

# **‘Hoe wolle jo jo sînens ferbetterje?’**

## **Sociodemographic differences in health goals and preferred support for reducing drinking and smoking in Friesland**

Master Thesis Population Studies

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## **Abstract**

Alcohol consumption and smoking are harmful behaviours that threaten population health and tend to exacerbate existing health inequalities. Dutch healthcare policies are currently not on track of reaching health targets to reduce drinking and smoking, indicating a need for more effective interventions. This study examines the intentions of the population in Friesland to reduce or quit drinking and smoking. It investigates how sociodemographic differences (age, gender, educational attainment, income) influence health goals and preferred support for achieving these goals. Descriptive statistics and logistic regressions were conducted to analyse panel survey data provided by Planbureau Fryslân.

The results indicate that males, older individuals, and those with higher education and income are more likely to set alcohol-related health goals. Smoking-related goals are more common among smokers with intermediate education and modal salaries compared to those with higher socioeconomic status. Exploratory analyses of preferred support suggest that more support is preferred for smoking cessation than for alcohol cessation, with older individuals tending to prefer professional support or none at all, while younger people favour informal support. Gender and income also show weak associations with smoking support preferences.

Understanding sociodemographic differences in health goals of the Frisian population is valuable for effectively assisting them in reducing health-damaging behaviours. These insights can help policymakers develop targeted interventions to address the needs of disadvantaged groups, reducing health inequalities, and improving overall health in Friesland. The exploratory nature of preferred support findings highlights the need for further research to confirm these associations.

**Keywords:** health-damaging behaviours, health goals, sociodemographic differences, Friesland, theory of planned behaviour, health belief model, cessation support

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## List of abbreviations

AIC	Akaike information criterion
BIC	Bayesian information criterion
CI	Confidence interval
GenAI	Generative Artificial Intelligence
HBM	Health belief model
IIA	Independence of irrelevant alternatives
LR	Likelihood ratio
OR	Odds ratio
SES	Socioeconomic status
TPB	Theory of planned behaviour
VIF	Variance inflation factor

# 1. Introduction

## 1.1 Background

Alcohol and smoking pose significant threats to population health and are among the world's leading causes of preventable deaths (Organisation for Economic Co-operation and Development, 2021). Alcohol consumption is linked to chronic conditions such as liver disease, cardiovascular disease, various cancers, and neurological impairments (Griswold et al., 2018). Similarly, tobacco smoking is a major risk factor for diseases including lung cancer, heart disease, and stroke (Chang et al., 2021). Both substances are associated with adverse mental health outcomes and addiction (Prochaska et al., 2017; Sullivan et al., 2005).

In the Netherlands, 77% of adults consume alcohol, with 56% exceeding the guidelines set by the health council (Trimbos Instituut, 2023b). Additionally, 19% of adults smoke (Centraal Bureau voor de Statistiek, 2024a). Population subgroups differ in the extent to which they engage in these health damaging behaviours. Men tend to drink and smoke more than women, and younger people more than older groups (Centraal Bureau voor de Statistiek, 2024a; Trimbos Instituut, 2023b). Smoking is more prevalent among people of low socioeconomic status (SES) (Monshouwer et al., 2023; Zomer & Van der Noordt, 2020), while excessive alcohol consumption is more common among higher socioeconomic groups (Trimbos Instituut, 2023a). Despite this, lower-SES groups experience more alcohol-related problems, a phenomenon known as the alcohol-harm paradox (Beard et al., 2016). Thus, alcohol and smoking not only threaten population health but also exacerbate existing health disparities.

Currently, people with higher SES live longer and in better health (Centraal Bureau voor de Statistiek, 2023; Chen & Miller, 2013; Knoops & Brakel, 2010), a result of a complex interplay between differences in behaviour, living environments, psychosocial factors and underlying mechanisms like health skills (World Health Organization, 2019). Different groups have different motives and means that influence their health and health behaviours (Pampel et al., 2010).

## 1.2 Relevance

To improve population health, the Dutch government has formulated several healthcare policies. These policies are mainly aimed at prevention, and they range from laws and regulations to health programmes, public health campaigns, and education (Van Gestel et al., 2021). However, a recent report concluded that with current policies, the national health targets for reducing alcohol consumption and smoking by 2040 would not be accomplished, and that stronger measures would be required for this (Eykelboom et al., 2024; Kuijpers et al., 2024).

This master thesis examines how people want to reduce their risky health behaviours. It studies how sociodemographic characteristics – gender, age, education and income – influence health goals to reduce drinking and smoking among adults in the Dutch northern province Friesland. Additionally, it explores preferred support with reaching these health goals, to gain insights into *who* set health goals and *how* these people want to be supported. Friesland is the province with the highest percentage of people who perceive their health as good or very good (De Vries et al., 2021). Studying health goals in Friesland is particularly interesting because they provide insights into how people prioritise their health behaviours and the specific areas they seek to enhance. Understanding health goals and preferred support for reducing drinking and smoking can help target alcohol and smoking behaviours more effectively and assist people in improving their health.

Previous research has highlighted different relationships between sociodemographic characteristics and health goals, but no study has combined all these factors to examine both drinking and smoking. This thesis addresses this gap by examining drinking and smoking goals across gender, age, education and income levels, thereby providing a complete overview of the situation in Friesland. Moreover, it combines health goals with preferred support for achieving these goals, a relatively unexplored area in the context of alcohol and smoking. This research combines the theory of planned behaviour (for health goals) and the health belief model (for preferred support), the latter of which has not been applied to alcohol and smoking cessation support before. Combined insights offer a new

perspective on how sociodemographic factors influence health goals and support preferences, that can improve understanding of health behaviour dynamics in Friesland.

### **1.3 Research objective and research questions**

The main objective of this thesis is to identify sociodemographic differences in health goals to reduce alcohol consumption and smoking for the population of Friesland. It aims to investigate people's goals to reduce drinking and smoking for the near and far future, as well as their preferred support for achieving these goals, across various sociodemographic characteristics: gender, age, educational attainment, and income. The findings can be used to develop targeted interventions and support strategies to address and reduce health-damaging behaviours. This can improve overall health of the Frisian population and help reduce health inequalities by focusing on the most disadvantaged groups.

The main research question is: "How do sociodemographic characteristics influence health goals and preferred support for reducing alcohol consumption and smoking in Friesland?"

To answer this question, several sub-questions will be addressed:

1. How do people's goals to reduce alcohol consumption differ across different sociodemographic characteristics (gender, age, education, and income) in Friesland?
2. How do people's goals to reduce smoking differ across different sociodemographic characteristics (gender, age, education, and income) in Friesland?
3. How does preferred support for reducing alcohol consumption differ from preferred support for reducing smoking among Frisian adults?
4. How does preferred support for goals to reduce alcohol consumption and smoking differ across different sociodemographic characteristics (gender, age, education, and income) in Friesland?

This study employs quantitative methods to answer these research questions. Survey data from a Frisian panel were analysed using univariate and bivariate descriptive statistics and multinomial logistic regression models. The next chapter discusses the theoretical background of this study by outlining theories on health-related behaviour, providing an overview of previous studies, and introducing the conceptual model and the hypotheses. Chapter 3 provides detailed information on the data and methodology used in this research. Chapter 4 describes the results of the analyses, which are further discussed in chapter 5, alongside the limitations of the study. Finally, chapter 6 concludes the thesis by answering the research question and giving recommendations for policy and future research.

## 2. Theoretical background

This chapter provides an overview of two theories on health-related behaviour that form the basis of this study: the theory of planned behaviour and the health belief model. Additionally, it reviews previous research on sociodemographic variations in health, health goals, and cessation support, and it places these studies in the frameworks of the theories. Then, the conceptual model is presented which emerges from the theories and literature. Finally, the chapter gives an overview of the hypotheses that follow from the literature, theories and conceptual model.

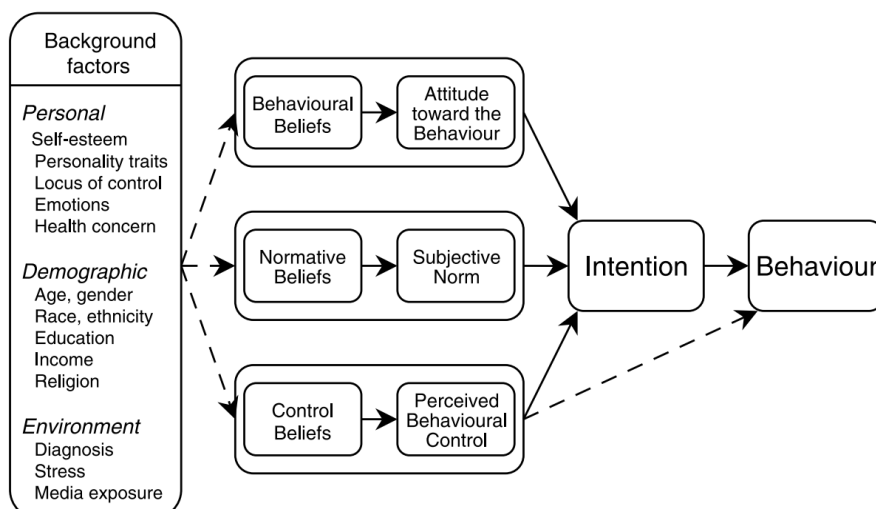
### 2.1 Theories on health-related behaviour

There are two theories that underly this study: the theory of planned behaviour and the health belief model. Both theories describe health behaviour changes and contain elements that can help explain sociodemographic variations in health goals to reduce drinking and smoking, and preferred support.

#### 2.1.1 Theory of planned behaviour

The theory of planned behaviour (TPB) is often used to understand and predict individual behaviour. This theory is an extension of the theory of reasoned action proposed by Ajzen and Fishbein (1980) with an addition of perceived behavioural control. The TPB, as visualised in figure 1, suggests that people’s behaviours are determined by their intentions, which are in turn influenced by three main factors: a person’s attitude towards the behaviour, subjective norms, and the perceived level of behavioural control. If a person perceives a certain behaviour as positive (attitude), if they perceive social pressure to perform the behaviour (subjective norm) and if they believe they are capable of performing the action (perceived behavioural control); they will *intend to* engage in a behaviour (Fishbein & Ajzen, 2011). The TPB then views intentions as the most important predictor of actual behaviour, with the predictive validity of intentions being especially strong on a shorter time interval (Ajzen, 2011). In addition, whether an intention predicts behaviour also depends on actual control factors, such as a person’s skills and environmental influences (Ajzen, 2011).

The TPB assumes that the three determinants of behaviour – attitudes, subjective norms, and perceived behavioural control – have corresponding behavioural beliefs, for example regarding the consequences of behaviour, the expectations of others, and the factors that can facilitate or hinder the behaviour (Ajzen & Manstead, 2007). Furthermore, attitude, subjective norms, and perceived behavioural control are embedded in individual background factors, including personal and demographic factors, as portrayed in figure 1 (Ajzen & Manstead, 2007).



**Figure 1:** Theory of planned behaviour (source: Ajzen & Manstead, 2007, p. 46)



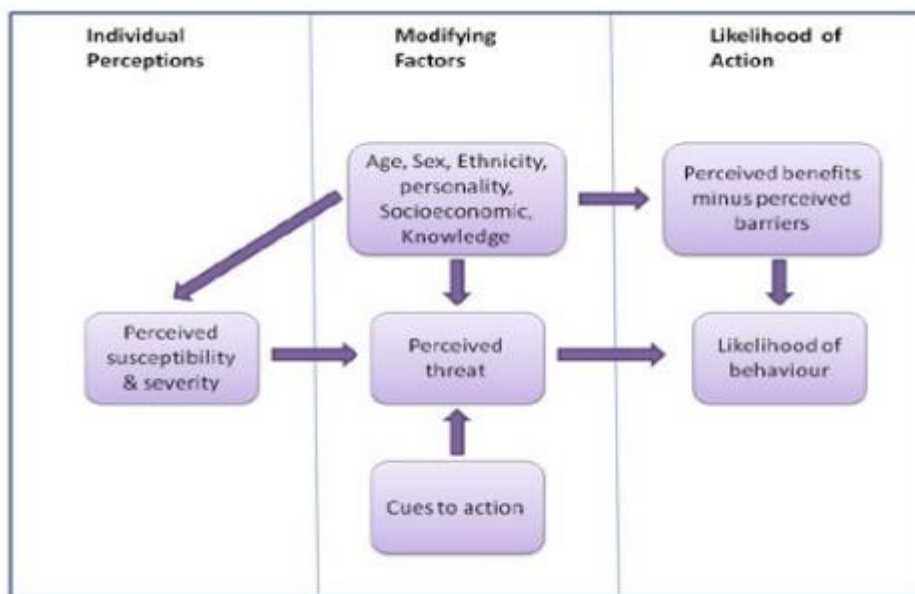
A strength of the TPB is that it captures individuals' perceptions of performing behaviour and that it shows clear relations of how behavioural intentions come to be. A limitation is that it is very rational and may not account for impulsive or habitual behaviours (Droomers et al., 2016; Galvin, 1992). The theory is mainly used in quantitative research and has limitations for a deeper understanding of behaviour (De Haas, 2017).

*Theory of planned behaviour in the context of this research*

For this research, the TPB is especially relevant as it theorises how intentions come to be. It gives insight in the role of sociodemographic factors and the pathway through which this happens. In this study, the health goals to reduce drinking and smoking align with Ajzen's concept of intentions. Sociodemographic characteristics such as gender, age, educational attainment, and income, influence the three determinants of behaviour, which in turn shape intentions. Thus, the TPB can help explain the link between sociodemographic characteristics and health goals, to gain a deeper understanding of differences in the goals to reduce drinking and smoking. Previous research (Bhochhibhoya & Branscum, 2018; Cooke et al., 2016; Droomers et al., 2004; Høie et al., 2012; McMillan & Conner, 2003) supports the use of the TPB to predict intentions to reduce drinking and smoking. Different studies highlight different predictors of the theory to best forecast intentions, and Ajzen (1991) also mentioned that the impact of the different variables of the TPB could differ across populations and situations (Moan & Rise, 2005). Applying this theory to the Frisian context can help identify underlying mechanisms behind sociodemographic differences in health goals in this region. The conceptual model in section 2.3 further elaborates on the use of the TPB in this study.

*2.1.2 Health belief model*

Another framework that can help explain individual health differences, is the health belief model (HBM). This model describes different factors that influence people's health-related behaviours (figure 2). According to the HBM, health behaviours are influenced by a person's perceptions of health risks (susceptibility and severity), perceived benefits of taking action to reduce those risks, and perceived barriers to adopt health-related behaviours. Individuals can differ in their perceptions due to different personal characteristics, such as demographic or psychosocial variables (Stretcher & Rosenstock, 1997).



**Figure 2:** The health belief model (source: Stretcher & Rosenstock, 1997)

The HBM allows for a holistic understanding of health-related decision-making by emphasising personal perceptions and explaining individual differences in health behaviours. A limitation is that the model assumes all people value health and want to engage in health-related behaviours (Mikhail, 1981), making it less suitable for application in broader contexts. Also, the model's individual focus risks overlooking broader social and environmental factors (Taylor et al., 2006). The HBM has limited predictive power compared to other models such as the theory of reasoned action (the predecessor of the theory of planned behaviour) and its predictive accuracy changes across contexts (Zimmerman & Vernberg, 1994). Some scholars argue the HBM is more a list of variables than a theory based with clearly specified relationships, limiting its usefulness in quantitative research (Taylor et al., 2006; Zimmerman & Vernberg, 1994).

#### *Health belief model in the context of this research*

For this research, the HBM can provide insights into sociodemographic differences in support preferences for alcohol and smoking cessation. The HBM contextualises how sociodemographic characteristics influence perceptions that shape the likelihood of actions like support-seeking. While the HBM has previously been applied to general alcohol and smoking behaviours (De Leon et al., 2023; Pribadi & Devy, 2010), and support-seeking in the context of mental health problems (Henshaw & Freedman-Doan, 2009; Kim & Zane, 2015; O'Connor et al., 2014), it has not yet been used specifically for alcohol and smoking cessation support. Studies on mental-health support seeking indicate that particularly perceived benefits (effectiveness of support) predict help-seeking intentions, and that help-seeking is least likely when many barriers (such as stigma) are perceived (Kim & Zane, 2015; Nam et al., 2013; O'Connor et al., 2014). Research on alcohol and smoking cessation confirms that people are more likely to seek support when they are aware of the benefits (McKee et al., 2005), and when stigma is absent (Marlatt et al., 1997; McKee et al., 2005). This study focuses on the HBM's barriers and benefits to understand support-seeking across sociodemographic characteristics.

## **2.2 Literature review**

The next section gives an overview of current studies on sociodemographic differences in health-damaging behaviours, health goals, and preferred support. It elaborates on differences in health goals related to drinking and smoking, and discusses potential explanations that are given for these differences. Sociodemographic differences are described with regards to gender, age, educational attainment and income. Furthermore, current studies on preferred support for reducing alcohol and smoking are discussed, and how these are influenced by sociodemographic characteristics.

### *2.2.1 Gender differences in health and health goals*

The first sociodemographic factor that could influence health goals, is gender. In Friesland, like in the rest of the Netherlands, men drink and smoke more than women (Centraal Bureau voor de Statistiek, 2024a; Marinus, 2023; Trimbos Instituut, 2023b). Studies on gender differences in intentions to reduce these habits have mixed findings. For alcohol, there are a few studies on gender differences in intentions reduce drinking. A Dutch report notes that, although men more often drink heavily and problematic, the proportion of men and women that want to reduce their drinking is equal (Kloosterman et al., 2023). Beard et al. (2016) found that among heavy drinkers, women are more likely than men to cut down their intake. These studies seem to suggest that women are relatively more concerned with their alcohol consumption. When underlying motivations are considered, several studies indicate that women approach alcohol consumption differently than men. Women are more likely to view alcohol as harmful (Kloosterman et al., 2023) and focus on the positive outcomes reducing intake (Cooke et al., 2016); while men more often drink for social reasons (Kloosterman et al., 2023) and are more susceptible to masculinity concerns and the related social pressure to drink (Cooke et al., 2016). In light of the TPB, these gender differences reflect different attitudes and social norms regarding drinking.

For smoking, there are studies that suggest women are more likely to want to quit (Chinwong et al., 2018; Liu et al., 2021), although data from the Netherlands show no significant difference between the genders in the desire to stop smoking (Kloosterman et al., 2023). The studies that do find gender differences argue that women are more likely to quit because they are more concerned about health

damage (Chinwong et al., 2018), or because they smoke less, making them feel less dependent on cigarettes and more in control of their actions (Liu et al., 2021). These factors show parallels to the TPB aspects of attitude (health concerns) and behavioural control (feeling in control of your actions).

Overall, while there are gender differences in smoking and drinking behaviours, evidence on health goals related to these behaviours seems mixed. Some studies find no significant differences in health goals, while others find women are more likely to set smoking or drinking health goals. Underlying explanations for these differences are mixed as well and relate to different aspects of the TPB.

