

[Socioeconomic Differences in Health Related Behaviour]

Mariël Droomers

Droomers, Mariël
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Socioeconomic differences in Health Related Behaviour

Sociaal-economische verschillen in gezondheidsgerelateerd gedrag

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Prof.dr. H. Graham
Prof.dr.ir. J. Brug
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Part I

[Introduction]

Chapter 1

[Introduction]

Socioeconomic differences in health

The general pattern of better health among those socioeconomically better off is found over time and across demographic groups, for most measures of health and disease, and for various measures of socioeconomic position.¹ The first firm evidence of substantial socioeconomic differences in mortality date from the 17th century.²⁻³ Since then, diseases have come and gone, some infectious diseases have been eradicated, others have emerged, and a host of non-infectious diseases has dominated the profile of causes of death and disability,⁴ but still now in the 21st century differentials in the health of different socioeconomic groups remain.²

During the last few decades, socioeconomic differences in health have continued to exist and in some cases even widened, even in countries with good overall health, such as the Netherlands, Sweden, and Denmark.^{3, 5} In the United Kingdom, the Black report concluded, there had been a striking deterioration in the health experience of the lower socioeconomic classes over the 1960s and early 1970s,⁶ while during the 1980s and 1990s, the differences in mortality between those at the top and bottom of the socioeconomic scale widened even more.⁷⁻⁸

In the Netherlands, inequalities in health to the disadvantage of people in lower educational, occupational, and income groups, have been present from the very start of their registration in the 19th century.³ Now, people with lower socioeconomic status live three and a half years less and spend 12 years longer in poor health compared to those from the highest socioeconomic group.⁹⁻¹⁰ In the 1990s, a clear educational gradient in all-cause mortality¹¹⁻¹² and mortality from specific causes of death, e.g. cardiovascular disease and cancer,¹¹ was observed. People from lower socioeconomic groups report more chronic conditions and health problems or complaints, as well as poorer perceived general health.¹³ Less educated people suffer more often from myocardial infarction,¹⁴ lung cancer¹⁵⁻¹⁶ and early memory decline or dementia.¹⁷⁻¹⁸

The mere existence of socioeconomic health differences does not mean that the situation is inevitable and that nothing can be done about it. If inequalities can widen then in theory they can also narrow. Evidence from different countries and at different times within the same country have provided encouragement that the health divide is not inevitable, but may be amenable to reduction by purposeful policy action.⁵ The prerequisite for the development of effective policies and programs to reduce socioeconomic health differences is the identification of the causes of socioeconomic differences in health

Traditional explanations for socioeconomic health differences

In 1980, the Black report provided a causal model in an attempt to find explanations for socioeconomic health differences.⁶ Socioeconomic health inequalities were at that time thought to derive from two main mechanisms, i.e. the selection mechanism and the causation mechanism.⁶ The health selection mechanism involves the impact of health on the attainment of socioeconomic position, i.e. healthy people may move up, while unhealthy people may move down in the socioeconomic hierarchy. Social causation is,

however, believed to be the main explanatory mechanism for socioeconomic differences in health.^{6, 19-21} Social causation assumes that socioeconomic status has an indirect effect on health through an unequal distribution of determinants of health across socioeconomic groups. The influential Black report divided the causal mechanisms into the material or structural explanation and the behavioural or cultural explanation.⁶

The material explanation of socioeconomic differences in health emphasizes the role of material factors to which some people have no choice but to be exposed given their position in the socioeconomic structure.⁶ There are two ways by which material or structural factors influence health. One possible pathway is through the direct physiological effects of lower absolute material standards on health by, for example, occupational hazards or poor housing, which are examples of biologically plausible causes of disease.²⁰⁻²² The other pathway follows the concept of relative deprivation, claiming that people evaluate their socioeconomic situation according to how it compares with others, irrespective of absolute levels of affluence.^{6, 22-25}

The behavioural explanation of socioeconomic differences in health implies that lower socioeconomic groups suffer from poor health due to their excessive consumption of unhealthy food, tobacco and alcohol, or lack of exercise, or their under-utilization of preventive health care.^{6-7, 21} These two explanations within social causation which focus on health related behaviour and material standard of living, however, seem insufficient to completely understand the causal mechanism by which socioeconomic differences in health develop.²³

Other explanations for socioeconomic differences in health

The ongoing discussion on socioeconomic differences in health, which elaborated on the framework provided by the Black Report led to other possible mechanisms by which socioeconomic health differences might develop. A relatively new approach in the explanation of socioeconomic differences in health is the psychosocial perspective. This perspective focuses on the psychosocial impact of stress related to inequality structures, induced psychosocially as well as materially, as for example, in the case of social cohesion²⁶ or relative deprivation.^{23, 25} The distribution of stress is an important determinant of socioeconomic health differences in present day affluent societies and stress is strongly influenced by the quality of social and interpersonal relations, while the latter are determined to a large extent by the magnitude of society's inequalities.²³ The two different pathways from stress to health are the direct effect of stress on disease development and an indirect route, when stress leads to health damaging behaviour.²³

The life course approach claims that throughout the life course, risks for poor health gradually accumulate through episodes of illness, adverse environmental or socioeconomic conditions, and unhealthy behaviour.^{20, 27} Socioeconomic health differences in adult life, hence, could derive partly from processes earlier in life, including both selection and causation mechanisms.²⁸⁻³⁰ There are two main, interacting ways by which socioeconomic factors throughout the life course affect adult health and disease risk.^{28, 31} Firstly, socioeconomic factors affect exposures to biological risk factors for poor health during all phases of the life course.^{29, 31} It is in this way that biological 'programming' of adult chronic disease and many adult risk factors for disease during

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gestation or early infancy occurs.^{27, 32} Secondly, socioeconomic factors form part of the social chains of risk that begin with a socially compromised start, operate via educational and other learning experiences, and lead to adult socioeconomic circumstances which affect disease risk through exposures to causal factors later in life.³⁰⁻³¹

