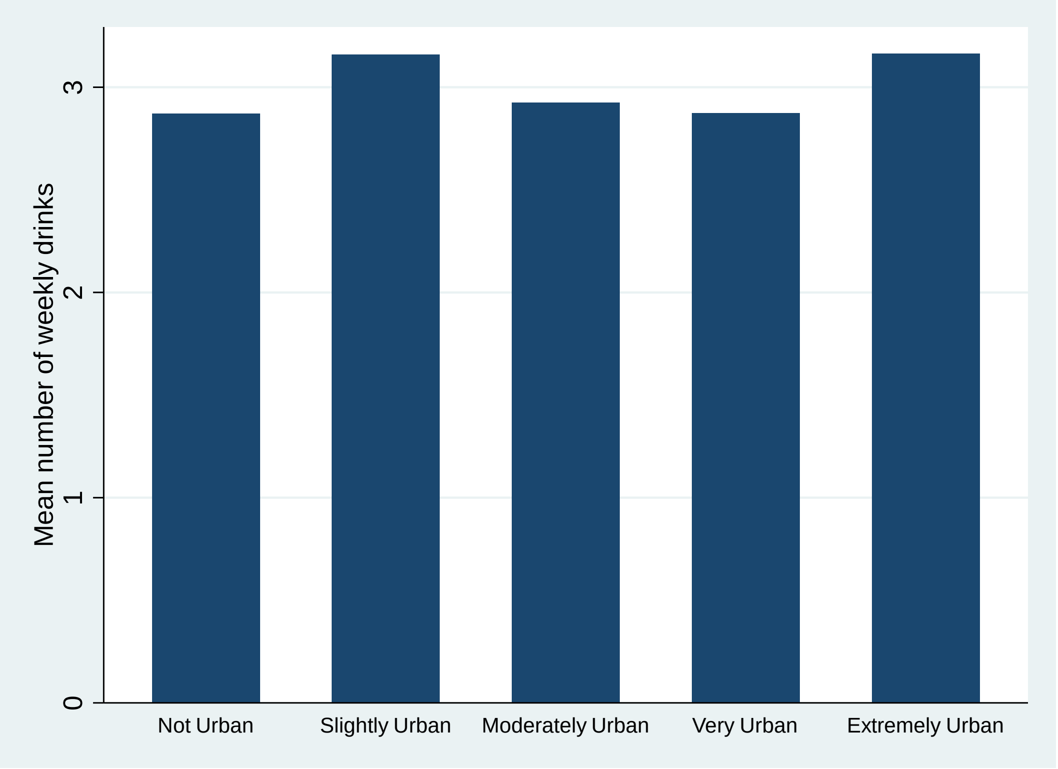

Figure 5. Average Daily Cigarette Consumption per Level of Urbanity