### *2.2.2 Age differences in health and health goals*

Another characteristic that could influence people's health intentions is their life stage. Generally, young people smoke and drink more, which is also the case in Friesland (Centraal Bureau voor de Statistiek, 2024a; De Vries et al., 2021; Trimbos Instituut, 2023b). The effect of age on health goals seems less straightforward. For alcohol intentions, evidence is mixed; a study by Davies et al. (2019) found that older-age individuals are more likely to reduce their intake, especially in the near future (Davies et al., 2019), while others studies report that elderly less often want to reduce their drinking compared to younger groups (Han et al., 2018; Kloosterman et al., 2023). Reasons for this vary; from lower initial consumption levels for older people (Kloosterman et al., 2023), to a lower perceived urgency to change, potentially due to an incomplete understanding of the risks of drinking among older adults (Han et al., 2018). Among individuals with alcohol abuse or dependence, Chiapetta et al. (2014) found younger adults to be more likely to attempt quitting. Underlying motivations for (not) drinking also differ by age: younger people more often drink because of social reasons (Kloosterman et al., 2023), while older people are less likely to view social factors as barriers to giving up alcohol (Han et al., 2018). Middle-aged and older respondents more often cite health as a reason to drink less (Davies et al., 2017; Kloosterman et al., 2023); while the youngest and oldest age groups want to change their drinking behaviour because of (sexual) embarrassment or forgetfulness (Davies et al., 2017).

Regarding smoking, several studies found that younger smokers are more likely to attempt quitting (Arancini et al., 2021; Nagelhout et al., 2013), motivated by a longer remaining life expectancy (Margolis, 2013), while older smokers have fewer intentions to stop smoking (Kloosterman et al., 2023). Social norms also play a role, especially for younger smokers, who are more vulnerable to other people's opinions, both when these are in favour or against smoking (Høie et al., 2012; Moan & Rise, 2005). Additionally, younger smokers seem to be more confident about their ability to quit than older adults, who have experienced more failed past attempts (Dono et al., 2022). This differs from alcohol cessation, as Han et al. (2018) found that especially older adults are confident about their ability to change their drinking habits. Smoking and alcohol-related behaviours also seem to differ over the life course due to different life transitions, such as starting a career or family, changing social norms, and emerging health problems (Dawson et al., 2013; Görlitz & Tamm, 2020; Lillard & Christopolou, 2015; McDermott et al., 2006; Pampel et al., 2017), which could be reflected in people's health goals.

Overall, generational differences are observed due to evolving priorities, social norms, and confidence in quitting. These findings suggest links between age and the TPB's components – attitudes, subjective norms, and perceived behavioural control – that shape people's drinking and smoking patterns and intentions to reduce or quit these behaviours.

### *2.2.3 Socioeconomic differences in health and health goals*

Socioeconomic status<sup>1</sup> is another characteristic that influences people's health and health behaviours. Individuals with lower education and income levels generally report worse health, and more frequently engage in unhealthy lifestyles (Eikemo et al., 2017; Knoops & Brakel, 2010; Mackenbach, 2010; Ross

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<sup>1</sup> Socioeconomic status (SES) encompasses people's social standing, and can be measured through income, educational attainment or occupation, but also through a people's perceptions of social class and status (American Psychological Association, 2023). This thesis uses educational attainment and personal income as variables to measure SES (see also chapter 3).

& Wu, 1995). In the Netherlands, high-educated individuals live up to five years longer, and 15 more years in good health, compared to low-educated groups (Centraal Bureau voor de Statistiek, 2023). Part of this disparity can be explained by differences in health behaviours: higher-educated pay more attention to healthy habits (Viinikainen et al., 2022), while lower-educated individuals more often engage in risky health behaviours (André et al., 2018), including smoking (Monshouwer et al., 2023; Zomer & Van der Noordt, 2020). Factors contributing to socioeconomic health disparities include knowledge gaps (Rademakers, 2014), financial resources, working conditions, social networks, and cultural lifestyle differences (Kraaykamp et al., 2018).

In general, frequent alcohol consumption is more common among high-SES groups, who are more often heavy drinkers, while people with a lower education and income are more often non-drinkers or drinking within the health guidelines (Trimbos Instituut, 2023a; Zomer & Van der Noordt, 2020). André et al. (2018) hypothesise that this could be due to the social and cultural acceptance of alcohol among high-SES groups. In Friesland, a slightly different pattern is observed, where high-SES individuals are less often heavy or excessive drinkers compared to middle- and low-SES groups (Marinus, 2023). Smoking is more prevalent among lower-educated and low-income groups, also in Friesland (Marinus, 2023), potentially because this behaviour is more accepted and less stigmatised in their social networks, or because they know less about the health risks (André et al., 2018). Despite the high costs of tobacco, financial constraints do not seem to play a role here, or they may be outweighed by other factors such as social norms (André et al., 2018).

Research on socioeconomic differences in health goals and intentions shows mixed results. For alcohol consumption, Kloosterman et al. (2023) found higher educated more inclined to reduce their drinking. Although this intention aligned with their higher initial consumption levels, higher-educated also estimated the harms of alcohol higher, more often had the desire not to drink, and more commonly cited their health as a reason not to drink (Kloosterman et al., 2023). Between income groups, no significant differences were found in the desire to cut back on alcohol, but motivations varied. While higher-income individuals more often mentioned a satisfaction with their current alcohol consumption level as a reason not to reduce, those from lower-income households more often mentioned their already low consumption as a reason for not wanting to drink less (Kloosterman et al., 2023). In general, it seems that individuals that consume more alcohol are more motivated to reduce their intake (De Vocht et al., 2018), and that in countries with more problematic drinking, more people have the intention to reduce drinking (Davies et al., 2019). Also, higher-educated seem more aware of the harms of alcohol than lower-educated people (Kloosterman et al., 2023).

For smoking, several studies report that higher-educated have more positive attitudes toward quitting than smokers from lower-educated groups (Brownson et al., 1992; Manfredi et al., 1998; Reid et al., 2010), and that higher-income smokers are more likely to intend to quit or cut down (Droomers et al., 2004; Reid et al., 2010). However, there are also studies that found no effect of education on intentions to quit smoking (Clark et al., 1998; Droomers et al., 2004, 2016), potentially because higher-educated smokers may represent a more selected group of hardcore smokers, who continue smoking despite knowing about its harms, while for lower-educated smokers, social norms and acceptance play a more important role in their smoking behaviour (Droomers et al., 2004).

When considering actual behavioural change, Beard et al. (2016) found that high socioeconomic status, measured by occupational level and income, correlates with a higher likelihood of attempting to cut down alcohol. This could potentially explain the alcohol harm paradox, where those with a lower SES experience more alcohol-related problems despite lower consumption (Beard et al., 2016). For smoking, Margolis (2013) found that after diagnosis of a health condition, higher-educated individuals are more likely to change their behaviour by smoking less. More generally, it seems that higher-educated individuals are more successful in translating intentions into actions, because of greater psychological capacity for behavioural changes and better support systems (Cutler & Lleras-Muney, 2010), and that lower-educated groups do not succeed in reaching their health goals as often (Droomers et al., 2004). Income may also play a role here: low-income groups experience more financial stress than those in a financially secure situation, leading them to be more present-oriented, and as a result, value health differently (Hill et al., 2014; Jarvis et al., 2003). Lower-income groups may also have poorer access to cessation resources that make it more difficult for them to quit smoking or drinking (Casetta et al., 2017; Hill et al., 2014; Jarvis et al., 2003; Wood & Bellis, 2017).

To summarise, lower socioeconomic status is associated with worse health, increased health risks, and different health intentions. In Friesland, lower socioeconomic status is related to more frequent engagement in the health-damaging behaviours drinking and smoking. Socioeconomic inequalities in health are related to inequalities in knowledge, resources, support and norms, all of which can facilitate behaviour change. In the context of the TPB, these inequalities reflect the influence of education and income on attitudes, social norms, and behavioural control. Socioeconomic differences should also be taken into account when studying how to best support people in changing their behaviour, which are discussed in the next section.

#### *2.2.4 Differences in preferred support*

Research suggests that support could help people reach their health goals and lead to better health outcomes (Marlatt et al., 1997; Trimbos Instituut, 2023d). Support makes people more likely to succeed because it can provide people with practical resources (Van Westen-Lagerweij et al., 2022), encouragement, and a sense of community through shared experiences (Carlson et al., 2002; Reynoso et al., 2005). Support can come from formal sources such as medical experts or lifestyle coaches, but also from informal sources like friends and family. Literature suggests that the extent to which people would like to receive support in reducing smoking or drinking, and the preferred source of support, differ by health goal and by sociodemographic characteristic.

Previous studies show that people are generally more likely to seek support when they are aware of the benefits of support (McKee et al., 2005), and less likely when people experience more stigma (Marlatt et al., 1997) or other perceived barriers (McKee et al., 2005). People usually want to receive more help with quitting smoking than with reducing alcohol consumption (Davies et al., 2019; Kloosterman et al., 2023; Owen & Davies, 1990), possibly because drinking is more normalised in society and seen as less harmful than smoking (Kloosterman et al., 2023; Marlatt et al., 1997). In line with this, different studies report that people that want to reduce smoking generally prefer formal sources of support, especially from their doctor (Dono et al., 2022; Owen & Davies, 1990), while those that want to drink less more often feel stigma around this, making them more hesitant to seek formal help (Marlatt et al., 1997).

People's support needs and preferences are also influenced by sociodemographic characteristics. Different studies show that especially people that perceive smoking cessation as difficult, are open to receiving support (Clare et al., 2014; Dono et al., 2022; Owen & Davies, 1990). More concrete, especially older and socioeconomically disadvantaged smokers use supported methods such as help from a doctor or stop smoking services for cessation (Clare et al., 2014; Dono et al., 2022; Smith et al., 2022). Schöllgen et al. (2011) confirm that especially people from more deprived socioeconomic backgrounds, as well as older adults, benefit from support in reaching their health goals, and they add that support from social networks may be especially beneficial for lower-income groups, because they may experience more difficulty affording professional help (Schöllgen et al., 2011). Meanwhile, higher-SES and younger smokers feel more confident about their ability to quit smoking without assistance (Clare et al., 2014; Dono et al., 2022). For alcohol, Han et al. (2018) found that older people are more confident about their ability to quit, although they were also more likely to use supported methods, a finding confirmed by Davies et al. (2019). Furthermore, several studies found that for alcohol and smoking cessation, younger people prefer informal over formal support (Benson, 1990; Buscemi et al., 2010; Helle et al., 2022), and online over offline support (Garnett et al., 2017), potentially because younger people have relatively stronger feelings of stigmatization than older generations (Choi et al., 2014). When looking at gender differences, females have been shown to be more receptive to help in reducing alcohol intake than males (Helle et al., 2022). Women's preferred sources of support include professional support (Owen & Davies, 1990) as well as more social sources like peer groups, focusing especially on psychosocial challenges and needs (Leal et al., 2021; Owen & Davies, 1990; Stewart et al., 2011). An explanation for this could be that women especially struggle with emotional challenges during cessation, whereas men encounter more external, environmental obstacles, resulting in a stronger preference for more coercive measures (Dieleman et al., 2021).

These findings show some general tendencies that align with the HBM interactions: support-seeking is more likely when the perceived benefits of support are higher, which seems to be the case across sociodemographic characteristics but also for drinking compared to smoking. Additionally,

perceived barriers such as stigma decrease the likelihood of seeking support, and these barriers also differ across sociodemographic characteristics as well as by health goal. Furthermore, the preferred source of support could be related to the benefits and barriers that people perceive of employing that source of support: for example, for socioeconomically disadvantaged groups, the benefits of professional support may be higher because their personal support networks are weaker (Dono et al., 2022), and younger people may see more benefits in employing online sources because they are more at ease with using online methods (Garnett et al., 2017). The next section further outlines how the interactions of the HBM work in the conceptual model of this study.

### 2.3 Conceptual model

The literature review has shown how various sociodemographic variables influence health goals and preferred support. The theory of planned behaviour (TPB) and the health belief model (HBM) describe mechanisms through which these variables interact with determinants of behaviour (attitude, social norms, perceived behavioural control), and perceived benefits and barriers, leading to different intentions and actions. For the TPB, what is especially relevant is how sociodemographic characteristics influence attitudes, norms, and perceived behavioural control, which in turn affect health goals. Applying the TPB to health goals in Friesland may help understand and address differences in health goals.

The HBM will be applied to support-seeking intentions, focusing on how sociodemographic characteristics influence perceived benefits and barriers, which then affect support preferences. The HBM can reveal sociodemographic differences in perceived barriers and benefits of support, which can guide policies and research to make cessation support more accessible and effective. Additionally, the HBM will compare support-seeking behaviours between alcohol and smoking cessation. Despite the model’s focus on individual characteristics, it can help identify differences between these goals as well, by identifying variations in support preferences between alcohol and smoking cessation.

The conceptual model of this study is shown in figure 3. The model visualises how sociodemographic characteristics influence health goals through the interactions of the TPB, and support preferences through the interactions described by the HBM. Since preferred support is only indicated by respondents who set a certain health goal, there is a funnel-like relationship between the health goals and support preferences. This relationship also indicates that the preferred support depends on the specific health goal that is set, meaning that support preferences differ between the goals to reducing smoking versus drinking.

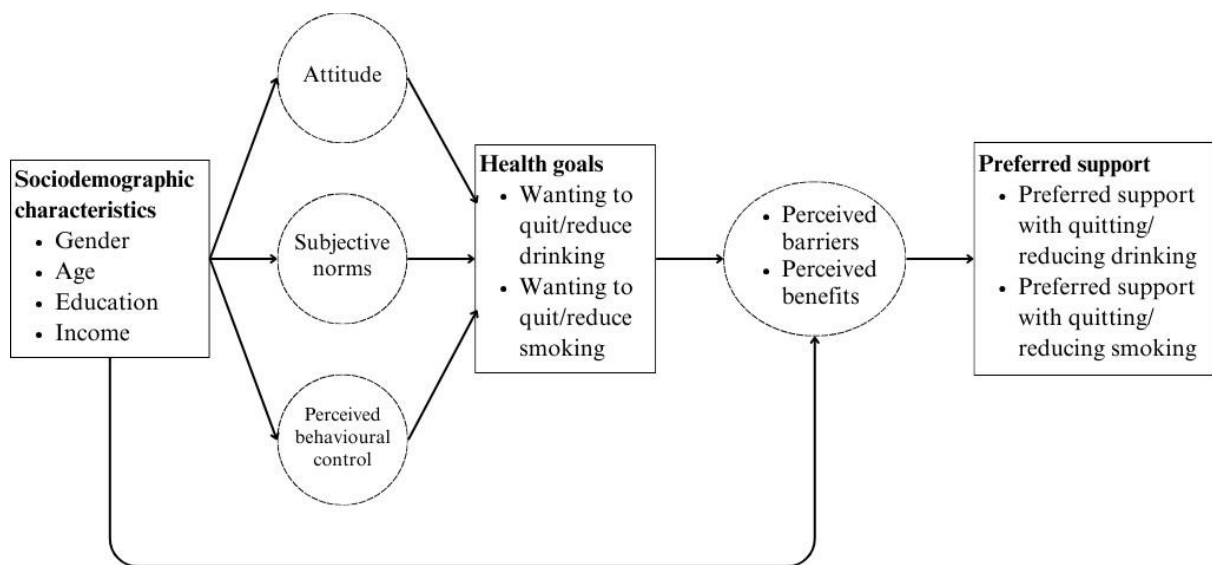


Figure 3: Conceptual model (created by author)

### *2.3.1 Interactions of variables in the conceptual model*

The literature review has outlined how sociodemographic characteristics influence health goals and support preferences, and it has already indicated several parallels with the TPB and HBM. The next section further discusses the interactions between these variables and how they are linked in the conceptual model.

#### Health goals

In line with the interactions of the TPB, sociodemographic characteristics influence health goals through attitudes, norms, and behavioural control. In the case of gender, previous research shows differences in attitudes as women are more concerned about the health damage of alcohol and smoking (Chinwong et al., 2018; Kloosterman et al., 2023), and are more focused on the expected positive outcomes of behavioural change (Cooke et al., 2016). Norms to smoke and drink are generally stronger for men (Cooke et al., 2016); and in the case of smoking, women experience more behavioural control, because they are generally less dependent on cigarettes (Liu et al., 2021). Through these factors, being female may relate to a higher likelihood of setting alcohol and smoking health goals than being male.

For age, studies show differing attitudes towards risky health behaviours over the life course due to the effect of life transitions, arising health problems, and remaining life expectancy (Dawson et al., 2013; Lillard & Christopolou, 2015; Margolis, 2013). Subjective norms also change over the life course as social acceptance of drinking and smoking shifts (Dawson et al., 2013; Han et al., 2018; Pampel et al., 2010), and vulnerability to social pressure reduces with age (Han et al., 2018; Høie et al., 2012). Furthermore, perceived behavioural control is higher for young smokers (Dono et al., 2022). In contrast, older adults are more confident about their ability to quit drinking (Han et al., 2018), although this corresponds with a lower urgency to change and may not influence goal-setting. These age-related fluctuations make it difficult to predict exact patterns, but in this study, it is expected that younger age will result in more goals to drink and smoke less, especially because older adults experience lower urgency and shorter remaining life expectancy. While younger people are more vulnerable to social norms, these can work both ways, either be positive or negative against drinking and smoking. Also, for smoking, older age seems related to a lower confidence in abilities to quit, which is expected to negatively influence goal-setting.

Higher education- and income-levels are related to more negative attitudes towards drinking and smoking, because of higher awareness of the damage of these behaviours and paying more attention to healthy habits (André et al., 2018; Rademakers, 2014; Viinikainen et al., 2022). Conversely, financial stress causes people to prioritise factors other than health (Hill et al., 2014; Jarvis et al., 2003). Subjective norms differ across education- and income-levels and across behaviours, where in Friesland, it is expected that heavy drinking and smoking are more accepted among lower- and middle-SES groups, who engage in these behaviours more (Kloosterman et al., 2023; Marinus, 2023). Furthermore, socioeconomic inequalities in psychological, economic and social resources to attempt quitting drinking and smoking (Cutler & Lleras-Muney, 2010; Droomers et al., 2004; Hill et al., 2014), can be linked to differences in perceived behavioural control. Through these interactions, higher educational attainment and income level are expected to lead to higher likelihood of setting health goals for both drinking and smoking.

#### Preferred support

Preferred support is also linked to sociodemographic characteristics, as well as to health goals, through the interaction with perceived barriers and benefits. It is expected that health goals influence preferred support, because perceived benefits and barriers may differ for alcohol compared to smoking. For smoking cessation, support is more normalised (McKee et al., 2005), also from professional sources (Dono et al., 2022), which could result in preferences for more and professional support for this behaviour. Conversely, for alcohol cessation support, stigma is higher (Marlatt et al., 1997) and people are less aware of the benefits of support (Kloosterman et al., 2023), which is expected to result in lower overall support preferences. This stigma and lower awareness of benefits of cessation support, may also

result in especially preferences for informal support in the case of alcohol cessation, as this is accessed more easily.

As described by the HBM, perceived barriers and benefits are also influenced by personal characteristics. Gender-wise, being female could lead to a higher preference for support (Helle et al., 2022), especially through social support sources (Leal et al., 2021; Owen & Davies, 1990; Stewart et al., 2011), because the perceived benefits of this type of support are particularly high among women due to the emotional challenges they encounter in smoking or drinking cessation (Dieleman et al., 2021). Meanwhile, men especially encounter external, environmental challenges (Dieleman et al., 2021), which is expected to result in fewer perceived benefits from support, and thus, a lower preference for cessation support.