Socioeconomic differences in health related behaviour

Health related behaviours are an important determinant of health and part of the explanation of socioeconomic differences in morbidity and mortality.^{6-7, 18, 33-34} The latter takes effect through the social pattern of health related behaviours, i.e. lower socioeconomic status is generally associated with higher rates of health damaging behaviour, such as smoking or poor diet, and lower rates of health promoting activities, like physical activity.^{4, 7, 33, 35-36}

Smoking is consistently found to be more prevalent in lower socioeconomic groups compared to higher socioeconomic groups.^{11, 37-39} People from lower socioeconomic groups engage in physical activity during leisure time less often and less intensively than people with higher socioeconomic status.^{6, 36-37} This not only applies to sports, but to walking, cycling, and other everyday moderate activity as well. Dietary patterns tend to differ between socioeconomic groups as well. People from lower socioeconomic backgrounds eat less fruit and vegetables,⁴⁰⁻⁴² vitamin C⁴² and potassium,⁴³ but more meat.⁴⁰⁻⁴¹ No or inconsistent associations were found for the intake of dietary fat.^{40, 42-43} Low socioeconomic groups are however least likely to purchase food that accords with nutritional recommendations, in the absence of differences in availability, accessibility and affordability.⁴⁴ Men from lower socioeconomic groups drink alcohol excessively more often than higher socioeconomic groups.⁴⁵⁻⁴⁷ A more complex relationship between socioeconomic status and alcohol consumption in women has been reported. Some studies observe more excessive drinking among women from higher socioeconomic groups,⁴⁸ while others find that women from lower socioeconomic groups more often engage in excessive alcohol consumption.⁴⁵⁻⁴⁷

Socioeconomic differences in health related behaviours already appear during adolescence. Adolescents from lower socioeconomic backgrounds more often engage in unhealthy behaviours than their peers from higher socioeconomic groups, i.e. they smoke more often,⁴⁹⁻⁵² have high fat diets more often,⁵² and drink alcohol more often.⁵²⁻⁵⁴

Socioeconomic differences in unhealthy lifestyles tend to grow during adulthood, because people from lower socioeconomic groups make unhealthy behavioural choices more often. For example, smokers with lower socioeconomic backgrounds more often continue to smoke, whereas higher socioeconomic groups more often quit smoking.⁵⁵⁻⁵⁷ Unfavourable changes in physical activity, like decreasing activity or becoming sedentary are also more often reported by lower socioeconomic groups.⁵⁸⁻⁶¹ Moreover, people from lower socioeconomic backgrounds become excessive drinkers more often during their adult life compared to higher socioeconomic groups.⁶²⁻⁶⁴

Understanding the reasons why lower socioeconomic groups (start to) behave in an unhealthy manner more often could eventuate in a more equitable distribution of health related behaviour and health.

Explanations for socioeconomic differences in health related behaviour

The reasons why individuals adopt one form of behaviour rather than another are complex. They include the influence of early life experiences, the social and economic environment, work or school, and the cultural milieu, as well as characteristics specific to the individual.⁷ Even more puzzling is the question ‘why do poor people behave poorly?’³⁶ and until today we are still in need of an explanation for the fact that those in the most socially disadvantaged positions seem least able to adopt healthier lifestyles.⁸ The existence of socioeconomic differences in health related behaviour have made clear that behaviours, which were once thought of as falling exclusively within the realm of individual choice and individual predictors, occur in a social context and are also a response to the socioeconomic circumstances.^{4, 38}

There exists no clear and unambiguous explanatory model for socioeconomic differences in health related behaviour. Therefore, explanations for socioeconomic differences in health related behaviour derive from more general explanations for the health related behaviour of people. Predictors of health related behaviours can be broadly divided into individual influences and environmental circumstances.

Individual characteristics of persons, whether innate or acquired, are critical to the explanation of health related behaviour. Examples are intelligence, skills obtained through education and training, physical and mental qualities, or personality and personal dispositions.⁶

Some have pointed to the existence of a more general unhealthy personality risk profile, characterising those who show unhealthy behaviour or who make unhealthy behavioural choices. People with poor personal control over life, for example, are more often physically inactive⁶⁵ or decrease their physical activity,⁶¹ and smoke more often^{66, 67} or continue to smoke.⁶⁸ People who score high on neuroticism scales are less physically active⁶⁹ and less successful in smoking cessation.⁷⁰ Adolescents reporting lower self-esteem smoke more often^{67, 71} and consume more alcohol.⁷¹

The Theory of Planned Behaviour, one of the dominant psychosocial theories on behaviour⁷² provides further individual predictors of behaviour, that is attitudes and self-efficacy. Attitudes or beliefs about the consequences of the behaviour predict behavioural change, because people who believe that a certain behaviour is good for their health, finances, image, etc. will be more likely to perform that behaviour.⁷² Attitudes have been related to smoking behaviour and alcohol consumption, but most strongly to physical exercise.⁷³ Also adolescent smoking or alcohol consumption is related to more positive attitudes and beliefs regarding the respective behaviour.^{49, 74-76} Self-efficacy or the perceived capability to perform certain behaviour predicts behaviour,⁷²⁻⁷³ because people who feel they are able to perform certain behaviour will be more prone to behave in that way.⁷² In the case of smoking cessation, for example, high self-efficacy is considered an important prerequisite for success.⁷⁷⁻⁷⁸

The environment also exerts considerable influence on individual behaviour. This environmental impact operates through several pathways, such as producing stress, by providing environmental opportunities to engage in certain behaviours, or by social cohesion that enforces patterns of social norms, control and support.^{4, 26, 79-80} Environmental influences derive from material or psychosocial sources. Examples of

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psychosocial environmental factors are social support,^{23, 81-82} social norms,⁷²⁻⁷³ or psychosocial stress.⁸³⁻⁸⁶ Material factors relate to, for example, poor quality housing,^{6, 21, 25} unemployment,^{6, 21} air pollution and other aspects of the physical environment,^{21, 25} income,²¹ or material deprivation.^{21, 25}