For age, it is expected that older age is related to higher perceived benefits of support, given that older smokers have often already experienced the difficulty of quitting on their own (Dono et al., 2022). This could also mean that asking for professional support may be more normalised at older age (Davies et al., 2019; Schöllgen et al., 2011), resulting in lower perceived barriers. Younger age, on the other hand, may be related to higher barriers for asking support, caused by stronger feelings of stigma (Choi et al., 2014), and fewer perceived benefits from especially professional support sources (Dono et al., 2022). These higher barriers could potentially result in especially perceived benefits for more accessible support sources (Garnett et al., 2017), such as informal support.

Lower education and income levels are both expected to lead to preferring more support, as the perceived benefits of receiving support are higher (Schöllgen et al., 2011), given that lower-educated groups struggle more with translating intentions into actions (Cutler & Lleras-Muney, 2010), and because lower-SES groups less often succeed in reaching health goals (Droomers et al., 2004). This could also be a reason for socioeconomically disadvantaged groups to prefer professional sources of support over other support sources (Clare et al., 2014; Dono et al., 2022; Smith et al., 2020). Meanwhile, higher-SES groups are expected to experience more barriers in asking for support; due to self-induced and social stigma (Cutler & Lleras-Muney, 2010; Kim & Zane, 2015; Kloosterman et al., 2023), and because they perceive relatively fewer benefits of external support compared to lower-SES groups (Clare et al., 2014), resulting in lower preferences for cessation support.

## 2.4 Hypotheses

Based on the theories and literature, the following hypotheses arise:

1. Women, people with a younger age, a higher education level, and a higher income, are more likely to set health goals to reduce their alcohol consumption.
2. Women, people with a younger age, a higher education level, and a higher income, are more likely to set health goals to reduce smoking.
3. For the goal to reduce alcohol consumption, people more often prefer no support or informal support, while for the goal to reduce smoking, people more often prefer professional sources of support.
4. Women, people with an older age, a lower education level, and a lower income, more often prefer to receive support with their health goals. Women are more likely to prefer informal sources of support, and people with an older age, a lower education level, and a lower income, more often prefer professional sources of support.



### 3. Data and methodology

This chapter discusses the data and methods used to answer the research questions. It begins by outlining the study design, population, and sample. Next, the dataset and its quality are described, followed by the operationalisation of the concepts into measurable variables. Then, the statistical analysis methods are discussed, followed by reflections on ethical considerations. Finally, the use of Generative Artificial Intelligence (GenAI) is considered.

#### 3.1 Study design

For this research, quantitative analyses were conducted, using secondary survey data provided by Planbureau Fryslân, an independent research institute in the Dutch province of Friesland. Quantitative research is suitable for examining relationships and trends, as it allows for systematic investigation of variables (Babbie, 2020). The study is cross-sectional, meaning it compares participants' data at a single point in time rather than over multiple periods, as in longitudinal research (Babbie, 2020). The research is of a descriptive nature and aims to describe sociodemographic differences in health goals and preferred support.

#### 3.2 Study population and sample

This study investigates the health goals and preferred support of the adult population in Friesland, a province in the Northern Netherlands with approximately 660,000 residents (Hutjes, 2024). Compared to other Dutch provinces, Friesland scores average on most health indicators, including levels of alcohol consumption and smoking. Remarkably, though, the *experienced health* is relatively high in Friesland: it is the province with the highest percentage of citizens who perceive their health as (very) good (De Vries et al., 2021). Experienced health encompasses both mental and physical health and can be influenced by lifestyle factors, such as drinking and smoking behaviour, and whether people are trying to make changes in this (i.e., health goals).

The sample consists of panel members of Panel Fryslân, a representative random sample of 7,000 Frisian adults. Panel members are invited to fill in five or six online questionnaires annually on various topics (Planbureau Fryslân, n.d.). Panel members were selected using municipality data, which is known to be quite complete. Every two years, new additional panel members are being selected to maintain representativeness and account for potential loss of participants over time. When selecting new panel members, underrepresented groups are targeted specifically, for instance by requesting extra information of younger inhabitants (Planbureau Fryslân, 2023).

Typically, each Panel Fryslân survey is completed by 30 to 50% of panel members. For this research, the response rate was around 40%, making the sample the group of participants who completed the relevant surveys. The study sample for the first research question on alcohol health goals includes all respondents, resulting in a study population consisting of all Frisian adults. The subsequent research questions focus on subsets of the sample: participants who smoke (question two), because people can only intend to smoke less if they are current smokers; and those with goals to reduce drinking or smoking (questions three and four), because preferred support with reducing these behaviours was only indicated by those that set certain health goals. Therefore, the study population for smoking health goals is limited to Frisian adults who smoke, and for preferred support with smoking/drinking, it is limited to those who would like to quit or reduce these behaviours.

#### 3.3 Dataset and quality

The dataset used for this research combines information from different Panel Fryslân survey rounds. Respondents' health goals and preferred support data were collected from the February 2024 survey, completed by 3,714 respondents, focused on health. Sociodemographic information was acquired from the intake survey, completed by all participants prior to joining the panel, and an April 2024 survey that updated potentially changing characteristics, such as income.

The quality of the data is relatively high. To ensure survey quality, questionnaires underwent three rounds of testing to ensure prior to distribution: input from experts within and outside of the Planbureau to ensure credibility, feedback from test subjects on user-friendliness and accessibility, and technical checks to optimise survey routing and programming (Biemer, 2010; Planbureau Fryslân, 2023). After data collection, checks for nonresponse and missing data were conducted, and weight factors were provided to reflect the composition of the Frisian population by gender, age category and education level (Planbureau Fryslân, 2023).

Despite these measures, potential downsides to the dataset remain. The reliance on self-reported data can introduce biases, as participants may answer in socially desirable ways, although studies suggest social desirability bias has little to no impact on reporting of risky health behaviours and intentions (Armitage & Conner, 1999; Crutzen & Göritz, 2010; Persoskie & Nelson, 2013). Second, even with weight factors and targeted sampling strategies, some biases may persist, leading to potential under- or overrepresentation of certain groups, such as those that are not registered, may not have access to the internet, or are difficult to reach. Nonresponse may remain, as weighting cannot completely correct for systematic differences between respondents and non-respondents, potentially skewing the results. Missing values from multiple survey rounds pose another issue; Panel Fryslân typically sees a 10-15% attrition rate between surveys. Respondents with missing data or incomplete questionnaires were excluded from the analyses, except for those with missing income data, which is further discussed in section 3.5. This exclusion led to a final sample of 3,280 participants. Lastly, the depth of information is limited due to the design of survey questions, which could limit research insights.

### 3.4 Operationalisation of concepts

To measure the concepts introduced in the conceptual model, different survey questions were employed. These concepts were turned into the dependent and independent variables for this research, as discussed in the following section.

#### 3.4.1 Health goals

Health goals were measured through participants' answers to the following question: "Below here, there are a number of possible ways to improve your health. Which changes would you or would you not like to apply?". The answer options included a list of health goals, including 'reducing/quitting alcohol consumption', 'reducing/quitting smoking' and 'reducing/quitting vaping or using a nicotine evaporator'. For each health goal, the answer options were 'yes, in the next six months', 'yes, in the future' or 'no/not applicable'. Participants that selected 'yes, in the next six months' were considered to have an *immediate health goal*, those that selected 'yes, in the future' were considered to have a *future health goal*, and those that selected 'no/not applicable' were considered to *not have a health goal*.

Participants that indicated an immediate or future goal to reduce or quit alcohol consumption, were considered to have an alcohol health goal. Similarly, those that indicated an immediate or future goal to reduce or quit smoking and/or vaping were considered to have a smoking health goal. The answer options of smoking and vaping were combined because, in the Netherlands, e-cigarettes and vapes are legally classified as tobacco- and smoking products (Trimbos Instituut, 2023c). While some recent studies distinguish between tobacco and electronic smoking (Hammond et al., 2022; Jankowski et al., 2020), there is significant overlap between smokers and e-cigarette users in the Netherlands (Trimbos Instituut, 2023c), and not much is known yet about the long-term health consequences of electronic smoking. Therefore, the health goals of reducing/quitting smoking and reducing/quitting vaping or using a nicotine evaporator were combined into one category: *reducing or quitting smoking*.

#### 3.4.2 Preferred support

Respondents that indicated an immediate or future health goal were subsequently asked; "Of which of the following organisations/people would you like to receive support for [health goal]?". The answers to this question were used to measure preferred support. For each health goal separately, respondents indicate that they either did not want support from any organisation or person, or they could choose one or multiple people or organisations from whom they wanted support, as listed in table 1. The original answer options were recoded into four categories of preferred support to ensure sufficient group size and statistical power of each category.

Respondents' answers were used to create the variables to measure (1) preferred support for reducing/quitting alcohol consumption, and (2) preferred support for reducing/quitting smoking. An additional category, multiple sources of support, was created for participants indicating more than one preferred source of support. Additionally, there was an answer option 'someone else/another organisation, namely ...', allowing open responses. Answers ranged from a buddy to colleagues or employer. However, most respondents answering this question gave an answer along the lines of 'myself', indicating they did not want any support. Due to the varied nature of these responses, this category was excluded from analysis to prevent errors. Thus, the 'other' category consists of respondents that selected support from their insurance company or a social worker.

**Table 1:** Recoding of the variable preferred support

Original category (Dutch)	Original category (English)	New category
Geen organisatie of person	No organisation or person	No support
Huisarts/praktijkondersteuner	General practitioner	Healthcare professionals
Medisch specialist	Medical specialist	
Sport- of leefstijlcoach	Sport- or lifestyle coach	
Familie en/of vrienden	Family and/or friends	Social/informal support
Buurtbewoners	Neighbours	
De gemeente	The municipality	Other organisations
Zorgverzekeraar	Healthcare insurance	
(Having indicated multiple answer options)		Multiple sources of support

### 3.4.3 Sociodemographic characteristics (independent variables)

The sociodemographic characteristics defined for this research include age, gender, education level, and income. Additionally, smoking status is defined as a personal characteristic, used to determine the study population for smoking health goals.

#### Age

Age was measured by asking participants for their month and year of birth, with the dataset providing participants' ages as of April 2024. Age was used as both a numerical variable and a categorical variable, divided into 15-year age groups. To ensure comparable group sizes, the first and last groups were made larger (18-34 years; 75-95 years old) and the second-last age group was made smaller (65-74 years old). This categorisation ensures meaningful analysis across different life stages.

#### Gender

Respondents reported their gender as male, female, or other. However, there were only 23 respondents identifying as gender other than male or female. This small sample could result in high variability and unreliable estimates, potentially distorting representativeness and generalisability. Therefore, these respondents were excluded from the analyses to ensure more reliable results.

#### Education level

Education level was measured by asking participants for their highest completed education. Respondents could indicate one of eight categories of education levels, as shown in table 2. The variable was recategorised into three broader categories, in accordance with the International Standard Classification of Education and the categorisation maintained by the Dutch national statistical agency (Centraal Bureau voor de Statistiek, 2024b).

**Table 2:** Recoding of the variable education level

Original category (Dutch)	Original category (English)	New category
Basisonderwijs	Primary education	Low
Praktijkonderwijs	Practical education	
Voortgezet speciaal onderwijs (vso)	Secondary special education	
Vmbo, havo-onderbouw, vwo-onderbouw, mbo-1 (inclusief mavo, ulo, mulo, lts, lhno, vbo)	Prevocational secondary education, first three years of higher secondary education, first three years of pre-university education, lower secondary vocational training and assistant's training	

Havo-bovenbouw, vwo-bovenbouw (inclusief hbs, mms)	Upper secondary education	Intermediate
Mbo-2, mbo-3, mbo-4	Medium education level: upper secondary education (HAVO/VWO), basic vocational training (MBO-2), vocational training (MBO-3), middle management and specialist education (MBO-4)	
Hbo-opleiding	Education at university of applied sciences	High
Universitaire opleiding	University education	

### Income

Income was measured through participants' reported personal monthly income in 2023. This measure was chosen over household income due to fewer missing values and better alignment with individual health goals. Participants could select from 13 income categories, ranging from less than €1,000 per month to over €6,000 monthly. For analysis, these categories were recoded into three groups, to ensure a sufficient and equal number of respondents for each category and to allow for easier interpretation. Income categories were based on the modal income, which refers to the most frequently occurring income in the country, and is a term that is commonly used in the Netherlands to define income groups. Participants earning below €2,000 were coded as a below-modal income, those earning between €2,000 and €3,000 per month were coded as modal, and those earning above €3,000 monthly were coded into the above-modal category<sup>2</sup>.

Additionally, 560 respondents did not report their income. Due to the sensitive nature of income information, this is not uncommon (Kim et al., 2007). These respondents were categorised as 'not reported' to be able to include them in analyses. Excluding them would reduce the sample size and diminish the model's statistical power. Also, evidence suggests that missing income data is often not at random (Kim et al., 2007; Schenker et al., 2006), potentially leading to biases in analysis. The 'not reported' category acknowledges the presence of missing data while allowing for a thorough analysis.

### Smoking behaviour

Another personal characteristic that was considered is respondents' smoking behaviour. Respondents reported their current and past smoking habits by indicating whether they used tobacco or vaping products and how often (daily, or several times per week, month, or year). Respondents that indicated using these products several times in the past year, or more often, were considered current smokers. This information was used to analyse of smoking health goals, focusing on those who smoke.

## **3.5 Method of data analysis**

After preparing the dataset handling missing variables and recoding categories, as described in section 3.4, data analysis was conducted. This section describes the steps taken for analysing alcohol and smoking health goals and preferred support, to answer the research questions. All statistical analyses were conducted using STATA (version 18). The STATA .do files, describing all steps of data preparation and analyses, are attached in Appendix A.

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<sup>2</sup> In the Netherlands, the net modal income in 2023 was €2,550 excluding, and €2,680 including holiday benefits (Centraal Bureau voor de Statistiek, 2024c). The modal income category was set to include participants choosing either '€2,000 to €2,500 per month' or '€2,500 to €3,000 per month' as an answer option, to include people that earned 10% more or less than the modal income, and to ensure comparable group sizes for analyses.

### 3.5.1 Analysis methods for health goals

Sociodemographic differences in health goals to reduce drinking and smoking were analysed separately, though the process was similar for both. The data analysis took place in three consecutive stages.

To start, univariate analyses were conducted to get an overview of absolute and relative frequency distributions of alcohol and smoking health goals, and sociodemographic characteristics. For alcohol, these distributions were generated for all respondents, both with and without weight factors, to get an idea of how weights would alter the sample and their health goals. For smoking, the analysis was limited to current smokers only. Weights were not applied here, because they were designed to be applied only to the total sample. As the subset of smokers could not be assumed to be a non-random selection, and their characteristics may differ from the general sample, applying sample weights could introduce bias. Therefore, analysing this subset without weights provides a more accurate reflection of current smokers' health goals.

Second, bivariate analyses were conducted through crosstabulations and chi-squared ( $\chi^2$ ) significance tests, to explore the relationships between sociodemographic variables and the health goals. For the alcohol goal, crosstabulations included both weighted and unweighted data, though  $\chi^2$  tests were only applied to unweighted data to avoid violating the independence of cases and artificially inflating certain groups. For smoking, crosstabulations did not include weighted data.

Third, multinomial logistic regression models were created for health goals to reduce drinking and smoking. Separate models were created for alcohol and smoking, to analyse the likelihood of different outcomes (setting a goal in the next six months, in the future, or not at all) (table 3). Logistic regression allows for interpretation of the likelihood of outcome categories, and in multinomial regression specifically, multiple outcomes can be compared to a reference category (Mehmetoglu & Jakobsen, 2022). Ordinary least squares (OLS) regression is not suitable because the dependent variable is not continuous, so there is no linear relationship (Mehmetoglu & Jakobsen, 2022). The independent variables included age, gender, education and income, which are numerical and categorical variables. Table 3 provides a more detailed description of the variables, including their types and reference categories. The reference categories for the independent variables were chosen based on the hypotheses and theoretical relevance. After running the regressions, it was also checked whether changing reference categories would make a difference or would reveal additional significant relations.

Since there is evidence that drinking, smoking, and cessation of both vary over the life course (Davies et al., 2019; Dawson et al., 2013; Lillard & Christopolou, 2015s), for both alcohol and smoking health goals, another model was created including the squared term of age,  $age^2$ . If the squared term of age is significant or improves the model fit, this could mean that the relationship between age and the dependent variable (setting a health goal) is more complex than a simple linear relationship (Mehmetoglu & Jakobsen, 2022). To determine if  $age^2$  improved the model fit, and should be added to the final model, several statistical tests were conducted to compare the models with and without  $age^2$ , such as the log likelihood ratio test (Davies et al., 2019), McFadden's (1974) pseudo  $R^2$  and the Akaike information criterion. After determining whether  $age^2$  should be added, the resulting regression models were tested to assess their model fit and whether they met all assumptions for multinomial logistic regression models. Lastly, the final models were run and the results were analysed and interpreted, focusing on the significance and directions of the coefficients, to answer the research questions and assess the influence of different sociodemographic characteristics on health goals.

**Table 3: Variables, types and reference categories of the variables for the multinomial regression models**

Category	Variable	Type of variable
Dependent variables	Health goal alcohol	Categorical (nominal) No (reference category) Yes, in the next six months Yes, in the future
	Health goal smoking	Categorical (nominal) No (reference category) Yes, in the next six months Yes, in the future
Independent variables	Age <sup>3</sup>	Numerical (ratio) (measured in years)
	Age-squared (age <sup>2</sup> )	Numerical (ratio)
	Gender <sup>234</sup>	Categorical (nominal) / binary Male (reference category) Female
	Education	Categorical (ordinal) High (reference category) Intermediate Low
	Household income	Categorical (ordinal) Above modal (reference category) Modal Below modal Not reported

### 3.5.2 Analysis methods of preferred support

After the analysis of health goals, preferred support for each health goal was explored. Differences between preferred support for alcohol and smoking goals were compared, and sociodemographic differences in support preferences were examined through exploratory analyses. First, univariate analyses were conducted to analyse frequency and percentage distributions of the variables ‘preferred support for reducing drinking’ and ‘preferred support for reducing smoking’ (see table 1). These distributions were used to compare drinking and smoking support, to answer research question 3. After that, crosstabulations and  $\chi^2$  (chi-squared) tests were conducted to examine associations between sociodemographic characteristics and preferred support for reducing alcohol and smoking. These analyses addressed research question 4 on sociodemographic differences in support preferences. Analyses of preferred support were kept exploratory, due to constraints in time and scope of research.

<sup>3</sup> In the crosstabulations, age groups are added as a categorical variable to allow for more meaningful interpretations. In the regression model, however, age will be added as a numerical value, because this allows for more granularity in data, it increases statistical power, and it makes model results easier to interpret.

## 3.6 Ethical considerations and positionality

### 3.6.1 Data confidentiality and privacy

The data used in this research were collected by Planbureau Fryslân. All respondents are over 18, participated voluntarily, and gave informed consent for their responses to be used for research purposes. To ensure confidentiality, data access was limited to the researcher and their supervisor. A detailed agreement and research plan were submitted to receive the data, and the study complies with the Dutch General Data Protection Regulation (Algemene Verordening Gegevensbescherming). The data remained property of Planbureau Fryslân and were deleted after the thesis was completed. Additionally, to protect privacy, only necessary data were provided, so that individual respondents cannot be easily tracked. Data were pseudonymised and were only processed in a secured digital environment.

### 3.6.2 Positionality

Another consideration in doing research is the position of the researcher. The researcher's background as a Dutch student, who is personally not from Friesland, may influence their understanding of the Frisian context. Being a Dutch female university master student who does not smoke but does drink alcohol could introduce potential biases in analyses. However, there are no conflicts of interest related to the study's goals or outcomes. Hypotheses were based on literature and theories, and they were formulated before retrieving the data. Also, data collection was not conducted by the researcher themselves, and the analysis was performed independently. Throughout the research process, the author reflected on their personal background in relation to the research topic and how this could induce biases. Additionally, the interpretation of results was discussed with an expert from Planbureau Fryslân to gain a better understanding of the Frisian context and the meaning of the outcomes.

## 3.7 Use of Generative Artificial Intelligence (GenAI)

For writing this master thesis, GenAI was employed to assist with data analysis tasks. OpenAI's GPT-3 model, version 3.5, was used for this. GenAI was used to generate code and troubleshoot errors in STATA. For example, when prompted with "In STATA, I want to set category 5 ('Multiple sources') of my variable preferred support (support\_pref\_alc), such that all respondents are included that answered 1 to multiple variables of V32a\_\_2 until V32a\_\_9. With what code can I do this?", ChatGPT generated the following response:

To set category 5 ('Multiple sources') for the variable `support_pref_alc` such that all respondents who answered 1 to multiple variables of `V32a__2` to `V32a__9` are included, you can use the following Stata code:

```
// Create a count variable to count the number of 1's in the specified variables
gen count_sources = 0 foreach var of varlist V32a__2 V32a__3 V32a__4 V32a__5
V32a__6 V32a__7 V32a__8 V32a__9 { replace count_sources = count_sources + (
`var' == 1 ) }
// Set category 5 ('Multiple sources') for those who answered 1 to more than one variable
replace support_pref_alc = 5 if count_sources > 1
// Clean up temporary variable
drop count_sources. (OpenAI, 2024)
```

Another example is that, when given the following prompt "When I enter this command in STATA: 'replace support\_pref\_alc = 1 if V32a\_\_1 == 1', I am getting the following error: 'type mismatch r(109)'. What does it mean and how can I improve my code?", the text generated by ChatGPT suggested the following:

The "type mismatch" error in Stata usually occurs when you try to compare or assign values between variables of different types, such as a numeric variable and a string variable. In your case, the error might be due to `V32a__1` being a string variable rather than a numeric one.



To resolve this, you need to ensure that all variables involved in the comparison are of the same type. If `v32a__1` (and the other `v32a__` variables) are string variables, you should first convert them to numeric format. You can use the `destring` command for this. (OpenAI, 2024).

The outputs of GenAI were implemented in STATA and results were critically reviewed, to see whether the desired effects were reached and whether the problems were solved. GenAI was not used for other purposes such as retrieving information or writing.

## 4. Results

This chapter discusses the results of the statistical analyses, by research question. It starts with describing univariate statistics of the sample's health goals and sociodemographic characteristics. Then, sociodemographic differences in the health goal to reduce drinking are discussed, considering bivariate statistics as well as multinomial logistic regressions. This is followed by a similar analysis of sociodemographic differences in the health goal to reduce smoking. Next, preferred support is explored by comparing descriptive statistics of support preferences for drinking and smoking, and by considering sociodemographic differences in these preferences through crosstabulations and  $\chi^2$  tests. For each research question, this chapter discusses the results of the analyses and how these relate to the hypotheses. The results are further interpreted in the discussion in chapter 5.

### 4.1 Descriptive statistics

Table 4 describes the sociodemographic characteristics of the total sample, both unweighted and weighted, as well as those of the sample of current smokers. In the unweighted sample, men were somewhat overrepresented compared to women. The age distribution was skewed, with older age categories larger than younger ones, and the mean age was 59 years. Most respondents had a high education level, with the low-educated group being the smallest. Regarding income, the majority of the sample earned a modal salary, and there was a substantial group that did not know or did not wish to report their income, potentially limiting the depth of analysis and precision of the conclusions drawn. Finally, 11% of respondents were considered current smokers. In the weighted sample, gender, age groups and education level were more equally distributed, indicating that the weights made the data more representative. The application of weights also influenced the distribution of income groups and current smokers. Among the sample of current smokers, there were relatively more men, younger age groups, and intermediate-educated individuals, and fewer high-educated individuals, compared to the total unweighted sample.

**Table 4:** Sociodemographic characteristics of the total sample (unweighted and weighted) and of current smokers

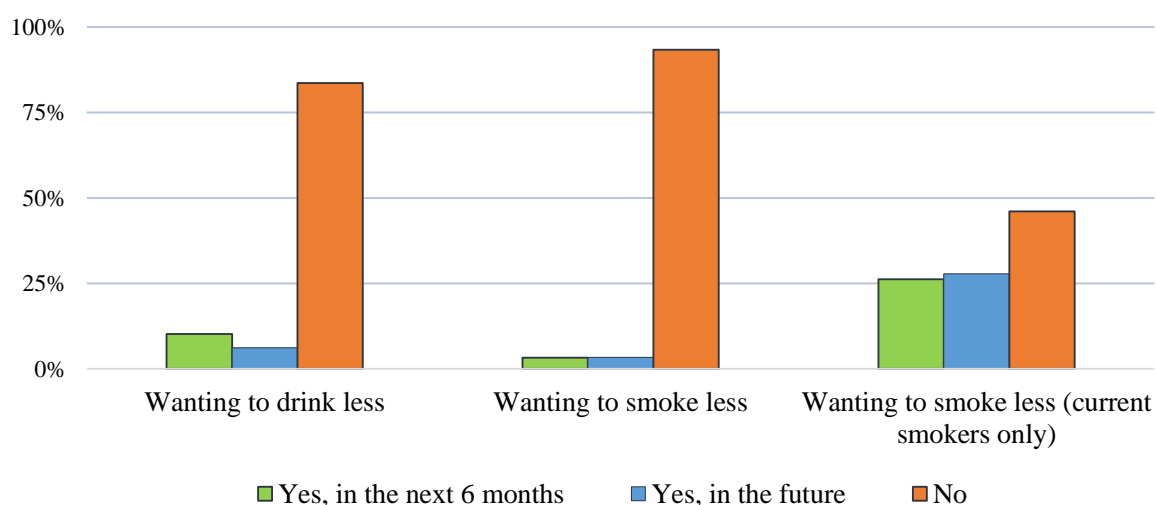
Variable	Total sample n (%) unweighted (n = 3,257)	Total sample n (%) weighted (n = 3,257)	Current smokers n (%) unweighted (n = 367)
<b>Gender</b>			
Male	1,892 (58.09)	1625 (49.89)	239 (65.12)
Female	1,365 (41.91)	1632 (50.11)	128 (34.88)
<b>Age</b>			
	<i>Mean: 59.46 (SD 17.23)</i>	<i>Mean: 51.21 (SD 18.10)</i>	<i>Mean: 53.70 (SD 17.98)</i>
18-34	443 (13.60)	806 (24.75)	85 (23.16)
35-49	445 (13.66)	696 (21.37)	55 (14.99)
50-64	758 (23.27)	888 (27.28)	86 (23.43)
65-74	966 (29.66)	500 (15.34)	111 (30.25)
75+	645 (19.80)	367 (11.26)	30 (8.17)
<b>Education</b>			
High	1775 (54.50)	802 (24.63)	159 (43.32)
Intermediate	1,044 (32.05)	1,518 (46.61)	156 (42.51)
Low	438 (13.45)	937 (28.76)	52 (14.17)
<b>Income</b>			
Above modal	844 (25.91)	575 (17.64)	101 (27.52)
Modal	1,002 (30.76)	943 (28.96)	119 (32.43)

Below modal	859 (26.37)	1,146 (35.18)	95 (25.89)
Not reported	552 (16.95)	593 (18.22)	52 (14.17)
<b>Current smoker</b>			
No	2,890 (88.73)	2737 (84.04)	367 (100.00)
Yes	367 (11.27)	520 (15.96)	0 (0.00)

Table 5 presents the unweighted and weighted frequency distribution of alcohol and smoking health goals. The majority of respondents did not set health goals related to alcohol or smoking, as visualised in figure 4. More respondents intended to reduce their alcohol intake compared to smoking, and this health goal was also more commonly set for the near future (the next six months). Among current smokers, there was a majority of 54% that set the health goal to reduce or quit. Some respondents set a smoking-related health goal despite not reporting being smokers. Although it is unclear whether the error lies in their smoking status or their health goal reporting, these respondents were excluded from further analysis of smoking goals, to maintain data quality and ensure accurate conclusions.

**Table 5:** Weighted and unweighted distribution of respondents' health goals

Variable	unweighted n (%) (n = 3,257)	weighted n (%) (n = 3,257)
<b>Wanting to reduce or quit alcohol</b>		
Yes, in the next six months	331 (10.16)	309 (9.50)
Yes, in the future	201 (6.17)	225 (6.90)
No/not applicable	2,725 (83.67)	2,723 (83.60)
<b>Wanting to reduce or quit smoking</b>		
Yes, in the next six months	109 (3.25)	157 (4.81)
Yes, in the future	106 (3.35)	160 (4.93)
No/not applicable	3,042 (93.40)	2,940 (90.26)
<b>Wanting to reduce or quit smoking, if current smoker (n = 367)</b>		
Yes, in the next six months	96 (26.16)	
Yes, in the future	102 (27.79)	
No/not applicable	169 (46.05)	



**Figure 4:** Unweighted distribution of respondents' health goals

## 4.2 Sociodemographic differences in alcohol health goals

### 4.2.1 Crosstabulations and $\chi^2$ significance tests

To further explore the data, crosstabulations were conducted, shown in table 6. To test significance,  $\chi^2$  (chi-squared) tests were performed on the unweighted dataset, to test whether there is a significant association between the row and column variables. A significant p-value indicates that the observed frequencies differ from what would be expected under the null hypothesis of no association (Mehmetoglu & Jakobsen, 2022).

The crosstabulations and significance tests show highly significant relationships between alcohol health goals and the characteristics gender, age, education, and income. This justifies including all variables in the regression model to further explore these relationships. The weighted and unweighted distributions are relatively similar, although there are some slight differences. For example, in the weighted sample, future drinking goals appear more pronounced for both genders, lower-educated, and modal earners. Further analysis used the unweighted data, potentially leading to slight biases in estimates. However, given the similarity between the weighted and unweighted distributions, these biases are likely to be small and should not significantly affect the overall conclusions.

**Table 6:** Bivariate analyses of alcohol health goals by sociodemographic characteristics (unweighted and weighted)

Setting a goal to reduce or quit drinking	n (%) unweighted			n (%) weighted		
	Yes, in the next six months (n = 331)	Yes, in the future (n = 201)	No (n = 2,725)	Yes, in the next six months (n = 309)	Yes, in the future (n = 225)	No (n = 2,723)
<b>Gender</b>						
Male	207 (10.94)	146 (7.72)	1,539 (81.34)	175 (10.79)	154 (9.48)	1,296 (79.73)
Female	124 (9.08)	55 (4.03)	1,186 (86.89)	134 (8.22)	71 (4.33)	1,427 (87.45)
	$\chi^2 = 23.07$ , df = 2, p = 0.000***					
<b>Age</b>						
18-34	47 (10.61)	38 (8.58)	358 (80.81)	68 (8.46)	66 (8.19)	672 (83.35)
35-49	57 (12.81)	28 (6.29)	360 (80.90)	93 (13.43)	57 (8.19)	546 (78.39)
50-64	85 (11.21)	46 (6.07)	627 (82.72)	90 (10.17)	62 (6.93)	736 (82.90)
65-74	100 (10.35)	62 (6.42)	804 (83.23)	41 (8.13)	26 (5.26)	433 (86.60)
75+	42 (6.51)	27 (4.19)	576 (89.30)	17 (4.57)	14 (3.77)	336 (91.66)
	$\chi^2 = 23.26$ , df = 8, p = 0.002***					
<b>Education</b>						
High	210 (11.83)	102 (5.75)	1,463 (82.42)	97 (12.18)	48 (5.97)	656 (81.84)
Intermediate	93 (8.91)	77 (7.38)	874 (83.72)	148 (9.73)	116 (7.61)	1,255 (82.65)
Low	28 (6.39)	22 (5.02)	388 (88.58)	64 (6.82)	61 (6.53)	812 (86.65)
	$\chi^2 = 18.11$ , df = 4, p = 0.001***					
<b>Income</b>						
Above modal	113 (13.39)	62 (7.35)	669 (79.27)	73 (12.74)	55 (9.56)	447 (77.71)
Modal	97 (9.68)	77 (7.68)	828 (82.63)	99 (9.63)	99 (10.49)	753 (79.88)
Below modal	72 (8.38)	43 (5.01)	744 (86.61)	91 (7.95)	54 (4.71)	1,001 (87.34)
Not reported	49 (8.88)	19 (3.44)	484 (87.68)	54 (9.15)	17 (2.85)	522 (88.00)
	$\chi^2 = 30.65$ , df = 6, p = 0.000***					
*** p < 0.01						

#### 4.2.2 Logistic regression models

To further investigate how alcohol health goals differ across sociodemographic characteristics, multinomial logistic regression models were created. First, a basic model was created, model 1, with the alcohol health goal as the dependent variable (wanting to reduce drinking in the next six months, in the future, or not), and sociodemographic characteristics as independent variables (age, gender, income and education) (see table 3). Additionally, because of evidence that alcohol consumption and cessation vary over the life course (Davies et al., 2019; Dawson et al., 2013), a second model (model 2) was created, which also included the squared term of age (age<sup>2</sup>). To determine whether age<sup>2</sup> improves model fit, and thus, whether the relationship between age and setting an alcohol health goal is more complex, model 1 and model 2 were compared through several statistical tests, with results shown in table 7.

**Table 7:** Model fit statistics comparing model 1 (alcohol goal without age-squared) with model 2 (alcohol goal including age-squared)

	<b>Model 1 (excluding age<sup>2</sup>)</b>	<b>Model 2 (including age<sup>2</sup>)</b>
<b>Log likelihood</b>	-1763.09	-1757.50
<b>LR <math>\chi^2</math></b>	79.07	90.24
<b>LR test</b>		$\chi^2$ : 11.17, p = 0.004***
<b>Pseudo R<sup>2</sup></b>	0.0219	0.0250
<b>Wald test statistic</b>		Wald $\chi^2$ (2): 10.55, p = 0.005***
<b>AIC</b>	3558.17	3551.00
<b>BIC</b>	3655.59	3660.59

\*\*\* p < 0.01

The log likelihood and likelihood ratio (LR) chi-square ( $\chi^2$ ) indicate how well the model predicts the observed data, with higher values meaning that the model fits the data better. McFadden's (1974) pseudo R<sup>2</sup> also measures model fit, by comparing the log-likelihood of the model with that of an empty model. A higher pseudo R<sup>2</sup> means the model is better able to explain variance in the dependent variable. The likelihood ratio (LR) test shows the improvement of fit when moving from model 1 to model 2, and evaluates whether this improvement is significant (Mehmetoglu & Jakobsen, 2022). The log likelihood, LR  $\chi^2$  and pseudo R<sup>2</sup> were higher for the model that includes age<sup>2</sup>, and the LR test gave a significant result, meaning that the addition of age<sup>2</sup> significantly improved the model's ability to explain the data.

The Wald (1943)  $\chi^2$  test can be used to evaluate specific terms of the model. It assesses whether coefficients are significantly different from zero, and thus, whether they significantly contribute to the model (Mehmetoglu & Jakobsen, 2022). The result of the Wald test when age<sup>2</sup> is added was significant, meaning that age<sup>2</sup> significantly contributes to the model.

The Akaike information criterion (AIC) and the Bayesian information criterion (BIC) are two alternative measures for assessing model fit as well as complexity. Both variables can be used to compare model fit, and they penalise for including additional variables, to prevent overfitting. The BIC adds a stronger penalty for including extra parameters than the AIC, and a lower AIC and BIC indicate a better model fit (Mehmetoglu & Jakobsen, 2022). The AIC showed a better model fit for model 2, but the BIC did not, likely due to its stronger penalty for the addition of age<sup>2</sup>.

Given the theoretical evidence for a non-linear relationship between age alcohol intentions (Davies et al., 2019; Dawson et al., 2013), and because almost all tests indicated a better model fit for model 2, this model appeared preferable over model 1 and thus, the final model for alcohol goals included the squared term of age.

The final model was evaluated to test multinomial regression assumptions and to assess model fit. When possible, model assumption- and model fit tests were conducted on the multinomial regression model. However, since this is not possible for misspecification-, goodness-of-fit-, and outlier tests, these were

performed on a binary logistic regression model, where the answer options (yes, in the future) and (yes, in the next six months) were combined<sup>4</sup>.

Multicollinearity occurs when different independent variables are strongly interrelated, which could affect the reliability and stability of the model coefficients. To test for multicollinearity, the Variance Inflation Factor (VIF) was used. The VIF test gives each independent variable a tolerance value ( $1/VIF$ ), which is the proportion of variance shared with other independent variables. Tolerance values below 0.2 make variables unstable (Mehmetoglu & Jakobsen, 2022). For the alcohol model, most independent variables appeared to be stable, the VIF test only showed multicollinearity between age and age<sup>2</sup>, which had tolerance values of 0.0228 and 0.0227. Given that the variable age<sup>2</sup> is a function of age, this is an inevitable result, but since age<sup>2</sup> substantially improves the model, this does not preclude the inclusion of these variables in the model.

Independence of irrelevant alternatives (IIA) is an assumption in multinomial regression, stating that the relative odds of choosing between two alternatives should not be affected by the presence or characteristics of other alternatives. To test this, the Hausman test of IIA was conducted, which compares the estimates from the full model with those from a restricted model that excludes one or more alternatives (Mehmetoglu & Jakobsen, 2022). The results of the Hausman test were not significant, meaning that the model does not violate the IIA-assumption.

To test whether a model is misspecified by including wrong variables or excluding necessary variables, a linktest can be performed. The model is correctly specified if the linear predicted value `_hat` is significant (meaning that it's a good predictor of the dependent variable), and the squared linear predicted value `_hatsq` is not significant (Mehmetoglu & Jakobsen, 2022). For this model, neither `_hat` nor `_hatsq` were significant, meaning that the model was not very good, but there was also no specification problem. To further test model fit, the goodness-of-fit test (`estat gof`) was conducted, which tests whether the observed dependent variable values match the expected values (Mehmetoglu & Jakobsen, 2022). A significant result would mean the model has to be rejected (Mehmetoglu & Jakobsen, 2022), which was not the case for model 2. Therefore, the model could be said to fit the data reasonably well and did not need to be rejected.