Environmental stress from minor and major stressful circumstances in daily life is commonly alleviated by excessive alcohol use or smoking.^{23, 57, 83, 87-88} Stress may derive from psychosocial sources, such as daily problems,⁸³ life events,⁸⁴ or job demands⁸⁵⁻⁸⁶ as well as from material sources, such as financial difficulties^{21, 25} or problems with housing.^{6, 21, 25} The impact of stress depends on the availability of buffering resources or stress moderating factors, such as social support or personality characteristics.^{23, 84} Lower socioeconomic groups have less or less effective buffering resources available, which makes them more vulnerable to stress and therefore more likely than higher socioeconomic groups to react with unhealthy behaviour.^{23, 81-82, 84, 89}

Environmental barriers for healthy behaviour that lower socioeconomic groups experience are, for example, poor access to good food^{6, 20, 44} or sports facilities.^{6, 90} Family or work responsibilities tend to reduce opportunities for physical activity due to competing time claims.⁵⁸

Social cohesion or social capital is another psychosocial environmental characteristic of communities or groups that influences behaviour by increasing the adoption of healthy norms and control over deviant health related behaviour.²⁶ Lower socioeconomic groups have poorer access to social capital, resulting in less healthy prevailing norms and low social control, predisposing them to behave unhealthy.²⁶ Social norms or the perceived social desirability to perform certain behaviour is most important during adolescence.^{73, 91} Also modelling behaviour of parents and friends is a psychosocial environmental factor which particularly has its impact on health related behaviour during adolescence,^{49, 51, 71, 76} when learning and establishing new behaviours is most applicable.⁹¹

This thesis

In this thesis, a description of socioeconomic differences in health related behaviour during different phases of the life course is provided. Furthermore, individual characteristics and environmental factors are studied for their contribution to the explanation of these socioeconomic patterns in health related behaviour. The Dunedin Multidisciplinary Health and Development Study on New-Zealand adolescents provides information to describe and explain the relation between occupational level of the father and daily smoking and alcohol consumption during adolescence. Data from the Dutch longitudinal GLOBE study on socioeconomic health differences in the Netherlands enable the description and explanation of educational differences in (changes in) smoking, physical activity, and alcohol consumption during adulthood. Both studies collected extensive information on individual and environmental determinants of behaviour. Individual factors include personality, intelligence scores, attitudes or beliefs, and health. Environmental factors comprise psychosocial stressors, social support, social norms, financial situation, living environment, employment status, and deprivation. In this thesis we studied the role of these individual and environmental factors in the explanation of socioeconomic differences in health related behaviour and unhealthy behavioural changes.

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Part II

**[Socioeconomic differences in health related behaviour
among adolescents]**

Chapter 2

[Occupational level of the father and daily smoking during adolescence; patterns and predictors]

Occupational level of the father and daily smoking during adolescence; patterns and predictors

We describe the association between occupational level of the father and daily smoking among a cohort of New Zealand adolescents from age 9 till 21 years and study predictors of the relation between occupational level of the father and adolescent smoking.

Data were obtained from the longitudinal Dunedin Multidisciplinary Health and Development Study that followed children from birth in 1972/73 till adulthood. Smoking behaviour was self-reported, starting at age 9. Potential predictors of smoking were social and material environmental factors, personality characteristics, personal beliefs and attitudes regarding smoking and achievement measured at ages 9, 11, and 13. Longitudinal logistic GEE analyses were used to fit and explain the relation between father's occupation and adolescent smoking.

Daily smoking starts around the age of 13 and smoking prevalence reaches adult levels at the age of 18 years. Adolescents from the lowest occupational group have twice the odds of being a daily smoker than those from the highest occupational group. Adolescents from the second lowest occupational group are more than 1½ times more likely to smoke daily. The most important predictor of the relation between fathers' occupation and adolescent smoking is the relatively lower intelligence scores in the lower occupational groups. Also the higher frequency of smoking in fathers and friends in the lower occupational groups contributes to the differences in smoking during adolescence.

Implications for interventions to reduce socioeconomic differences in smoking among adolescents are discussed.

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Introduction

Socioeconomic differences in smoking among adults have been reported consistently worldwide, i.e. lower socioeconomic status is associated with a higher prevalence of smoking.¹⁻⁴ Attempts to explain socioeconomic differences in smoking behaviour have mainly focussed on adults, while lifestyle patterns are for an important part developed and perpetuated during adolescence. Not much is known about the development of socioeconomic differences in unhealthy lifestyles during adolescence and even less about the determinants of this process. Such information, however, would greatly facilitate the design of effective interventions to prevent lower socio-economic adolescents from starting smoking, and hence tackle the development of socioeconomic differences in smoking at an early stage.

Adolescents with lower socioeconomic backgrounds tend to engage in smoking more often than their peers from higher socioeconomic groups,⁵⁻¹⁶ though some studies fail to find such a relation.¹⁷⁻¹⁹ This relation between socioeconomic status of the parents and adolescent smoking might originate from the higher prevalence of risk factors for adolescent smoking among lower socioeconomic groups.

Literature on adolescent smoking emphasizes the role of modelling behaviour of parents and peers. Children who have smoking parents or live with other people who smoke,^{8-9, 12, 14, 16-18, 20-30} or who have friends who smoke^{5-6, 10, 12, 16, 21-27, 31} are more inclined to (start to) smoke during adolescence. Some studies, however, fail to corroborate the predictive effect of parental smoking on adolescent smoking.^{10-11, 31-32} Other social factors that were reported to influence smoking during adolescence were perceived social norms or pressure to smoke,^{6, 11, 21, 25, 30, 33-35} poor family support or control,^{10, 16-17, 25, 27, 29, 36} poor

social bonding,⁶ and high involvement in social activities.³³

Seltzer and Oechli¹³ addressed the predictive potential of personality traits with regard to adolescent smoking and reported that children with type A personality traits, extraversion, and psychoticism more often smoke during adolescence. Others reported that an external locus of control,^{15, 21, 37} low self-esteem,^{5-6, 15, 25-26, 29, 38} and deviant or risky behavior^{6, 21, 25-26, 28-29, 38} were related to smoking among adolescents.