Additionally, the model was tested for potential presence of influential cases which could disproportionately affect the model outcomes. The Pregibon (1981) influence statistic  $\Delta\beta$  was used for this, which measures standardised change in parameters when an observation, and all observations with the same covariate pattern, are removed. A large  $\Delta\beta$  indicates a substantial influence of a certain pattern (Mehmetoglu & Jakobsen, 2022). Also, the observations with high leverage (`hat`) values were investigated, as these are the values that have a lot of influence on the parameter estimates (Mehmetoglu & Jakobsen, 2022). Especially observations that would have high leverage as well as a high  $\Delta\beta$  could exert large influence on the model. A number of observations were identified with relatively high  $\Delta\beta$  and/or `hat` values. Further investigation of these observations showed that these considered respondents which shared the same values on all sociodemographic predictors, leading them to exert relatively more influence on the model. Regardless, they were valid observations, not errors in the data. Removing these observations somewhat improved model fit, but not significantly. Sensitivity analyses, in which the model was ran both including and excluding these observations, revealed that removing the influential observations slightly changed the regression outcomes, but that the model was relatively robust. Due to the legitimacy of the influential observations, and the relative robustness of the model, it was decided to keep these cases in the model. The outputs of the regression in which the influential observations were removed, are attached in Appendix C, and the effect of influential observations on the regression results is further considered in the discussion.

#### 4.2.3 Logistic regression results

The regression results from the alcohol model are shown in table 8. Significant relationships were found for gender, age, age<sup>2</sup>, education and income, particularly in predicting near-term goals.

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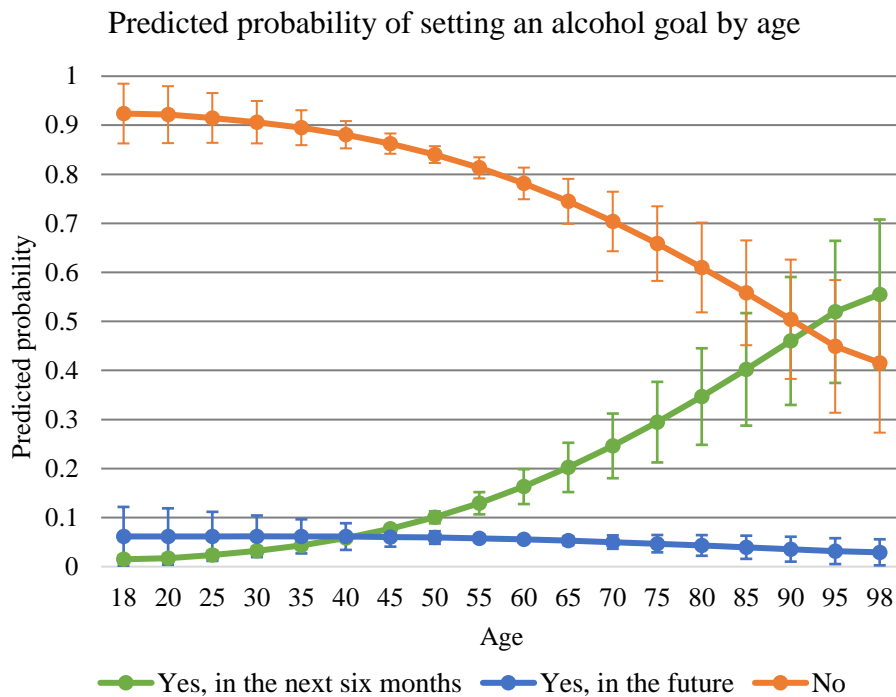
<sup>4</sup> Results and sensitivity analyses reveal that combining the categories 'yes, in the next six months' and 'yes in the future', is more appropriate than combining one of these categories with 'no/not applicable'. The results of the binary regression models for both alcohol and smoking are attached in Appendix B.

**Table 8:** Results of regression model 2: Sociodemographic predictors of alcohol health goals (odds ratios (OR), significance, and confidence intervals (CI))

Reference category: does not intend to drink less or quit drinking (n = 2,748)		Intends to drink less or quit in the next six months (n = 331)		Intends to drink less or quit in the future (n = 201)	
		OR (95% CI)	p	OR (95% CI)	p
(Intercept)		0.06 (0.02-0.19)	0.000***	0.16 (0.04-0.66)	0.011**
<b>Gender</b>	Female	0.75 (0.58-0.97)	0.028**	0.48 (0.34-0.67)	0.000***
<b>Age</b>		1.07 (1.02-1.12)	0.006***	1.00 (0.95-1.06)	0.916
<b>Age<sup>2</sup></b>		1.00 (1.00-1.00)	0.001***	1.00 (1.00-1.00)	0.515
<b>Education level</b>	Intermediate	0.77 (0.59-1.01)	0.061*	1.30 (0.94-1.80)	0.108
	Low	0.64 (0.42-0.98)	0.041**	1.06 (0.64-1.75)	0.819
<b>Income</b>	Modal	0.77 (0.57-1.05)	0.096*	1.06 (0.74-1.52)	0.760
	Below modal	0.75 (0.53-1.07)	0.118	0.73 (0.46-1.15)	0.179
	Not reported	0.73 (0.50-1.06)	0.099*	0.51 (0.30-0.88)	0.016**

Reference categories; gender = male, education level = high, income = above modal.  
 \* p < 0.1  
 \*\* p < 0.05  
 \*\*\* p < 0.01

Gender was a significant predictor for intending to reduce drinking in the next six months, and a highly significant predictor of intending to drink less in the future. In both cases, females were less likely than males to set alcohol-related health goals; with 25% (six months) and 52% (future) lower odds of intending to drink less. Both age and age<sup>2</sup> were highly significant predictors for setting the health goal to reduce drinking in the near future, but not for the far future. The age odds ratio of 1.07 indicates 7% higher odds of setting a drinking health goal for each additional year, and the significance of age<sup>2</sup> indicated a non-linear relationship between age and alcohol health goals. The nature of this relationship was further examined by plotting out the relationship between age and the different categories of the dependent variable. The graph in figure 5 shows that the probability of setting a far future alcohol goal remained relatively stable over age. The probability of not setting an alcohol goal was highest for the youngest age groups and decreased with age, while the probability of setting a health goal in the next six months increased with age. Thus, a younger age correlated with a higher likelihood to set no goals for reducing alcohol consumption, while older age meant a higher likelihood to set especially immediate goals.



**Figure 5:** Predicted probabilities of different alcohol goals by age (created by author)

Furthermore, for education, there was a significant relationship for low education compared to high education, and a weak significant relationship for intermediate education compared to high education. Compared to high-educated, low-educated had 36% lower odds, and intermediate educated had 23% lower odds, of setting near future drinking health goals. When the reference category of education was changed to low or intermediate education, no additional significant relationships between these groups appeared. For income, the not-reported income category was significantly less likely to set alcohol goals in the far future compared to above-modal earners (49% lower odds); and modal and not-reported earners were, on a lower significance level ( $p < 0.1$ ), less likely to set alcohol goals in the near future (23% and 27% lower odds) compared to above-modal earners. If the reference category of income was changed to modal, additional significant relationships appeared where below-modal and not-reported earners were significantly less likely to set far future alcohol goals than modal earners, with below-modal earners having 31% lower odds ( $p < 0.05$ ) and not-reported income groups having 51% lower odds to intend to drink less ( $p < 0.01$ ) compared to those with a modal salary.

When comparing the outcomes of the regression models with the hypotheses, results are mixed. For gender, it was hypothesised that women would be more likely to set health goals to reduce drinking and smoking than men, contrary to what was found in the regressions. For age, it was expected that younger people would be more likely to set health goals, although the effects could differ over the life course. Again, the opposite effect was found, where younger respondents seem less likely to set an alcohol health goal. Older groups are especially more likely to set alcohol health goals in the immediate future. Furthermore, it was hypothesised that higher socioeconomic status (both through education and income) would correspond to a higher likelihood of setting the goal to reduce drinking. Some findings were in line with this, as low-educated were significantly less likely to set near-future health goals and intermediately educated were somewhat less likely to do this, compared to high-educated. There appeared to be a similar income effect, as below-modal earners were less likely to set far-future alcohol goals compared to modal earners; and on a weaker significance level, modal earners were less likely to set near-future alcohol goals than above-modal earners. Furthermore, several significant effects for the not-reported income group were found: they were significantly less likely to set far-future drinking



goals compared to above modal and modal earners, and they were on a weaker significance level less likely to set near-future drinking goals compared to above-modal earners. No significant effects were found for low-educated compared to intermediate educated, and for below-modal compared to above-modal earners, but the magnitude of the odds ratios for education and income groups generally aligned with the hypothesis that high-SES groups are more likely to set alcohol health goals. The results and their implications, including comparisons to theories and literature, are further discussed in chapter 5.

### 4.3 Sociodemographic differences in smoking health goals

The next section further discusses sociodemographic differences in the health goal to reduce or quit smoking, to answer research question 2. The analysis process mirrored that of alcohol health goals, except the population was restricted to current smokers. As shown in table 5 and figure 4, the majority of current smokers intended to reduce or quit smoking in the near or distant future.

#### 4.3.1 Crosstabulations and $\chi^2$ significance tests

Table 9 presents the crosstabulations and  $\chi^2$  significance tests for smoking health goals. No immediate significant relationships were found between variables. This may be due to the reduced sample size, as only current smokers were included. Despite the insignificance in the bivariate analyses, all variables were included in the regression model due to their theoretical importance and to maintain a complete analysis.

**Table 9:** Bivariate analyses of smoking health goals by sociodemographic characteristics, for current smokers

Setting a goal to reduce or quit smoking	n (%) unweighted		
	Yes, in the next six months (n = 96)	Yes, in the future (n = 102)	No (n = 169)
<b>Gender</b>			
Male	57 (23.85)	71 (29.71)	111 (46.44)
Female	39 (30.47)	31 (24.22)	58 (45.31)
$\chi^2 = 2.32$ , df = 2, p = 0.313			
<b>Age</b>			
18-34	23 (27.06)	24 (28.24)	38 (44.71)
35-49	13 (23.64)	15 (27.27)	27 (49.09)
50-64	28 (32.56)	21 (24.42)	37 (43.02)
65-74	26 (23.42)	32 (28.83)	53 (47.75)
75+	6 (20.00)	10 (33.33)	14 (46.67)
$\chi^2 = 3.38$ , df = 8, p = 0.908			
<b>Education</b>			
High	45 (28.30)	35 (22.01)	79 (49.69)
Intermediate	39 (25.00)	51 (32.69)	66 (42.31)
Low	12 (23.08)	16 (30.77)	24 (46.15)
$\chi^2 = 4.90$ , df = 4, p = 0.297			
<b>Income</b>			
Above modal	23 (22.77)	26 (25.74)	52 (51.49)
Modal	37 (31.09)	37 (31.09)	45 (37.82)
Below modal	23 (24.21)	27 (28.42)	46 (47.37)
Not reported	13 (25.00)	12 (23.08)	27 (51.92)
$\chi^2 = 5.59$ , df = 6, p = 0.471			

### 4.3.2 Logistic regression models

A multinomial regression model was built to further analyse the relationship between sociodemographic characteristics and the goal to reduce or quit smoking. Similar to the alcohol model, first, a basic model (model 3) was created, with the health goal to reduce or quit smoking as the dependent variable, and age, gender, education and income as independent variables being (table 3). Furthermore, as there is evidence that smoking behaviour changes over the life course (Lillard & Christopolou, 2015), another model was created that included the squared term of age, model 4.

The model fit was assessed using several statistical tests, with results shown in table 10. While some measures like log likelihood, LR  $\chi^2$ , and pseudo R<sup>2</sup> suggested an improved fit for model 4, as they had higher values here, this difference was not significant according to the LR test. It is likely that the values improved merely because of the additional variable, which increased the model's complexity. Additionally, the Wald test statistic was not significant for age<sup>2</sup>, suggesting that the model including age<sup>2</sup> did not fit the data significantly better. Also, both AIC and BIC indicated a worse fit for model 4, as they had higher values here. (Mehmetoglu & Jakobsen, 2022). Because the tests did not show a significant improvement for the model when age<sup>2</sup> was added, model 3 used for further analyses.

**Table 10:** Model fit statistics comparing model 3 (smoking goal without age-squared) with model 4 (smoking goal including age-squared)

	<b>Model 3 (excluding age<sup>2</sup>)</b>	<b>Model 4 (including age<sup>2</sup>)</b>
<b>Log likelihood</b>	-383.77	-382.51
<b>LR <math>\chi^2</math></b>	13.25	15.76
<b>LR test</b>		$\chi^2$ : 2.71, p = 0.258
<b>Pseudo R<sup>2</sup></b>	0.0170	0.0202
<b>Wald test statistic</b>		Wald $\chi^2$ (2): 2.43, p = 0.297
<b>AIC</b>	799.53	801.02
<b>BIC</b>	862.02	871.31

The smoking model was also tested for model assumptions and fit. The VIF test showed no multicollinearity, and the Hausman test confirmed the IIA-assumption is not violated. When testing for misspecification, neither the  $\hat{\mu}$  nor the  $\hat{\mu}^2$  value were significant, suggesting that the model was specified properly but did not fit the data very well. The goodness-of-fit test was not significant for model 3, so the model fit the data reasonably well and did not need to be rejected.

When influential observations were explored, through the Pregibon  $\Delta\beta$  and  $\hat{\mu}$ , there were again a number of observations that had outstanding values on one or more variables. Similar as with the alcohol model, these were respondents that shared the same demographic profile. Removing the observations did not significantly improve model fit, and sensitivity analyses showed that the model was relatively robust to these observations again, except some slight changes in regression outcomes. Like with the alcohol model, the influential cases were kept in the model due to their legitimacy and the relative robustness of the model. The discussion further considers the effects of influential cases and the outputs of the regression without influential observations are attached in Appendix D.

### 4.3.3 Logistic regression results

The logistic regression results for model 3 are shown in table 11. There were significant effects for education level, where those with an intermediate education had 80% higher odds of setting a future smoking goal compared to those with a high education. Furthermore, there was a weak significant effect for income, where modal earners had 76% higher odds of intending to smoke less or quit in the next six months compared to above-modal earners. No other significant relations were detected, and no additional effects appeared when the reference categories of education or income were changed to compare between middle- and low-SES groups.

**Table 11:** Results of regression model 3: Sociodemographic predictors of smoking health goals, for current smokers (odds ratios (OR), significance, and confidence intervals (CI))

Reference category: does not intend to smoke less or quit smoking (n = 169)		Intends to smoke less or quit in the next six months (n = 96)		Intends to smoke less or quit in the future (n = 102)	
		OR (95% CI)	p	OR (95% CI)	p
(Intercept)		0.43 (0.15-1.24)	0.119	0.39 (0.14-1.10)	0.076*
<b>Gender</b>	Female	1.33 (0.76-2.35)	0.317	0.84 (0.47-1.49)	0.548
<b>Age</b>		1.00 (0.98-1.01)	0.957	1.00 (0.97-1.02)	0.912
<b>Education level</b>	Intermediate	1.04 (0.59-1.83)	0.894	1.80 (1.02-3.16)	0.042**
	Low	0.88 (0.39-2.00)	0.760	1.58 (0.72-3.50)	0.255
<b>Income</b>	Modal	1.76 (0.90-3.46)	0.099*	1.56 (0.81-3.03)	0.186
	Below modal	1.04 (0.48-2.25)	0.917	1.07 (0.51-2.23)	0.866
	Not reported	0.98 (0.15-1.24)	0.963	0.81 (0.33-1.95)	0.634

Reference categories; gender = male, education level = high, income = above modal.  
 \* p < 0.1  
 \*\* p < 0.05

When comparing these outcomes to the hypotheses, there is no significant relationship for the hypothesised effects of gender and age. Furthermore, it was hypothesised that a higher socioeconomic status, measured through income as well as education, would correspond to a higher likelihood of setting health goals for drinking and smoking. The findings from the regression model contradict this, as it appears that middle-SES groups (intermediate educated and modal earners) are more likely to set smoking goals than high-educated and above-modal earners. These findings are further discussed in chapter 5.

### 4.3 Differences in preferred support

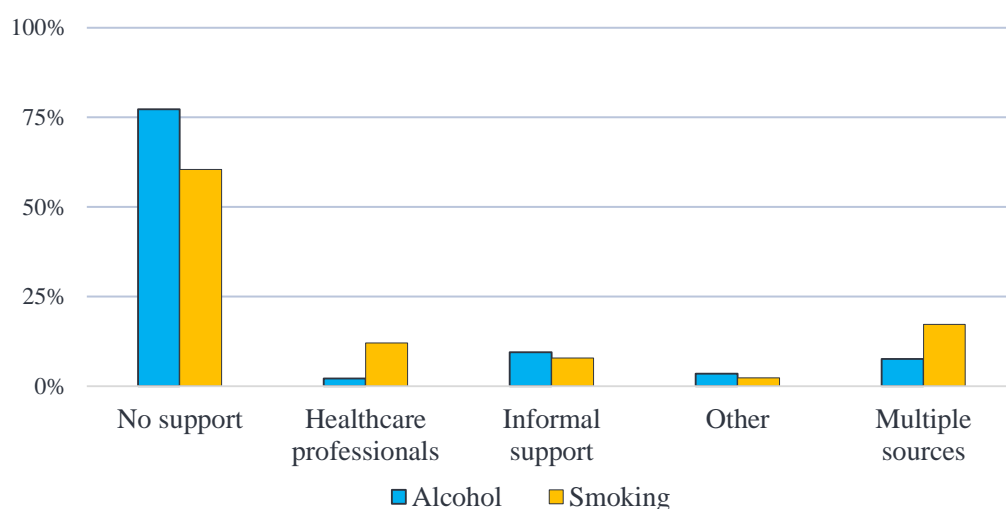
The next section discusses respondents' preferred support for reaching the health goals to reduce drinking and smoking. Descriptive statistics and crosstabulations were conducted to explore preferred support by sociodemographic characteristics and compare preferred support between alcohol and smoking goals. These explorative analyses are used to answer research questions 3 and 4.

#### 4.3.1 Descriptive statistics

Table 12 shows univariate descriptive statistics of the preferred support for both health goals, as indicated by those respondents that said they wanted to reach a certain health goal. For both alcohol and smoking, the majority of respondents did not want to receive support, although more people wanted support for smoking than for drinking. This is visualised in figure 6 and aligns with the hypothesis that preferred support for smoking would be higher than for drinking.

**Table 12:** Preferred support sources for reducing alcohol and smoking

Variable	Preferred support for reducing/quitting drinking (n = 515)	Preferred support for reducing/quitting smoking (n = 215)
	n (%)	n (%)
No support	398 (77.28)	130 (60.47)
Healthcare professionals	11 (2.14)	26 (12.09)
Informal support	49 (9.51)	17 (7.91)
Other	18 (3.50)	5 (2.33)
Multiple sources of support	39 (7.57)	37 (17.21)



**Figure 6:** Preferred support sources for reducing alcohol and smoking

Among respondents wanting support, the majority prefers informal support for alcohol, while healthcare professionals are the most preferred support source for smoking, with informal support chosen to a similar extent as for alcohol. Additionally, both for alcohol and smoking, many respondents indicate a preference for a combination of multiple support options. It must be noted that several categories have a very low number of respondents, limiting interpretation and generalisability of results. However, since preferred support analyses are kept exploratory, these findings should be viewed as preliminary insights that warrant further investigation.

#### 4.3.2 Crosstabulations and chi-squared tests

Crosstabulations and  $\chi^2$  (chi-squared) tests were conducted to get an idea of the associations between preferred support sources and sociodemographic characteristics. First, the results for alcohol cessation support are discussed, after which the results for smoking cessation support, and then these results are compared to the hypotheses.