Psychosocial factors associated with adolescent smoking are more positive attitudes and beliefs related to smoking,^{6, 10, 20, 21, 30-31, 33, 39} though McNeill et al.¹¹ failed to find such a relation.

Achievement also plays a role in adolescent smoking. Poorer school qualifications,^{8, 22, 26} negative attitude or poor adjustment towards school,^{20, 25} low academic expectations,^{6, 20-21, 27, 29} and (below) average school performance^{5, 20, 23, 25, 28} all predicted smoking during adolescence. Murray et al.³³ however, found no relation of attitude towards school and truancy with future smoking during adolescence.

Material factors like the availability of money^{6, 11} might induce smoking behaviour during adolescence. In general, material factors are considered important explanations for socioeconomic differences in health or health related behavior.⁴⁰⁻⁴²

Some of these factors related to adolescent smoking are more prevalent in lower socioeconomic groups, e.g. adolescents from lower socioeconomic backgrounds more frequently have smoking parents, friends, peers, and siblings,^{14, 16, 26} they experience more social pressure and positive norms to smoke,¹⁴ and report higher levels of external control,¹⁵⁻¹⁶ low self-esteem,¹⁶ and poor academic achievement.¹⁶ We may therefore hypothesize that these determinants give rise to socioeconomic differences in adolescent smoking. The Dunedin Multidisciplinary Health and Development Study collected extensive information on many predictors of adolescent smoking, which provides a unique opportunity to make a comprehensive attempt to explain the relation between occupational level of the father and daily smoking from age 9 until 21.

Methods

Population

Data were obtained from the Dunedin Multidisciplinary Health and Development Study, which is a longitudinal investigation of the health, development and behaviour of a cohort of children from birth until adulthood.⁴³ In summary, the sample consists of a cohort born in Dunedin's only obstetric hospital between 1st April 1972 and 31st March 1973. The perinatal histories were documented soon after birth, but study members were first enrolled in the longitudinal study at age 3. Ninety-one percent of eligible births (i.e. still resident in the province of Otago) participated in this first assessment, providing a base sample of 1037 for the longitudinal study. Study members were further assessed every 2 years thereafter, up to and including age 15 and again at age 18, 21, and 26. Most of the participants were assessed within 2 months of their birthdays. Transportation to the research unit was provided for those living outside Dunedin but in New Zealand, in order to maximize the number of study members being assessed in full. In the case of study members living overseas at age 21, an interviewer travelled to these locations (almost all of them were in Australia). This procedure resulted in very high follow-up rates, i.e. from

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90% to 97% of the study members included in the baseline sample, with a onetime low follow-up rate of 82% at age 13.⁴³ Prior to the interviews informed consent was obtained either from a parent (for interview prior to age 18) or from the participant starting at age 15. The sample was representative of the population of New Zealand's South Island and is primarily white.⁴³

Measures

Table 1. Measurement of potential predictors of daily smoking among adolescents.

Predictor	reported by	age ^a	Items ^b	answer categories	reference
Social environmental factors					
Self-reported smoking behaviour mother	parent	11	1	smoker / non-smoker / ex-smoker	
Self-reported smoking behaviour father	parent	11	1	smoker / non-smoker / ex-smoker	
Smoking behaviour of family at home	adolescent	13	1	yes / no	
Smoking behaviour of close friends	adolescent	13	1	no smoking friends / smoking friends	
I belong to organised groups, clubs or activities	adolescent	13	1	yes / no	
Family relationships	parent	13	27	true / false	46, 47
Attachment to parents	adolescent	13	12	(almost) never / sometimes / often / (almost) always	48
Relationship with parents	adolescent	13	1		
Attachment to friends	adolescent	13	12	(almost) never / sometimes / often / (almost) always	48
Material environmental factors					
Child receives pocket money	parent	11	1	yes / no	
Number of children in family	parent	13	1	number of children	
Unemployment of father in last 2 years	parent	13	1	yes / no	
Personality characteristics					
Self-esteem	adolescent	13	10	strongly agree / agree / disagree / strongly disagree	49
Neuroticism	parent	11	5	doesn't apply / applies somewhat / certainly applies	50
Health locus of control	adolescent	13	6	strongly disagree / disagree / agree / strongly agree	51, 52
Behavioural problems	parent	13	77	doesn't apply / applies somewhat / certainly applies	53
Personal attitudes and beliefs regarding smoking					
Attitude towards smoking friends	adolescent	13	1	both same / prefer smokers / prefer non-smokers	
Attitude towards smoking adults	adolescent	11	1	yes / no	
General attitude towards smoking	adolescent	11	16	yes / no	
Belief smoking is as bad for health as people say	adolescent	13	1	strongly agree / agree / disagree / strongly disagree	
Belief smoking affects health when you are older	adolescent	13	1	strongly agree / agree / disagree / strongly disagree	
Number of reasons to smoke	adolescent	13	18	yes / no	
Achievement					
Performance at school	adolescent	13	1	average / below average / above average	
Intelligence	adolescent	13		Wechsler Intelligence Scale for Children	54

a age of adolescent at which variable was measured

b number of items used to measure variable

The questions on smoking behaviour were first included in the study at age 9. When the study members were 9, 11, and 13 years of age, the interviews about smoking were carried out by the same trained interviewer in private at the Research Unit as part of the series of assessments of health, development and behaviour conducted over one day. A small proportion of the sample, which was not able to attend the Research Unit for assessment at ages 9, 11, and 13, was assessed at home or school and was not administered the questionnaire about smoking. At age 15, 18 and 21, smoking questions were included in the home, school, or workplace interviews. One interviewer carried out most of these interviews. Regular daily smoking is often used as an indicator of the development of habitual smoking. In this sample, a comparison of self-report of smoking status (Do you

usually smoke every day? yes or no) with saliva cotinine concentrations showed high sensitivity (96%) and specificity (82%).⁴⁴

Occupational level of the father was measured at the beginning of adolescence, at age 9 and categorized according to the Elley-Irving classification, which is specially designed for use in New Zealand. When information on occupational level of the father was missing, information collected at later measurements (until age 15) was used. Fathers' occupations were grouped in six levels, which are based on analyses of median education and income data from the 1981 New Zealand census for males.⁴⁵ Due to low numbers, we combined the two lowest occupational categories, i.e. the semi-skilled and unskilled groups.