##### Preferred support alcohol

Table 13 shows bivariate statistics for drinking support through crosstabulations and  $\chi^2$  tests. Only age showed a significant relationship, where it seemed that older groups more often preferred no support or professional support, while younger age groups had a preference for informal support. Other variables were not significant, possibly due to the small number of respondents per support category. Despite insignificant results, relative frequency distributions suggest potential trends, such as higher-educated

individuals preferring informal support and intermediately educated individuals preferring no support. However, it is also possible that these correlations are at random due to the limited sample size, so no further significant, reliable conclusions can be drawn.

**Table 13:** Bivariate analyses of preferred sources of support for reducing drinking by sociodemographic characteristic variables

Variable	Preferred support for reducing or quitting drinking				
	No support (n = 398)	Healthcare professionals (n = 11)	Informal support (n = 49)	Other (n = 18)	Multiple sources of support (n = 39)
<b>Gender</b>					
Male	264 (77.19)	8 (2.34)	30 (8.77)	13 (3.80)	27 (7.89)
Female	134 (77.46)	3 (1.73)	19 (10.98)	5 (2.89)	12 (6.94)
$\chi^2 = 1.20, df = 4, p = 0.878$					
<b>Age</b>					
18-34	50 (60.98)	0 (0.00)	17 (20.73)	3 (3.66)	12 (14.63)
35-49	52 (62.65)	0 (0.00)	17 (20.48)	6 (7.23)	8 (9.64)
50-64	104 (81.25)	5 (3.91)	6 (4.69)	7 (5.47)	6 (4.69)
65-74	133 (85.26)	3 (1.92)	8 (5.13)	1 (0.64)	11 (7.05)
75+	59 (89.39)	3 (4.55)	1 (1.52)	1 (1.52)	2 (3.03)
$\chi^2 = 65.46, df = 16, p = 0.000^{***}$					
<b>Education</b>					
High	236 (77.63)	3 (0.99)	33 (10.86)	10 (3.29)	22 (7.24)
Intermediate	123 (75.46)	7 (4.29)	13 (7.98)	7 (4.29)	13 (7.98)
Low	39 (81.25)	1 (2.08)	3 (6.25)	1 (2.08)	4 (8.33)
$\chi^2 = 7.85, df = 8, p = 0.448$					
<b>Income</b>					
Above modal	134 (78.36)	2 (1.17)	17 (9.94)	4 (2.34)	14 (8.19)
Modal	131 (77.51)	4 (2.37)	19 (11.24)	5 (2.96)	10 (5.92)
Below modal	80 (74.77)	3 (2.80)	10 (9.35)	7 (6.54)	7 (6.54)
Not reported	53 (77.94)	2 (2.94)	3 (4.41)	2 (2.94)	8 (11.76)
$\chi^2 = 0.885, df = 12, p = 0.626$					
*** p < 0.01					

#### Preferred support smoking

Table 14 shows bivariate analyses for preferred support for reducing smoking, with weak significant relations ( $p < 0.1$ ) with gender, age and income. Men seem more likely to prefer no support, while women prefer professional or multiple sources of support. Also, older groups appear more likely to want no or professional support, while younger respondents prefer informal or other support. Moreover below-modal earners seem the most likely to want to receive support, and modal earners are the least likely to prefer professional support. Support preferences of the not reported income group seem very similar to those of below-modal earners, with both having a relatively high preference for informal support.

Furthermore, when looking at relative frequency distributions, in this sample it appears that like lower-educated more often want no support, that high-educated are more likely to want professional support and that intermediate educated are most likely to prefer multiple sources of support. However, again, these results are not significant, and no reliable conclusions can be drawn.

**Table 14:** Bivariate analyses of preferred sources of support for reducing smoking by sociodemographic characteristic variables

Variable	Preferred support for reducing or quitting smoking				
	No support (n = 130)	Healthcare professionals (n = 26)	Informal support (n = 17)	Other (n = 5)	Multiple sources of support (n = 37)
<b>Gender</b>					
Male	92 (64.34)	15 (10.49)	12 (8.39)	5 (3.50)	19 (13.29)
Female	38 (52.78)	11 (15.28)	5 (6.94)	0 (0.00)	18 (25.00)
$\chi^2 = 8.42, df = 4, p = 0.077^*$					
<b>Age</b>					
18-34	22 (44.90)	4 (8.16)	8 (16.33)	1 (2.04)	14 (28.57)
35-49	19 (59.38)	2 (6.25)	3 (9.38)	1 (3.12)	7 (21.88)
50-64	34 (65.38)	9 (17.31)	2 (3.85)	3 (5.77)	5 (7.69)
65-74	40 (66.67)	8 (13.33)	2 (3.33)	0 (0.00)	10 (16.67)
75+	15 (68.18)	3 (13.64)	2 (9.09)	0 (0.00)	2 (9.09)
$\chi^2 = 25.12, df = 16, p = 0.068^*$					
<b>Education</b>					
High	51 (57.95)	16 (18.18)	7 (7.95)	2 (2.27)	12 (13.64)
Intermediate	57 (58.76)	7 (7.22)	9 (9.28)	3 (3.09)	21 (21.65)
Low	22 (73.33)	3 (10.00)	1 (3.33)	0 (0.00)	4 (13.33)
$\chi^2 = 9.67, df = 8, p = 0.289$					
<b>Income</b>					
Above modal	37 (67.27)	7 (12.73)	2 (3.64)	1 (1.82)	8 (14.55)
Modal	54 (68.35)	4 (5.06)	4 (5.06)	3 (3.80)	14 (17.72)
Below modal	24 (44.44)	10 (18.52)	9 (16.67)	0 (0.00)	11 (20.37)
Not reported	15 (55.56)	5 (18.52)	9 (16.67)	0 (0.00)	11 (20.37)
$\chi^2 = 19.89, df = 12, p = 0.069^*$					

\* p < 0.1

#### 4.3.3 Summary of results

The exploratory analyses showed a number of significant associations. Age was significantly associated with alcohol support preferences, and had a weak significant association with smoking support preferences. In both cases, older people seemed to prefer no support or professional support, while younger age groups preferred informal support. This contradicts the hypothesis that older people would prefer more support than younger groups, but is in line with the hypothesis that older age groups prefer professional support and younger groups prefer informal support. There was also weak evidence for a relationship between gender and smoking support, where it seemed that men prefer no support, while women preferred professional or multiple sources of support. This aligns with the hypothesis that women prefer more support than men, but contradicts the hypothesis that women are more likely to prefer informal support. Finally, preferred support for smoking cessation was also weakly significantly associated with income, with below-modal earners seeming the most likely to want to receive support, and with high preferences for informal support, while modal earners were the least likely to prefer professional support. This aligns with the hypothesis that lower income groups more often prefer support, but not with the hypothesis that lower income groups more often prefer professional support. No significant associations were found for education and support preferences. These results are further discussed in the next chapter.

## 5. Discussion

This chapter discusses the analysis results in more detail, comparing them to literature and theories and discussing their implications. Additionally, it discusses the limitations of this research.

### 5.1 Discussion of results

#### 5.1.1 Sociodemographic differences in health goals

The findings regarding sociodemographic differences in health goals partially align with findings from earlier studies. In general, the vast majority of Frisians did not set any health goals related to alcohol or smoking, which highlights the need for further action and awareness to reduce health risks. Across sociodemographic characteristics, some factors increased the odds of setting health goals, while others decreased it, and there are also characteristics for which no significant effects were found.

#### Gender

For gender, a significant relationship was found only for alcohol-related health goals, with women having lower odds of setting these goals compared to men. This contrasts with previous studies that found either no gender differences (Kloosterman et al., 2023) or a higher likelihood for women (Beard et al., 2016). One explanation, suggested by Kloosterman et al. (2023), could be that women are less likely to set drinking goals because they already consume less alcohol. Given that Frisian women reportedly drink less than Frisian men (Marinus, 2023), this could apply here, though it cannot be verified due to absence of alcohol consumption data for the sample.

No significant gender differences were found in smoking health goals, which aligns with previous Dutch data (Kloosterman et al., 2023), but contrasts with other studies (Chinwong et al., 2018; Liu et al., 2021). This could mean that gender differences among current smokers in Friesland are not as pronounced. Although women are generally more concerned about health damage (Chinwong et al., 2018), this concern might be more pronounced among non-smoking women, aligning with the observation that Frisian women smoke less than men (Marinus, 2023). Alternatively, the lack of significant effects could be due to the limited sample size of current smokers, reducing statistical power.

With respect to the interactions of the theory of planned behaviour (TPB), as described in the conceptual model, it was expected that women would have stronger attitudes, norms, and perceived behavioural control against drinking and smoking compared to men (Chinwong et al., 2018; Cooke et al., 2016; Kloosterman et al., 2023; Liu et al., 2021). However, the findings do not support this, and the higher odds for men of intending to reduce drinking may reflect opposing relations, where women experience more negative attitudes, norms, or perceived control. These findings imply that gender-specific approaches may not be necessary for reducing smoking, but they could be effective for alcohol reduction. Gender-specific strategies should seize men's motivation to drink less, while addressing barriers that may prevent women from doing the same.

#### Age

Age showed significant relations in the alcohol model, with older individuals more likely to set alcohol goals for the next six months, and younger individuals more likely to set no alcohol goals. This contradicts studies that report younger individuals being more likely to set alcohol goals (Chiapetta et al., 2014; Kloosterman et al., 2023), although Davies et al. (2019) also found older individuals more inclined to reduce their alcohol intake, particularly in the near future. This desire for immediate change among older adults may reflect life course changes, such as the onset of health problems, which motivate them to change their behaviours (Davies et al., 2017; Kloosterman et al., 2023). This supports a link between age, attitude, and intentions in the conceptual model, suggesting older age leads to a more negative attitude towards drinking due to health concerns, which in turn influences intentions or health goals. Meanwhile, younger generations may be less inclined to reduce their alcohol consumption, possibly due to the influence of social norms surrounding drinking (Kloosterman et al., 2023).

For smoking cessation, previous studies reported that younger smokers are more likely to try quitting than older ones (Arancini et al., 2021; Kloosterman et al., 2023; Nagelhout et al., 2013). In this study, no significant age effects were found, suggesting the relationship between age and smoking cessation intentions may be less pronounced among Frisians. This could either imply that attitudes, subjective norms, and perceived behavioural control related to smoking cessation intentions are consistent across age groups, or the relative influence of these factors may fluctuate over the life course. Social norms that reinforce smoking may be stronger at younger age (Høie et al., 2012; Moan & Rise, 2005), while older smokers may have more negative attitudes towards quitting due to shorter remaining life expectancy (Margolis, 2013) or they may lack perceived behavioural control due failed past cessation attempts (Dono et al., 2022). Alternatively, the lack of significance could also be related to the limited sample size of current smokers.

These findings suggest that alcohol interventions for older adults should emphasize the immediate health benefits and address any barriers to setting reduction goals. Younger generations will need to be motivated to reduce their drinking first, for example, by reinforcing positive social norms. For smoking, similar strategies could be effective for younger people, while interventions for older adults should focus on short-term benefits and addressing past failures.

### Socioeconomic status

For socioeconomic status, several significant effects were found. In the alcohol model, higher socioeconomic status is related to a higher likelihood of setting goals to reduce drinking. Education analyses show that low-educated individuals, and to a lesser extent intermediate-educated individuals, are less likely to set near-future alcohol health goals compared to high-educated groups. These findings align with Kloosterman et al. (2023), who attributed these educational differences to higher initial consumption levels among the high-educated. Other studies confirm that heavier drinkers more often have intentions to reduce (De Vocht et al., 2018; Davies et al., 2019). However, in Friesland, alcohol consumption higher educated individuals actually drink less than middle- and low-educated groups (Marinus, 2023), so this explanation does not hold up. Additionally, income analyses indicate that below-modal earners are less likely to set far-future alcohol goals compared to modal earners, and there is weak evidence that modal earners are less likely to set near-future alcohol goals compared to above-modal earners. Thus, with rising income, the likelihood of setting alcohol goals appears to increase as well, an effect not detected in previous research (Kloosterman et al., 2023). The effects of education should be interpreted with caution, since these do not remain significant in the binary regression model or the model without influential cases (Appendix B and C). It is possible that the observed relationships are particularly influenced by sample characteristics or outliers, rather than representing associations in the broader population. However, the income results are more robust, so the general socioeconomic trend holds up.

As the positive relationship between socioeconomic status and alcohol goals in Friesland cannot be attributed to higher consumption levels, higher-SES individuals may be influenced by other factors than their drinking habits. According to the TPB interactions, this could reflect more positive attitudes towards health and reducing alcohol consumption, as higher-SES individuals value health more (Jarvis et al., 2003; Viinikanen et al., 2022). It could also reflect higher perceived behavioural control, driven by better capacities for behavioural change (Casetta et al., 2017; Cutler & Lleras-Muney, 2010). In contrast, for lower-SES groups, the findings could reflect less favourable attitudes towards reducing drinking due to lower health literacy, or it could be evident of lower perceived behavioural control as they face more barriers to behavioural change, such as financial stress or lack of access to resources (Droomers et al., 2004; Wood & Bellis, 2017). Higher alcohol consumption levels among lower-SES Frisians may also contribute to these barriers as well as to less supportive social norms. These findings imply that interventions for reducing alcohol consumption should take into account the challenges faced by lower-SES groups, including addressing barriers to behaviour change and enhancing health literacy.

Furthermore, several significant effects were found for the group that did not report their income: they were less likely to set alcohol goals in the near and far future compared to above-modal and modal earners. These results seem similar to those of below-modal earners, but it must be taken into account that the group that does not report their income may have differing reasons for not reporting income, such as privacy concerns, distrust in the system, or irregular income sources. Therefore, it is



difficult to identify specific factors influencing their health intentions. In light of the TPB, it could be that individuals in the non-reported income category may experience more negative attitudes, social norms, or perceived behavioural control towards reducing alcohol consumption, possibly for the same reasons they choose not to report their income. However, the heterogeneity of this group makes it difficult and highlights the need for tailored approaches to address the specific barriers they face.

For smoking, intermediate-educated smokers are significantly more likely to want to reduce smoking in the near future compared to high-educated smokers. Additionally, modal earners are more likely to want to reduce smoking in the far future compared to above-modal earners, although on a lower significance level. These results suggest that middle-SES groups are more inclined to set smoking goals than high-SES groups, with no evidence that lower-SES groups are less likely to set smoking goals. This contrasts with other studies that found higher-income groups or higher-educated groups more likely to quit smoking (Brownson et al., 1992; Droomers et al., 2004; Manfredi et al., 1998; Reid et al., 2010), although some also reported no significant educational differences in smoking goals (Clark et al., 1998; Droomers et al., 2004, 2016). Like with alcohol, the regression results of education and income should also be treated with caution in the smoking model, as there are some slightly changes in the binary model and the model without outliers (Appendix B and D). However, again, the general tendency stays the same: middle-SES groups (and, after removing outliers, also low-educated) are significantly more likely to set smoking goals compared to those of higher socioeconomic status.

A potential explanation, proposed by Droomers et al. (2004), is that higher-educated smokers may be a selective group of hardcore smokers who continue despite knowing the harms. This could explain the situation in Friesland as well. In light of the TPB interactions, these results might reflect different influences of attitudes and subjective norms on smoking intentions across socioeconomic groups. High-SES smokers may face high social pressure (norms) to quit and be more aware of the harms (André et al., 2018; Droomers et al., 2004), yet continue smoking due to particularly negative attitudes towards quitting. In contrast, middle-SES smokers might experience a more balanced influence of TPB components, with moderate social pressure to quit and a balanced awareness of harms (Droomers et al., 2004; Kloosterman et al., 2023), making them more open to setting smoking reduction goals. Additionally, since smoking is more common among middle- and low-SES groups, also in Friesland (Marinus, 2023), middle-SES smokers may not be a particularly hardcore group, unlike high-SES smokers.

These findings suggest for lower- and middle-SES groups may be susceptible to interventions that inform, address potential (financial) barriers, and enhance social support, while for high-SES smokers, it is especially necessary to counter negative attitudes through personalized support or strategies that address their resistance to quitting.

#### Near- versus far-future goals

The findings regarding health goals highlight how the interactions of the TPB, as outlined in the conceptual model, can identify aspects that influence alcohol or smoking goal-setting. These aspects can help address the differing needs of sociodemographic groups. This study distinguishes between goals that are set for the near and far future. Therefore, it is also relevant to consider Ajzen's (2011) proposition that the predictive validity of intentions is especially strong over shorter time intervals. This could mean that goals set for the next six months are more robust than goals set for the distant future. In the analyses, most significant variables were related to near-future goals, except for the significant relationship between intermediate education level and smoking goals. This may indicate that individuals with intermediate education levels are beginning to shift their attitudes or norms regarding the harms of smoking, but these motivations are not yet strong enough to lead to immediate behavioural change. Alternatively, this group may be facing barriers that delay their actions, such as unhelpful social norms or lack of perceived control, which are less prevalent among higher-educated groups.

#### *5.1.2 Differences in preferred support*

The explorations of preferred support revealed that most people want no support with alcohol or smoking cessation. Given that support evidently leads to more successful health outcomes (Marlatt et al., 1997; Trimbos Instituut, 2023d), this tendency highlights the need for further action and awareness. People should be made more aware of the benefits of support, and barriers to accessing it should be

removed. There are differences in preferred support between health goals and across sociodemographic characteristics, which indicate that the most effective strategies may vary.

### Alcohol versus smoking

When comparing support preferences for alcohol and smoking cessation, there is a higher preference for support when quitting smoking than for quitting alcohol, consistent with existing literature (Davies et al., 2019; Kloosterman et al., 2023; Owen & Davies, 1990). For smoking cessation, professional support is the most preferred method, whereas for alcohol cessation, informal support is preferred, aligning with previous studies (Marlatt et al., 1997; Owen & Davies, 1990). According to the health belief model (HBM) and the conceptual model, these findings suggest differences in perceived barriers and benefits between alcohol and smoking support. The lower preference of support in alcohol cessation could indicate that Frisian people perceive fewer benefits and more barriers to seeking support, potentially due to higher social stigma (Kloosterman et al., 2023; Marlatt et al., 1997). The preference for informal support suggests that barriers are lowest and benefits highest, when seeking help from personal contacts, possibly due to the perception that professional help indicates a more severe problem (Marlatt et al., 1997). For smoking cessation, preferences suggest that people perceive greater benefits from professional help. Potentially, this is because smoking is viewed more as an addiction that requires specialized help, or because of failed past cessation attempts that reduced people's confidence to quit without external assistance (Dono et al., 2022; Kloosterman et al., 2023; Owen & Davies, 1990).

It should be noted that support preferences are only indicated by those who set these health goals, meaning that the groups of respondents differ between drinking and smoking. Therefore, differences between the involved populations may have influenced observed differences in support preferences between drinking and smoking, which limits direct comparability. However, these findings still provide valuable insights into the differences in needs of those who set specific health goals, which can be used to inform policies.

These findings imply that promoting support for alcohol cessation should focus on different aspects than that of smoking. For alcohol cessation, campaigns should aim to reduce stigma around seeking help, and interventions should engage informal support networks. Meanwhile, smoking cessation may be more effectively promoted through general practitioners, and ensuring inclusive access to professional support services is crucial.

### Sociodemographic differences

Regarding sociodemographic differences in support preferences, crosstabulations show significant associations between alcohol goals and age, and a weaker significant association between smoking goals and age. In line with previous studies, younger people seem to prefer informal support and older adults prefer professional sources (Benson, 1990; Buscemi et al., 2010; Dono et al., 2022; Helle et al., 2022), although it was also found that older adults are more likely to want no support, in contrast with Davies et al. (2019) who found a higher tendency for support among older people. Interpreted through the HBM interactions, these findings suggest that older adults perceive higher barriers or fewer benefits in seeking cessation support. This could be due to failed past attempts that lead them to prefer professional help or avoid seeking help altogether due to shame from relapses. Meanwhile, younger individuals may especially see benefits in informal support, potentially because of higher confidence in their ability to quit without professional help (Dono et al., 2022), or because they rely more on their social networks.

Gender is also weakly related to smoking support preferences, with men more frequently preferring no support, while women prefer professional or multiple sources of support. This is consistent with literature suggesting that women are more receptive to help (Dieleman et al., 2022; Owen & Davies, 1990), and aligns with an earlier finding that women want professional support (Owen & Davies, 1990), although it does not provide evidence for previous studies indicating women have a preference for informal support (Dieleman et al., 2022; Leal et al., 2021; Owen & Davies, 1990; Stewart et al., 2011). These findings suggest that men perceive fewer benefits or more barriers to seeking support, while women especially see benefits in professional or multiple support sources. This could be related to women's preferences for psychological and social support, (Dieleman et al., 2022; Leal et al., 2021; Stewart et al., 2011) making them more likely to turn to various support sources simultaneously,

while men may perceive fewer benefits of support as they especially experience external obstacles beyond their control (Dieleman et al., 2021)

In addition, income shows a weak significant association with smoking support preferences. Below-modal earners appear more likely to seek support, especially from informal sources, while modal earners seem the least likely to prefer professional support. These findings align with studies indicating socioeconomically disadvantaged smokers are more likely to use supported methods (Clare et al., 2014; Dono et al., 2022), though these studies often highlight a preference for professional support among low-SES groups. The observed preference for informal support may indicate that lower-income smokers perceive financial barriers to affording professional help (Schöllgen et al., 2011). The reluctance of modal earners to seek professional support may be related to perceived ineffectiveness, negative past experiences, or financial barriers as well.

These findings suggest that alcohol and smoking campaigns targeted at older people should especially emphasise the benefits of (professional) support, while younger Frisians may respond better to campaigns that focus on peer support. Furthermore, smoking cessation campaigns may need to target men and women differently, focusing on reducing barriers for men and emphasising the benefits of professional support for women. Additionally, income-related differences can be considered by addressing financial barriers and by ensuring that support services are accessible and tailored to the need of various income groups.

There are no significant relations found for other sociodemographic variables and support preferences. This is potentially due to the small number of respondents that indicated wanting support, and especially the small number of respondents in certain categories. In light of this, it must also be noted that the associations are not significant at a very high level and that the results have limited generalisability and must be interpreted with caution, also due to the low number of respondents for different categories. These exploratory findings should be seen as preliminary insights that can guide further research. Deeper investigations, including larger sample sizes would be required to draw more reliable and relevant conclusions regarding sociodemographic differences in support preferences for alcohol and smoking cessation.

### *5.1.3 Combining insights from health goals and preferred support*

The previous paragraphs have discussed the findings regarding health goals and preferred support separately. Sociodemographic factors influence both health goals and preferred support, with implications for policy and practice. Combining these insights can provide further understanding and highlights additional needs.

For some characteristics, significant effects were found in relation to health goals as well as preferred support with that goal. Older people are more likely to set immediate alcohol health goals, but prefer no or professional support with those goals. This suggests that they may feel confident managing independently, or they may have particular trust in professional help. Thus, it is important to make professional support accessible and appealing to older adults, while addressing their reasons for declining support, to ensure they have the necessary resources to succeed. Similarly, for smoking, modal earners are more likely to set smoking goals compared to above-modal earners, but they want less support with these goals compared to below-modal or not reported earners, indicating a need to address perceived barriers and inform them about support benefits.

Furthermore, there are a few characteristics for which there were no significant differences in health goals, but only in preferred support: female smokers want more and professional support, older people who smoke prefer no or professional support, and young smokers informal support. This emphasises the importance of offering a range of support options to meet the diverse needs of those people that set health goals.

Additionally, for certain characteristics, significant differences in health goals did not translate to differences in preferred support. Men and higher socioeconomic groups set more alcohol goals, and intermediate-educated individuals set more smoking goals, but their support preferences appeared similar to others. This shows a need for universally accessible and effective support services, regardless of initial differences in goal-setting behaviour.

In conclusion, these combined insights can help make health campaigns and support services more effective. Improved understanding of the needs and preferences of different groups can lead to better, more accessible support. This way, people can get the help they need to successfully reduce or quit health-damaging behaviours, resulting in improved health for everyone.

## **5.2 Limitations of this study**

There are several limitations to this study that may influence the results and their generalisability. Although the sample consisted of over 3,000 respondents, the number of participants who smoked or set health goals was relatively small. This limited the number of observations available for analysing smoking health goals and preferred support, potentially compromising the statistical power and significance of the results. Also, the analyses used unweighted data, leading to slight over- or underrepresentation of certain sociodemographic groups, potentially leading to slight biases in estimates. Additionally, the very small number of respondents identifying as gender other than male or female made it necessary to exclude them from analysis, which limited the inclusivity of the study, as the health needs of this specific group could not be addressed.

Furthermore, the model fit of both regression models was reasonably well, but could be improved. While only age, gender, education, and income were considered, other (sociodemographic) characteristics such as cultural background or mental health status may also play significant roles in health goal setting and support preferences. Moreover, no potential interaction variables were examined. The effects of certain characteristics may vary across sociodemographic groups; for instance, socioeconomic disparities may influence health goals differently across age group, due to different experiences during working life compared to retirement. These interactions could reveal differences not visible in the current results. Further investigation of other characteristics or interaction variables may have led to improved model fit and reveal further other characteristics or interactions that could influence health goals.

Also, analyses of preferred support were kept exploratory and no regressions were conducted. This means no detailed information on relationships and the strength of associations was obtained, resulting in less nuanced insights that should be treated with caution. The small category sizes in preferred support statistics also limit the generalisability of these findings.

Moreover, the lack of data on respondents' alcohol consumption levels made it unclear whether observed differences in alcohol goals were driven by motivations to quit or pre-existing differences in drinking levels. For smoking, while only current smokers were considered, the frequency of smoking was not taken into account. Differentiating between heavy and light smokers could provide further insights into motivations for reducing smoking.

Lastly, the study did also more generally not capture participants' underlying motivations behind health goals and preferred support. These motives are essential for accurately applying the TPB and HBM. This limitation restricts the ability to fully interpret results within these theoretical frameworks, leaving some interpretations speculative.

## 6. Conclusion

The objective of this thesis was to identify sociodemographic differences in health goals to reduce alcohol consumption and smoking for the population of Friesland, and to explore differences in preferred support. It aimed to investigate people's goals to reduce drinking and smoking, as well as the preferred support for achieving these goals, across the characteristics gender, age, education level, and income.

Findings indicate that sociodemographic characteristics influence both health goals and preferred support differently. The regression models showed that men, older individuals, higher-educated, and higher-income groups are more likely to set goals to reduce drinking. Intermediate-educated and modal earners are more likely to set smoking goals compared to high-educated or above-modal earners. No significant gender or age effects were found for smoking goals. Exploratory preferred support analyses showed differences between alcohol and smoking; people preferred more, especially professional, support for smoking cessation, while informal support was preferred for alcohol. Older people often preferred no or professional support, while younger individuals preferred informal support. Gender and income also showed weak associations with smoking support preferences; women and below-modal earners appeared to prefer more support, women from professional or multiple sources and below-modal earners from informal sources, while men and modal earners seemed to prefer no support.

The interactions of the theory of planned behaviour (TPB) and the health belief model (HBM) help explain these findings. Age, gender, education, and income influence attitudes, subjective norms, and perceived behavioural control regarding health goals, as well as perceived barriers and benefits of seeking support. This shapes health goals and preferred support. Barriers and benefits of support are also linked to the type of health goal that is set. To come back to the main research question: in Friesland, being male, older age, and having higher education and income levels are associated with a higher likelihood of setting goals to reduce alcohol consumption. Middle education and income levels are linked to a higher likelihood of setting goals to reduce smoking. Additionally, age, gender and income seem to influence support preferences for achieving these health goals.

Findings from this thesis provide insights into which factors hinder different groups from improving drinking and smoking behaviour, and how they prefer to be supported. These insights can help create targeted interventions and customised support strategies to mobilise people to set health goals and assist them in reaching these goals. This is particularly relevant given the current state of healthcare policies not being on track to reach targets for reducing drinking and smoking. By addressing the specific needs and barriers of the most disadvantaged groups, these interventions can reduce health inequalities that are exacerbated by alcohol and smoking. Understanding and addressing these varied needs can help policymakers develop more effective strategies to promote healthier behaviours across all sociodemographic groups. This can help achieve national health targets, create more inclusive health policies, and improve population health.

This study contributes to the existing literature by providing a comprehensive overview of sociodemographic influences on health goals to reduce drinking and smoking. It offers some findings that contrast with previous studies, thereby providing new perspectives on health-interventions for different genders and age groups. Combining the TPB and HBM to study health goals and preferred support offers new insights into alcohol and smoking cessation, and the combined insights from health goals and preferred support reveal further implications. In addition, the study offers specific insights into the Frisian population, which help improve understanding of the region and its inhabitants. Given the good experienced health in Friesland, these insights can also be used to improve understanding of how people prioritise their health behaviours and what can be done to further enhance these behaviours.

This research has some limitations, which may compromise its results. A larger sample size, especially including more smokers and people that want to set health goals, would enhance statistical power and generalisability. Including respondents who identify as a gender other than male or female would

increase inclusivity. It would also be valuable to include a wider range of demographic variables and to investigate potential interaction effects, to improve understanding of the influences on health goal setting and support preferences, and to reveal more nuanced insights. Furthermore, future research should include regression analyses for preferred support to gain deeper insights into relationships and associations between sociodemographic characteristics and support preferences. Additionally, it would be valuable to account for respondents' alcohol consumption levels and smoking frequency, to better understand how these behaviours influence health goals and preferred support. It would also be interesting to conduct qualitative follow-up research, to capture participants' underlying motivations and get insight into what hinders them, to provide a fuller understanding of the factors influencing health intentions and to be able to more accurately the TPB and HBM frameworks. Finally, longitudinal studies that track health goals and sociodemographic changes over time could provide a deeper understanding of the influences of life events and changes in sociodemographic status. Panel Fryslân could function as a platform for this, to gain more insights into the health goals and support preferences of the Frisian population, ultimately contributing to the development of more effective interventions and a healthier population.

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## Appendix A: STATA .do files

### Stata .do file for data preparation

```
clear all
cd "Y:\staff\frw\Demografie\Master Thesis_Eva"
import spss using "Data 2024_01_gezondheid"

* Set survey design to account for weights (for weighted calculations)
svyset [pweight=w]
* Give all observations a number for easier interpretation later on
gen obs_num = _n

*Create age categories
destring leeftijd, generate(age)
egen age_15yr_group = cut(age), at(18,35,50,65,75,100)
label define age_15yr_lbl 1 "18-34" 2 "35-49" 3 "50-64" 4 "65-74" 5 "75+"
label values age_15yr_group age_15yr_lbl
*Also create quadratic age
gen age2 = age^2

* Create gender categories
encode geslacht, generate(gender)
label define gender_lbl 1 "male" 2 "female" 3 "other"
recode gender (2=1) (3=2) (1=3)
label values gender gender_lbl
drop if gender == 3

*Create education categories (setting high education as reference category)
encode opleiding, generate(education)
label define edu_lbl 1 "high" 2 "intermediate" 3 "basic"
recode education (1=1) (2=3) (3=2) (4=1) (5=3) (6=2)
label values education edu_lbl

*Create personal income categories
gen pers_income_cat = ""
replace pers_income_cat = "below modal" if pinknetto_2023 == "€1.000 of minder" | ///
    pinknetto_2023 == "€1.000 tot €1.500" | ///
    pinknetto_2023 == "€1.500 tot €2.000"
replace pers_income_cat = "modal" if pinknetto_2023 == "€2.000 tot €2.500" | ///
    pinknetto_2023 == "€2.500 tot €3.000"
replace pers_income_cat = "above modal" if pinknetto_2023 == "€3.000 tot €3.500" | ///
    pinknetto_2023 == "€3.500 tot €4.000" | ///
    pinknetto_2023 == "€4.000 tot €4.500" | ///
    pinknetto_2023 == "€4.500 tot €5.000" | ///
    pinknetto_2023 == "€5.000 tot €5.500" | ///
    pinknetto_2023 == "€5.500 tot €6.000" | ///
    pinknetto_2023 == "Meer dan €6.000"
replace pers_income_cat = "not reported" if pinknetto_2023 == "Weet ik niet/wil ik niet zeggen" | ///
    missing(pinknetto_2023)

* Encode income (with above modal as reference category)
encode pers_income_cat, generate(pers_income)
```

```

label define pers_income_lbl 1 "above modal" 2 "modal" 3 "below modal" 4 "not reported"
recode pers_income (1=1) (2=3) (3=2) (4=4)
label values pers_income pers_income_lbl

* Create smoking behaviour categories
label variable V36_1 "vaping behaviour"
label variable V36_2 "smoking behaviour"
encode V36_1, generate(vape_beh)
encode V36_2, generate(smoke_beh)
* Create two categories: being a smoker yes or no
recode vape_beh (1 2 3 4 = 1) (5 = 0)
label define vape_labels 1 "Yes" 0 "No"
label values vape_beh vape_labels
recode smoke_beh (1 2 3 4 = 1) (5 = 0)
label define smoke_labels 1 "Yes" 0 "No"
label values smoke_beh smoke_labels
* Combine smoking and vaping into 1 variable, current_smoker
gen current_smoker = .
replace current_smoker = 0 if (vape_beh == 0 | smoke_beh == 0)
replace current_smoker = 1 if (vape_beh == 1 | smoke_beh == 1)
label define smoker_lbls 0 "No" 1 "Yes"
label values current_smoker smoker_lbls

* Drop the values that miss gender, education, age data, gender other, or that have incomplete surveys
> these are all the values that miss weight factor
drop if missing(w)

* Create health goals

*V31 answer options: 1 future, 2 next 6 months, 3 no/not applicable
*Rename answers to question 31 (health goals) V31_1 = alcohol; V31_2 = smoking; V31_3 = vaping
label variable V31_1 "Alcohol goal"
label variable V31_2 "Smoking goal"
label variable V31_3 "Vaping goal"

* Generate alcoholgoal
encode V31_1, generate(alcoholgoal)
label define alcohol_lbl 1 "Yes, future" 2 "Yes, next 6 months" 3 "No"
label values alcoholgoal alcohol_lbl
*Also create binary alcoholgoal variable that only has yes/no as answer options
generate alcoholgoal_dual = .
replace alcoholgoal_dual = 0 if alcoholgoal == 3
replace alcoholgoal_dual = 1 if alcoholgoal == 1 | alcoholgoal == 2
label define alcoholgoal_dual_lbl 1 "Yes" 0 "No"
label values alcoholgoal_dual alcoholgoal_dual_lbl
label variable alcoholgoal_dual "Wanting to reduce or quit drinking alcohol"

* Put smoking & vaping goals together into 1 variable: smokinggoal
encode V31_2, generate(smokinggoal_q)
encode V31_3, generate(vapinggoal_q)
destring V31_2 V31_3, replace
gen smokinggoal = .
replace smokinggoal = 3 if V31_2 == 3 | V31_3 == 3
replace smokinggoal = 1 if V31_2 == 1 | V31_3 == 1

```



```

replace smokinggoal = 2 if V31_2 == 2 | V31_3 == 2

label define smokinggoal_lbl 1 "Yes, future" 2 "Yes, next 6 months" 3 "No"
label values smokinggoal smokinggoal_lbl
*Also create binary smokinggoal variable that only has yes/no as answer options
generate smokinggoal_dual = .
replace smokinggoal_dual = 0 if smokinggoal == 3
replace smokinggoal_dual = 1 if smokinggoal == 1 | smokinggoal == 2
label define smokinggoal_dual_lbl 1 "Yes" 0 "No"
label values smokinggoal_dual smokinggoal_dual_lbl
label variable smokinggoal_dual "Wanting to reduce or quit smoking"

* Save edited data file
save "Data 2024_01_gezondheid_prepared", replace

```

### Stata .do file for research question 1 (analysis alcohol health goals)

```

clear all

cd "Y:\staff\frw\Demografie\Master Thesis_Eva"
use "Data 2024_01_gezondheid_prepared"

// RESEARCH QUESTION 1: ALCOHOL HEALTH GOALS (chapter 4.1 + 4.2)

* Absolute and relative frequencies of sociodemographic characteristics (table 4)
*unweighted:
tab gender
tab age_15yr_group
sum age
tab education
tab pers_income
tab current_smoker
*weighted:
svy: tabulate gender, count
svy: tabulate gender, percent
svy: tabulate age_15yr_group, count
svy: tabulate age_15yr_group, percent
svy: mean age
estat sd
svy: tabulate education, count
svy: tabulate education, percent
svy: tabulate pers_income, count
svy: tabulate pers_income, percent
svy: tabulate current_smoker, count
svy: tabulate current_smoker, percent

* Further investigate group with missing income data
tab gender if pers_income == 4
tab age_15yr_group if pers_income == 4
sum age if pers_income == 4
tab education if pers_income == 4

```

```

* Univariate descriptive statistics health goals (table 5)
  *unweighted:
tab alcoholgoal
tab smokinggoal
tab smokinggoal if current_smoker == 1
  *weighted:
svy: tabulate alcoholgoal, count
svy: tabulate alcoholgoal, percent
svy: tabulate smokinggoal, count
svy: tabulate smokinggoal, percent

* Bivariate statistics: crosstabulations and chi2 (table 6)
  *unweighted:
tabulate gender alcoholgoal, row chi2
tabulate age_15yr_group alcoholgoal, row chi2
tabulate education alcoholgoal, row chi2
tabulate pers_income alcoholgoal, row chi2
  *weighted:
svy: tabulate gender alcoholgoal, row count
svy: tabulate age_15yr_group alcoholgoal, row count
svy: tabulate education alcoholgoal, row count
svy: tabulate pers_income alcoholgoal, row count

// REGRESSION MODELS

* (1) Test whether age^2 should be added to the model
mlogit alcoholgoal age i.gender i.education i.pers_income, baseoutcome(3)
      // compare chi2, LLR, pseudo R2
estimates store model1
mlogit alcoholgoal age age2 i.gender i.education i.pers_income, baseoutcome(3)
      // compare chi2, LLR, pseudo R2
estimates store model2
test age2 // wald test
lrtest model1 model2 // likelihood ratio test
estimates table model1 model2, stats (aic bic) // aic & bic test

* so, age2 should be added > investigate relationship between age & alcoholgoal
  *create graph with predicted probabilities of outcomes & age:
mlogit alcoholgoal age age2 i.gender i.education i.pers_income
margins, at(age=(18, 20(5)95, 98))
marginsplot, xlabel(18(5)98) ylabel(0(.1)1) ///
      title("Predicted Probability of Setting an Alcohol Goal by Age") ///
      legend(order(3 "No" 2 "Yes, in the next 6 months" 1 "Yes, in the future")) ///
      ytitle("Predicted Probability") xtitle("Age")

* (2) Test model for model fit and model assumptions
mlogit alcoholgoal age age2 i.gender i.education i.pers_income, rrr baseoutcome(3)

  * (a) multicollinearity
quietly regress alcoholgoal age age2 i.gender i.education i.pers_income
estat vif // age & age2 are multicollinear

  * (b) IIA assumption
ssc install mlogtest