The Dunedin Multidisciplinary Health and Development Study measured information on several potential predictors of smoking behaviour among adolescents, like social and material environmental factors, personality characteristics, personal attitudes and beliefs regarding smoking factors, and achievement (Table 1). To enable identification of risk groups, we divided all continuous scale variables into tertiles (three equally sized groups) or into two groups, comparing the top or bottom quartile with the other 75% of the study population.

Analyses

Analyses were undertaken in four stages. At the *first stage* we studied the relationship between occupation of the father and daily smoking. We calculated the prevalence of daily smoking by occupational level at each of the ages 9, 11, 13, 15, 18, and 21 assessments. Since none of the participants smoked daily at ages 9 and 11, we omitted these age groups from further analyses. Then, we fitted logistic regression models, adjusted for sex, with the highest occupational group as a reference category, for each measurement wave separately. Next, we fitted a logistic GEE model that takes into account the dependence between repeated measurements within the same individual, using the GENMOD procedure of SAS 8.0.⁵⁵ We calculated occupational differences in daily smoking in the period from age 13 to 21, by fitting a GEE model including sex, time and occupation of the father.

At the *second stage*, we studied which variables longitudinally predicted daily smoking in the period from age 13 to 21, by fitting GEE models containing sex, time and one potential determinant successively. Variables were considered predictors of daily smoking when the GEE analyses showed a significant χ^2 likelihood ratio test ($p < 0.05$) and significantly increased odds ratios.

At the *third stage*, for those predictors, which showed significantly increased odds of daily smoking, we studied the distribution of categories of the predictor by occupational level of the father.

Finally, at *stage four*, we added significant predictors of daily smoking that were related to occupational level of the father, to the first GEE model (including sex, time, and occupation) in an attempt to explain the relation between fathers' occupation and daily smoking. The contribution of the predictor to the explanation of differences in smoking was expressed by the percentage reduction in odds ratios of the different occupational groups due to the inclusion of a predictor (all significantly increased odds ratios of occupation should decrease their value).

Results

Stage 1

In this New Zealand cohort of adolescents born in 1972, daily smoking only became apparent around the age of 13 (Table 2). From that time, the smoking prevalence increased enormously with each measurement wave, and reached adult levels of smoking prevalence at the age of 18 years, when about one third of the respondents reported to be a daily smoker. Differences in daily smoking by occupation of the father emerged at the age of 15, when smoking prevalence clearly decreases with higher occupational status of the father (Table 2). Relative differences in daily smoking were statistically significant from age 15, though only on the most disparate occupational group (Table 2).

Longitudinal GEE analyses, that take into account all repeated measurements from the whole adolescent period starting at age 13, showed that adolescents from the lowest occupational groups had odds of being a daily smoker that were twice as high as the highest occupational group (Table 2). While adolescents from the second lowest occupational group had odds that were more than 1½ times higher (Table 2).

The relation between occupation of the father and daily smoking in this New Zealand adolescent cohort was significantly stable during the entire period studied (p-value interaction occupation*time 0.4352).

Table 2. Prevalence and odds ratio of daily smoking by occupational level of the father at each measurement during adolescence.

Occupational level of father	age								longitudinal GEE	
	9	11	13	15	18	21			adolescent period	
	% OR ^a		% OR ^a		% OR ^a		% OR ^a		OR ^b	
higher professional, administrative		1.1	1.00	8.1	1.00	22.3	1.00	29.6	1.00	1.00
lower professional, technical		1.1	0.98	8.7	1.06	25.4	1.17	27.6	0.90	0.97
clerical, highly skilled		1.5	1.40	14.1	1.86	28.9	1.41	31.5	1.10	1.24
skilled		0.5	0.42	14.5	1.94	33.5	1.75*	37.5	1.43	1.57*
semi-skilled, unskilled		1.8	1.65	19.5	2.86*	38.4	2.21*	45.4	1.99*	2.12*
overall prevalence	0	0	1.1	13.5	30.3	34.7				
p-value of occupation			0.8804		0.0208		0.0217		0.0087	0.0029
number of respondents	745	760	700	916	887	903				

a logistic regression analysis adjusted for sex

b longitudinal GEE analysis including ages 13 to 21 adjusted for sex

* 1.00 is not included in 95% confidence interval of odds ratio

Stage 2

Table 3 shows which potential predictors measured at baseline augured daily smoking during adolescence from age 13 till 21 years. We found that the several social factors, such as having a smoking or ex-smoking father or smoking friends, living with smokers, not belonging to an organization, poor family relationships and low attachment to parents significantly predicted daily smoking during adolescence (Table 3). The only material factor that significantly increased the odds of being a daily smoker was the receipt of pocket money (Table 3). Adolescents that reported behavioural problems experienced significantly increased odds of daily smoking (Table 3).

Table 3. Association between potential predictors and daily smoking during adolescence.