```

```
quietly mlogit alcoholgoal age age2 i.gender i.education i.pers_income
mlogtest, hausman // not violated
```

```
* I goodness of fit
```

```
logit alcoholgoal_dual age age2 i.gender i.education i.pers_income
linktest, nolog
estat gof // neither hat nor hatsq significant (see results for interpretation)
```

```
* (d) test for influential cases (outliers)
```

```
/// examine pregibon dbeta
```

```
quietly logit alcoholgoal_dual age age2 i.gender i.education i.pers_income
predict p
predict db, dbeta
scatter db p, mlabel (obs_num)
sort db
browse obs_num db alcoholgoal age gender education pers_income
/// those with db > 0.1 seem to be outliers
```

```
/// examine leverage and residuals
```

```
quietly logit alcoholgoal_dual age age2 i.gender i.education i.pers_income
predict hat, hat
sort hat
browse obs_num hat alcoholgoal age gender education pers_income
/// those with hat > 0.034 seem to be outliers
```

```
/// influence plot:
```

```
twoway (scatter db hat, mlabel (obs_num)), yline(0.1) xline(0.034)
```

```
/// sensitivity analysis
```

```
// drop if db > 0.1
```

```
logit alcoholgoal_dual age age2 i.gender i.education i.pers_income
mlogit alcoholgoal age age2 i.gender i.education i.pers_income
```

```
// drop if hat > 0.034 // perform this step when db > 0.1 is dropped but also when it is still included to
compare each combination
```

```
logistic alcoholgoal_dual age age2 i.gender i.education i.pers_income
mlogit alcoholgoal age age2 i.gender i.education i.pers_income, rrr
```

```
/// new gof tests with outliers removed:
```

```
logit alcoholgoal_dual age age2 i.gender i.education i.pers_income
linktest, nolog
estat gof
```

```
/// rerun output tables (see below) without high leverage/residual values
```

```
mlogit alcoholgoal age age2 i.gender i.education i.pers_income, rrr baseoutcome(3)
```

```
/////
```

```
* FINAL OUTPUT TABLES (table 8)
```

```
clear all
```

```
cd "Y:\staff\frw\Demografie\Master Thesis_Eva"
```

```
use "Data 2024_01_gezondheid_prepared"
```

```
mlogit alcoholgoal age age2 i.gender i.education i.pers_income, rrr baseoutcome(3)
```

\*change reference categories to see if additional variables become significant:  
 mlogit alcoholgoal age age2 ib(2).gender ib(2).education ib(2).pers\_income, rrr baseoutcome(3)  
 mlogit alcoholgoal age age2 ib(2).gender ib(2).education ib(3).pers\_income, rrr baseoutcome(3)

\*change baseoutcome to see if this makes any difference, and compare binary regression with  
 mlogit:  
 mlogit alcoholgoal age age2 i.gender i.education i.pers\_income, rrr baseoutcome(2)  
 mlogit alcoholgoal age age2 ib(2).gender ib(2).education ib(2).pers\_income, rrr baseoutcome(2)  
 logistic alcoholgoal\_dual age age2 i.gender i.education i.pers\_income  
 logistic alcoholgoal\_dual age age2 ib(2).gender ib(2).education ib(2).pers\_income

### Stata .do file for research question 2 (smoking health goals)

clear all

cd "Y:\staff\frw\Demografie\Master Thesis\_Eva"  
 use "Data 2024\_01\_gezondheid\_prepared"

drop if current\_smoker == 0

// RESEARCH QUESTION 2: SMOKING HEALTH GOALS (chapter 4.1 + 4.3)

\* Absolute and relative frequencies of sociodemographic characteristics (table 4)

tab gender  
 tab age\_15yr\_group  
 sum age  
 tab education  
 tab pers\_income  
 tab current\_smoker

\* Univariate descriptive statistics health goals (table 5)

tab smokinggoal

\* Bivariate statistics: crosstabulations and chi2 (table 6)

tabulate gender smokinggoal, row chi2  
 tabulate age\_15yr\_group smokinggoal, row chi2  
 tabulate education smokinggoal, row chi2  
 tabulate pers\_income smokinggoal, row chi2

// REGRESSION MODELS

\* (1) Test whether age<sup>2</sup> should be added to the model

mlogit smokinggoal age i.gender i.education i.pers\_income, baseoutcome(3)  
 // compare chi2, LLR, pseudo R2  
 estimates store model3  
 mlogit smokinggoal age age2 i.gender i.education i.pers\_income, baseoutcome(3)  
 // compare chi2, LLR, pseudo R2  
 estimates store model4  
 test age2 // wald test  
 lrtest model3 model4 // likelihood ratio test  
 estimates table model3 model4, stats (aic bic) // aic & bic test  
 // age2 should NOT be added

```
* (2) Test model for model fit and model assumptions
mlogit smokinggoal age i.gender i.education i.pers_income, rrr baseoutcome(3)
```

```
* (a) multicollinearity
```

```
quietly regress smokinggoal age i.gender i.education i.pers_income
estat vif // no multicollinearity
```

```
* (b) IIA assumption
```

```
ssc install mlogtest
quietly mlogit smokinggoal age i.gender i.education i.pers_income
mlogtest, hausman // not violated
```

```
* (c) goodness of fit
```

```
logit smokinggoal_dual age i.gender i.education i.pers_income
linktest, nolog
estat gof // neither hat nor hatsq significant (see results for interpretation)
```

```
* (d) test for influential cases (outliers)
```

```
/// examine pregibon dbeta:
```

```
quietly logit smokinggoal_dual age i.gender i.education i.pers_income
predict p2, pr
predict db2, dbeta
scatter db2 p2, mlabel (obs_num)
sort db2
browse obs_num db2 smokinggoal age gender education pers_income
/// those with db > 0.1 seem outliers again (18 observations)
```

```
/// examine leverage and residuals
```

```
quietly logit smokinggoal_dual age i.gender i.education i.pers_income
predict hat2, hat
scatter hat2 p2, mlabel (obs_num)
sort hat2
browse db2 hat2 obs_num smokinggoal age gender education pers_income
/// those with hat2 > 0.07 seem particularly influential
```

```
/// examine leverage and residuals
```

```
list obs_num hat if hat2 > 0.07 // identify high leverage points
list obs_num db2 hat2 if hat2 > 0.07 | db2 > 0.1 > 2 // combine both diagnostics
/// influence plot:
twoway (scatter db2 hat2, mlabel (obs_num)), yline(0.1) xline(0.07)
/// sensitivity analysis (try for dropping db2, dropping hat2, and both)
// drop if db2 > 0.1
logit smokinggoal_dual age i.gender i.education i.pers_income
mlogit smokinggoal age i.gender i.education i.pers_income
// drop if hat2 > 0.06
logit smokinggoal_dual age i.gender i.education i.pers_income
mlogit smokinggoal age i.gender i.education i.pers_income
```

```
// new gof tests with outliers removed:
```

```
logit smokinggoal_dual age age2 i.gender i.education i.pers_income
linktest, nolog
estat gof
```

```

/// rerun output tables (see below) without high leverage/residual values for sensitivity
analyses
mlogit smokinggoal age i.gender i.education i.pers_income, rrr baseoutcome(3)
logistic smokinggoal_dual age i.gender i.education i.pers_income

```

```

/////

```

```

* FINAL OUTPUT TABLES (table 11)

```

```

clear all

```

```

cd "Y:\staff\frw\Demografie\Master Thesis_Eva"

```

```

use "Data 2024_01_gezondheid_prepared"

```

```

drop if current_smoker == 0

```

```

mlogit smokinggoal age i.gender i.education i.pers_income, rrr baseoutcome(3)

```

```

    *change reference categories to see if additional variables become significant:

```

```

mlogit smokinggoal age ib(2).gender ib(2).education ib(2).pers_income, rrr baseoutcome(3)

```

```

mlogit smokinggoal age ib(2).gender ib(2).education ib(3).pers_income, rrr baseoutcome(3)

```

```

    *change baseoutcome to see if this makes any difference, and compare binary regression with

```

```

    mlogit:

```

```

mlogit smokinggoal age i.gender i.education i.pers_income, rrr baseoutcome(2)

```

```

mlogit smokinggoal age ib(2).gender ib(2).education ib(2).pers_income, rrr baseoutcome(2)

```

```

logistic smokinggoal_dual age i.gender i.education i.pers_income

```

```

logistic smokinggoal_dual age ib(2).gender ib(2).education ib(2).pers_income

```

### Stata .do file for research question 3 and 4 (preferred support)

```

* Do-file Master Thesis Eva van der Hulst

```

```

clear all

```

```

cd "Y:\staff\frw\Demografie\Master Thesis_Eva"

```

```

use "Data 2024_01_gezondheid_prepared"

```

```

// RESEARCH QUESTION 3+4: PREFERRED SUPPORT

```

```

* Prepare variables and label them for clarity

```

```

destring V32a__1-V32a__999, replace

```

```

destring V32b__1-V32b__999 V32c__1-V32c__999, replace

```

```

*V32a = preferred support with reducing alcohol

```

```

label variable V32a__1 "no organization/person"

```

```

label variable V32a__2 "municipality"

```

```

label variable V32a__3 "neighbours"

```

```

label variable V32a__4 "family/friends"

```

```

label variable V32a__5 "health insurance"

```

```

label variable V32a__6 "GP"

```

```

label variable V32a__7 "societal worker"

```

```

label variable V32a__8 "medical specialist"

```

```

label variable V32a__9 "sport- or lifestyle coach"

```

```

label variable V32a__999 "other"

```

```

*V32b = preferred support with reducing smoking

```

```

label variable V32b__1 "no organization/person"

```

```

label variable V32b__2 "municipality"

```

```

label variable V32b__3 "neighbours"
label variable V32b__4 "family/friends"
label variable V32b__5 "health insurance"
label variable V32b__6 "GP"
label variable V32b__7 "societal worker"
label variable V32b__8 "medical specialist"
label variable V32b__9 "sport- or lifestyle coach"
label variable V32b__999 "other"
*V32c = preferred support with reducing vaping_goal
label variable V32c__1 "no organization/person"
label variable V32c__2 "municipality"
label variable V32c__3 "neighbours"
label variable V32c__4 "family/friends"
label variable V32c__5 "health insurance"
label variable V32c__6 "GP"
label variable V32c__7 "societal worker"
label variable V32c__8 "medical specialist"
label variable V32c__9 "sport- or lifestyle coach"
label variable V32c__999 "other"

```

\* Investigate 'other' support:

\* Create new variable preferred support

\*alcohol:

```

gen support_pref_alc = .
replace support_pref_alc = 1 if V32a__1 == 1
replace support_pref_alc = 2 if V32a__5 == 1 | V32a__6 == 1 | V32a__8 == 1
replace support_pref_alc = 3 if V32a__3 == 1 | V32a__4 == 1
replace support_pref_alc = 4 if V32a__2 == 1 | V32a__7 == 1 | V32a__9 == 1
gen count_ones_alc = (V32a__2 == 1) + (V32a__3 == 1) + (V32a__4 == 1) + (V32a__5 == 1) +
(V32a__6 == 1) + (V32a__7 == 1) + (V32a__8 == 1) + (V32a__9 == 1)
replace support_pref_alc = 5 if count_ones_alc >= 2
label define support_lbl_al 1 "No support" 2 "Healthcare professionals" 3 "Informal support" 4
"Other" 5 "Multiple sources"
label values support_pref_alc support_lbl_al

```

\*smoking+vaping:

```

gen support_pref_smok = .
replace support_pref_smok = 1 if V32b__1 == 1 | V32c__1 == 1
replace support_pref_smok = 2 if V32b__5 == 1 | V32b__6 == 1 | V32b__8 == 1 | V32c__5 == 1 |
V32c__6 == 1 | V32c__8 == 1
replace support_pref_smok = 3 if V32b__3 == 1 | V32b__4 == 1 | V32c__3 == 1 | V32c__4 == 1
replace support_pref_smok = 4 if V32b__2 == 1 | V32b__7 == 1 | V32b__9 == 1 | V32c__2 == 1 |
V32c__7 == 1 | V32c__9 == 1
gen count_ones_smok = (V32b__2 == 1) + (V32b__3 == 1) + (V32b__4 == 1) + (V32b__5 == 1) +
(V32b__6 == 1) + (V32b__7 == 1) + (V32b__8 == 1) + (V32b__9 == 1)
gen count_ones_vape = (V32c__2 == 1) + (V32c__3 == 1) + (V32c__4 == 1) + (V32c__5 == 1) +
(V32c__6 == 1) + (V32c__7 == 1) + (V32c__8 == 1) + (V32c__9 == 1)
replace support_pref_smok = 5 if count_ones_smok >= 2 | count_ones_vape >= 2
label define support_lbl_sm 1 "No support" 2 "Healthcare professionals" 3 "Informal support" 4
"Other" 5 "Multiple sources"
label values support_pref_smok support_lbl_sm

```

\* Investigate support preferences > univariate distributions

tab support\_pref\_alc

tab support\_pref\_smok

\* Bivariate distributions (crosstab)

\*alcohol (table 13)

tabulate support\_pref\_alc gender, col chi2

tabulate support\_pref\_alc age\_15yr\_group, col chi2

tabulate support\_pref\_alc education, col chi2

tabulate support\_pref\_alc pers\_income, col chi2

\*smoking (table 14)

tabulate support\_pref\_smok gender, col chi2

tabulate support\_pref\_smok age\_15yr\_group, col chi2

tabulate support\_pref\_smok education, col chi2

tabulate support\_pref\_smok pers\_income, col chi2



## Appendix B: Regression results of the binary models

Table 15 portrays the regression results of the binary logistic regressions for the alcohol and the smoking model, in which the categories ‘yes, in the next six months’ and ‘yes, in the future’ are combined.

**Table 15:** Results of binary alcohol and smoking regression models: Sociodemographic predictors of alcohol health goals (odds ratios (OR), significance, and confidence intervals (CI))

		Binary alcohol model (n = 3,280)		Binary smoking model (n = 367)	
		Intends to drink less or quit drinking (n = 532)		Intends to smoke less or quit smoking (n = 198)	
		OR (95% CI)	p	OR (95% CI)	p
(Intercept)		0.17 (0.06-0.45)	0.000***	0.83 (0.35-1.97)	0.668
<b>Gender</b>	Female	0.63 (0.51-0.78)	0.000***	1.06 (0.66-1.70)	0.808
<b>Age</b>		1.04 (1.00-1.08)	0.030**	1.00 (0.99-1.01)	0.975
<b>Age<sup>2</sup></b>		1.00 (1.00-1.00)	0.004***		
<b>Education level</b>	Intermediate	0.95 (0.76-1.18)	0.628	1.37 (0.86-2.18)	0.187
	Low	0.78 (0.55-1.09)	0.142	1.18 (0.61-2.30)	0.622
<b>Income</b>	Modal	0.88 (0.69-1.12)	0.298	1.67 (0.96-2.90)	0.070*
	Below modal	0.75 (0.56-1.00)	0.050*	1.06 (0.57-1.96)	0.858
	Not reported	0.65 (0.48-0.90)	0.009***	0.89 (0.35-1.97)	0.668

Reference categories; alcohol model = does not intend to drink less or quit drinking, smoking model = does not intend to smoke less or quit smoking, gender = male, education level = high, income = above modal.

\* p < 0.1  
 \*\* p < 0.05  
 \*\*\* p < 0.01

## Appendix C: Regression results of alcohol model without outliers

Table 16 portrays the regression results of the alcohol model when influential observations are removed. In the alcohol model, variables were considered influential when Pregibon  $\Delta\beta > 0.1$ , or hat  $> 0.034$ . In total, this resulted in the removal of 143 variables, corresponding to 4% of the total initial sample.

**Table 16:** Results of regression model 2 after removal of influential variables: Sociodemographic predictors of alcohol health goals (odds ratios (OR), significance, and confidence intervals (CI))

Reference category: does not intend to drink less or quit drinking n = 2,648		Intends to drink less or quit in the next six months n = 301		Intends to drink less or quit in the future n = 188	
		OR (95% CI)	p	OR (95% CI)	p
(Intercept)		0.05 (0.01-0.18)	0.000***	0.13 (0.03-0.59)	0.009***
<b>Gender</b>	Female	0.71 (0.54-0.93)	0.014**	0.48 (0.34-0.69)	0.000***
<b>Age</b>		1.08 (1.02-1.13)	0.006***	1.01 (0.95-1.07)	0.776
<b>Age<sup>2</sup></b>		1.00 (1.00-1.00)	0.001***	1.00 (1.00-1.00)	0.443
<b>Education level</b>	Intermediate	0.81 (0.62-1.08)	0.150	1.36 (0.98-1.90)	0.067*
	Low	0.71 (0.46-1.09)	0.118	1.12 (0.68-1.87)	0.654
<b>Income</b>	Modal	0.77 (0.56-1.05)	0.096*	1.06 (0.73-1.54)	0.759
	Below modal	0.74 (0.51-1.07)	0.110	0.71 (0.44-1.14)	0.159
	Not reported	0.73 (0.50-1.08)	0.113	0.52 (0.30-0.91)	0.022**

Reference categories; gender = male, education level = high, income = above modal.  
 \* p < 0.1  
 \*\* p < 0.05  
 \*\*\* p < 0.01

## Appendix D: Regression results of smoking model without outliers

Table 17 portrays the regression results of the smoking model when influential observations are removed. In the smoking model, variables were considered influential when Pregibon  $\Delta\beta > 0.1$ , or hat  $> 0.07$ . In total, this resulted in the removal of 100 variables, corresponding to 7% of the total sample of current smokers.

**Table 177:** Results of regression model 3 after removal of influential variables: Sociodemographic predictors of smoking health goals (odds ratios (OR), significance, and confidence intervals (CI))

Reference category: does not intend to smoke less or quit smoking n = 152		Intends to smoke less or quit in the next six months n = 91		Intends to smoke less or quit in the future n = 94	
		OR (95% CI)	p	OR (95% CI)	p
(Intercept)			0.074*		0.068*
<b>Gender</b>	Female	1.17 (0.65-2.10)	0.600	0.75 (0.41-1.36)	0.341
<b>Age</b>		1.00 (0.99-1.02)	0.909	1.00 (0.98-1.02)	0.991
<b>Education level</b>	Intermediate	1.06 (0.59-1.87)	0.854	1.98 (1.11-3.56)	0.021**
	Low	1.29 (0.54-3.09)	0.572	2.47 (1.04-5.87)	0.040**
<b>Income</b>	Modal	2.14 (1.06-4.33)	0.034**	1.73 (0.86-3.48)	0.122
	Below modal	1.25 (0.56-2.76)	0.588	1.22 (0.56-2.63)	0.613
	Not reported	1.13 (0.46-2.77)	0.784	0.91 (0.37-2.23)	0.832

Reference categories; gender = male, education level = high, income = above modal.  
 \* p < 0.1  
 \*\* p < 0.05