Social factors	OR ^a	p-value ^b		OR ^a	p-value ^b
Smoking behaviour mother		0.1332	Attachment to parents		0.0107
no	1.00		high	1.00	
ex-smoker	1.15		medium	1.35	
smoker	1.35*		low	1.74*	
Smoking behaviour father		0.0091	Attachment to friends		0.2274
no	1.00		low	1.00	
ex-smoker	1.54*		medium	0.91	
smoker	1.55*		high	0.72	
Smoking behaviour of family at home		0.0023	Relationship with parents		0.0773
no	1.00		OK	1.00	
yes	6.05*		not (always) OK	2.50*	
Smoking behaviour of close friends		<0.0001	Family relationships		<0.0001
no one smokes	1.00		best relationships	1.00	
one or more smoke	3.26*		quintile with poorest relationship	1.93*	
I belong to organised groups, clubs or activities		0.0019			
yes	1.00				
no	1.74*				
Personal attitudes and beliefs					
Attitude towards smoking friends		0.0070	Belief smoking is as bad for your health as people say		<0.0001
neutral	1.00		Strongly agree	1.00	
prefer non-smokers	0.65*		agree	1.97*	
prefer smokers	6.54*		(strongly) disagree	5.03*	
Attitude towards smoking adults		0.0354	Belief smoking will affect health when you are older		<0.0001
not OK to smoke in moderation	1.00		strongly agree	1.00	
OK to smoke in moderation	1.43*		agree	1.79*	
			(strongly) disagree	12.53*	
General attitude towards smoking		0.4526	Number of reasons to smoke		0.0002
lower scores	1.00		low	1.00	
most positive quartile	1.13		medium	1.24	
			high	12.34*	
Personality characteristics					
Health locus of control		0.0687	Self-esteem		0.4883
internal	1.00		high	1.00	
neutral	1.17		medium	0.93	
external	1.49*		low	1.25	
Behavioural problems		<0.0001	Neuroticism		0.3040
lowest	1.00		lower scores	1.00	
medium	1.54*		highest quartile	0.85	
highest	2.46*				
Achievement factors					
Performance at school		<0.0001	Intelligence		<0.0001
above average	1.00		higher	1.00	
average	2.29*		medium	1.40*	
below average	4.19*		lower	3.21*	
Material factors					
Child receives pocket money		0.0419	Father registered as unemployed		0.0936
no	1.00		no	1.00	
yes	1.31*		yes	1.88	
Number of children in family		0.5804			
1 or 2 children	1.00				
3 children	0.94				
4 or more children	1.04				

* 1.00 is not included in 95% confidence interval of odds ratio

a odds ratio of GEE analyses including ages 13 to 21 adjusted for sex

b likelihood ratio χ^2 test

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Furthermore, we report that adolescents with positive attitudes towards smoking friends or adults, who did not believe in the detrimental effects of smoking, and reported a high number of reasons to smoke were significantly more likely to smoke daily (Table 3). Low and medium intelligence scores and average or below average school performance also significantly predicted daily smoking (Table 3).

Table 4. Prevalence of risk categories of predictors of adolescent daily smoking by occupational level of the father

	Predictor	Risk category	Occupational level of father				
			lowest	lower	mediate	higher	highest
Social	Self-reported smoking father	ex-smoker	14.5	20.5	20.2	28.3	17.2
		smoker	56.5	45.4	41.2	33.6	25.9
	Anyone at home smokes	yes	11.9	6.0	6.1	4.3	7.7
	Smoking behaviour of friends	one or more smoke	49.5	36.0	35.1	33.0	22.2
	Belong to groups, clubs	no	27.9	18.7	24.2	18.9	21.1
	Family relationships	poorest relationship	35.0	23.3	15.7	22.9	16.7
	Attachment to parents	low	35.5	39.7	32.3	34.4	23.6
Material	Child receives pocket money	yes	55.6	56.5	59.6	59.0	59.7
Personality	Behavioural problems	medium	37.3	28.8	38.7	37.6	26.4
		highest	44.1	38.1	25.3	31.2	23.6
Psychosocial	Attitude towards smoking friends	prefer smokers	1.8	1.4	0.0	0.0	0.0
	Attitude towards smoking adults	OK in moderation	81.6	80.9	75.8	79.6	68.8
	Belief smoking is bad for health	agree	36.0	37.9	33.0	38.5	33.3
		(strongly) disagree	9.9	4.2	4.6	3.3	6.7
	Belief smoking affects health when older	agree	33.3	38.3	28.9	42.9	26.7
		(strongly) disagree	4.5	1.4	1.5	1.1	2.2
Achievement	Number of reasons to smoke	high	29.7	28.5	35.6	38.3	54.4
		average	78.2	77.9	63.5	62.2	51.1
		below average	9.1	6.1	4.7	3.3	2.3
	Intelligence	lower	50.8	42.1	29.8	22.9	10.9

Stage 3

Table 4 shows the relation between occupational level of the father and categories of statistically significant predictors of daily smoking during adolescence that showed statistically increased odds of daily smoking.

An inverse relation with fathers' occupation was observed for having a smoking father or friend, positive attitude towards smoking adults, low intelligence scores, and average or below average school performance.

Further, we observed that some risk factors were clearly more prevalent in the lowest occupational group without substantial differences between other occupational groups, i.e. living with smokers, not belonging to an organization, poor family relationships, high behavioural problems, positive attitude towards smoking friends, and not believing in the adverse health effects of smoking.

Stage 4

We tested the explanatory potential of all predictors of daily smoking, which were related to occupational level of the father, meaning that we excluded attachment to parents, receipt of pocket money and reasons to smoke from stage 4 of the analyses. We found that in this New Zealand population smoking behaviour of father and friends and intelligence scores explained the relation between occupation of the father and daily

smoking during adolescence, i.e. together they reduced the significantly increased odds ratios (skilled and semi-skilled occupational groups) to non-significant levels. The unequal distribution of intelligence scores across occupational groups contributed most to the described relation between fathers' occupation and daily smoking (Table 5).

Table 5. Explanation of occupational differences in daily smoking during adolescence

Occupational level of father	Basic model ^a	Basic + intelligence		Basic + smoking father		Basic + smoking friends		Basic + all predictors	
	OR ^b	OR ^b	% ^c	OR ^b	% ^c	OR ^b	% ^c	OR ^b	% ^c
higher professional, administrative	1.00	1.00		1.00		1.00		1.00	
lower professional, technical	0.97	0.95		0.86		1.01		0.88	
clerical, highly skilled	1.24	1.05		1.08		1.00		0.71	
skilled	1.57*	1.28	51	1.49	14	1.38	33	0.93	100
semi-skilled, unskilled	2.12*	1.88*	21	1.93*	17	2.07*	4	1.28	75
p-value of occupation ^d	0.0029	0.0692		0.0090		0.0281		0.2752	

a basic model for longitudinal logistic GEE analyses includes ages 13 to 21 adjusted for sex
 b odds ratio of daily smoking during adolescence obtained by longitudinal logistic GEE analysis
 c reduction in odds ratio of daily smoking by occupational level due to inclusion of predictor (OR basic model -OR basic + predictor/ OR basic model -1)
 d χ^2 likelihood ratio test of occupation

Discussion

We conclude that there is a clear relation between occupational level of the father and daily smoking during adolescence among this New Zealand cohort of adolescents, which was present and stable from the onset of daily smoking. The most important explanation for the relation between occupation of the father and daily smoking were differences in IQ scores. Smoking behaviour of father and friends also contributed to the differences in daily smoking among adolescents by occupational level of the father. None of the material factors, personality characteristics, or psychosocial factors contributed to the explanation of the relation between fathers' occupation and adolescent smoking. Though several of these factors predicted adolescent smoking, they were not inversely related to occupational level of the father.

Before further elaboration on our results, we want to discuss methodological issues concerning the study. First, we have chosen occupational level of the father to indicate the socioeconomic status of the adolescent, in accordance with many other studies on socioeconomic differences during adolescence.^{8, 13-14, 19} Furthermore, the Elley-Irving occupational index has proven to be a good indicator of socioeconomic status in New Zealand.⁵⁶ One objection to the use of occupational level to indicate socioeconomic status is the possible variability over time. The correlation between the four measurements of occupational level of the father in this study, i.e. from age 9 till 15 ($r>0.70$ $p=0.000$), indicate that occupational level was fairly stable during the period studied. Second, to exclude all possible concerns about causality between predictors and smoking behaviour, we have chosen to include factors measured before or at age 13, i.e. the baseline of our longitudinal analyses of daily smoking between 13 and 21 years of age. Since we studied a relatively long time frame, it might be possible that the effect of some factors, that have their impact on smoking behaviour at a certain (short) time, is underestimated. For example, behavioural attitudes or material barriers are very likely to affect current behaviour, but this effect might dissipate over time, resulting in stronger

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associations using shorter time frames, while other factors, like intelligence, are more likely to influence behaviour during the whole period studied. Furthermore, it is possible that some predictors changed after the measurement at baseline. For example, material factors are relatively unstable and very likely to change, e.g. unemployment. This will result in inaccurate estimation of the effect of such factors on daily smoking when studying the whole adolescent period.

The most important predictor of the relation between occupation of the father and daily smoking during adolescence were the lower intelligence scores among children from fathers with a lower occupational level. Other studies that have investigated explanations for socioeconomic differences in adolescent smoking and substance use also report academic competence or achievement to be one of the explanatory pathways.^{8, 16} Less intelligent adolescents might use smoking behaviour to counterbalance their lower academic success or might be less amenable to the messages on the negative health consequences of anti-smoking programs.

Our finding that participants from lower socioeconomic backgrounds report lower intelligence scores and therefore smoke more often during adolescence, might reflect the mechanism by which socioeconomic differences in smoking among adults develop. Adolescents with lower intelligence levels will be less likely to achieve higher education. In this study population lower intelligence scores at age 13 are related to lower occupational status at age 21 ($p=0.0162$). Also adolescent smoking is known to predict poor educational achievement and hence low social position.⁵⁷ To intervene in this vicious circle of socioeconomic differences in smoking, and hence health, intervention programs should focus on the prevention of smoking uptake among adolescents, particularly those from lower socioeconomic backgrounds. This might be achieved by developing school-based interventions, for example in lower socioeconomic neighbourhoods. Furthermore, special attention should be paid to intelligence scores of adolescents from lower socioeconomic backgrounds, since these are likely to result not only from heredity but from environmental influences as well.^{41, 58-61} A study of changes in intelligence scores in this same New-Zealand birth cohort cautiously suggested that decreases occurred in susceptible children living in negative, unstable home environments, characterized by conflicts, divorce and decreasing socioeconomic status.⁵⁹ Reviews on long-term effects of early childhood education and day-care found persistent positive effects on achievement and academic success,⁶²⁻⁶³ future socioeconomic status,⁶² as well as on IQ.^{60-61, 62}

The contribution of smoking behaviour of fathers and friends to the explanation of differences in daily smoking during adolescence highlights the importance of modelling behaviour during adolescence. We found no increased sensitivity of adolescents from lower socioeconomic groups to the behaviour of role models (non-significant interaction occupation*smoking father/friends). So, although adolescents from lower occupational backgrounds were more exposed to smoking role models, they fortunately were not more vulnerable to their influence. The few studies that have attempted to explain socioeconomic differences in smoking among adolescents likewise indicate that parental and friends' smoking behaviour plays a role.^{8, 16} Modelling is an indispensable aspect of learning and establishing new patterns of behavior.⁶⁴ Interventions aimed at the prevention of smoking among adolescents should provide positive role models who do not smoke and who are consonant with the culture and norms of adolescents with lower socioeconomic backgrounds.³⁴ On the other hand, adolescents should learn how to resist

the influence of fathers and friends who smoke through interventions that strongly emphasize the acquirement of resistance skills or protective behaviors⁶ and address the social acceptance of smoking. Therefore programs need to consider and effectively involve the adolescents' social environment, i.e. parents and social communities.⁵ These implications of our results accord with US guidelines for school health programs to prevent tobacco use and addiction.⁶⁵ We add that such interventions should specifically be targeted towards adolescents from lower socioeconomic groups since they are disproportionately exposed to potent predictors of smoking and hence are at great risk to become daily smokers.

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[Occupational level of the father and alcohol consumption during adolescence; patterns and predictors]

In this paper we describe the association between occupational level of the father and alcohol consumption among a cohort of New Zealand adolescents from age 11 to 21. We also study predictors of the relation between father's occupation and adolescent alcohol consumption.

Data were obtained from the longitudinal Dunedin Multidisciplinary Health and Development Study that followed children from birth in 1972/73 until adulthood. At each measurement wave, we categorized those who then belonged to the quartile that reported the highest usual amount of alcohol consumed on a typical drinking occasion as high alcohol consumers. Potential predictors of alcohol consumption were social and material environmental factors, individual factors and educational achievement and measured at age 9, 11, or 13. Longitudinal logistic GEE analyses were used to describe and explain the relation between father's occupation and adolescent alcohol consumption.

A clear association between fathers' occupation and adolescent alcohol consumption emerges at age 15. Longitudinal analyses show that adolescents from the lowest occupational group have almost twice the odds of being a large consumer than the highest occupational group. The association between father's occupation and high alcohol consumption during adolescence is explained by the higher prevalence of familial alcohol problems and friends approving of alcohol consumption, lower intelligence scores, and lower parental attachment in adolescents from lower occupational groups.

Socioeconomic background has a substantial effect on adolescent alcohol consumption. This likely contributes to accumulation of disadvantage. Intervention programs should take into account socioeconomic differences in alcohol consumption and focus on making healthier choices easier choices by means of environmental change.

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Introduction

Socioeconomic differences in unhealthy behaviour, such as the consumption of too much alcohol too often¹⁻⁴ are one of the explanatory pathways by which socioeconomic health differences develop.⁵⁻⁷ Attempts to explain socioeconomic differences in unhealthy behaviour have mainly focussed on adults, while lifestyle patterns are largely developed and perpetuated during adolescence. Not much is known about the development of socioeconomic differences in unhealthy lifestyles during adolescence and even less about the determinants of this process. Such information, however, would facilitate the design of effective interventions to tackle the development of socioeconomic differences in behaviour at an early stage.

Adolescents of low socioeconomic backgrounds tend to consume more alcohol and they consume alcohol more often than their peers from higher socioeconomic groups,⁸⁻¹² although there are also studies that could not corroborate such a relation.¹³⁻¹⁸ Some of this inconsistency in the literature is explained by the fact that research to date has failed to adequately conceptualise different dimensions of alcohol consumption, and in particular, failed to distinguish between frequency of consumption and quantities consumed.¹⁹ It might also be possible that the social circumstances that affect adolescent behaviour are not well captured by the usual measures of adult socioeconomic status.²⁰ A possible relation between parental socioeconomic status and adolescent alcohol consumption might be explained by a higher prevalence of predictors of alcohol consumption in adolescents from lower socioeconomic groups compared with peers from

higher socioeconomic backgrounds.

We studied environmental and individual predictors of alcohol consumption, as well as the effect of educational achievement. We divided environmental determinants of alcohol consumption into social and material influences. Important social environmental influences on adolescents' present and future social and health related behaviours, including alcohol consumption, derive from family socialization processes, e.g. modelling, supervision, norms and relationships. Adolescents who have parents that drink alcohol are more inclined to consume alcohol themselves.^{12, 16, 21-31} Other familial social processes that increase adolescents' alcohol consumption are inadequate parenting practices,^{22, 24-25, 32} poor parental monitoring, reinforcement and control,^{13, 25, 27, 33} poor parental support,^{8, 24, 33} poor family cohesion or bonding,^{15, 22, 26, 34} positive parental norms or tolerance of alcohol consumption,^{14, 21-23, 25-26, 29-30, 35} and familial alcohol problems or alcoholism.^{9, 32, 34, 36}

Having friends that drink alcohol increases the chance that adolescents consume (more) alcohol themselves,^{13-14, 18, 20-23, 29, 30-31, 34-35, 37-38} as well as pressure or encouragement of friends to drink,^{14-15, 23} friends with positive norms concerning alcohol,^{14, 21, 30, 38} and even the idea that most peers drink alcohol.^{23, 29, 37}

In general, material environmental factors are considered important explanations for socioeconomic differences in health or health related behavior.⁵⁻⁷ Material factors like financial strains or material deprivation^{2, 9, 36} might reduce alcohol consumption during adolescence.

Individual characteristics are the second group that plays an important role in adolescents' behaviour. Adolescents who consume more alcohol also reported low self-regulation,^{23-24, 31, 39} low self-esteem,^{20, 24} tolerance for deviance,^{20, 31-32, 38} risk taking or novelty seeking behavior,^{20, 32, 39} anti-social behaviour i.e. aggressiveness, hyperactivity, or neuroticism,²² and a positive attitude towards alcohol.^{14, 22, 30}

The last group of factors to influence adolescents' alcohol consumption relates to educational achievement. Adolescents who score lower in academic competence,²⁴ academic expectations,^{14, 16} educational commitment,^{22, 34} or who experience academic failure^{14, 16, 22-23, 35} have been found to consume more alcohol.

Some of the determinants of adolescent alcohol consumption are more prevalent in lower socioeconomic groups, e.g. having parents and friends that drink more alcohol,^{16, 18, 29} low parental support,¹⁸ more external control,¹⁸ low self-esteem,¹⁸ and poor academic achievement.¹⁸ To date, however, not many predictors of adolescents' alcohol consumption have been investigated for their relationship with socioeconomic status. We hypothesize that socioeconomic differences in these determinants exist and that they give rise to socioeconomic differences in adolescent alcohol consumption. The Dunedin Multidisciplinary Health and Development Study measured many predictors of alcohol consumption and alcohol consumption itself from age 11 to 21, and hence provides a unique opportunity to study explanations for the association between fathers' occupation and high alcohol consumption.

Methods

Population

Data were obtained from the longitudinal Dunedin Multidisciplinary Health and Development Study, which follows the development and behaviour of a cohort of children from birth until adulthood.⁴⁰ The sample consists of a cohort born in Dunedin's only obstetric hospital between 1st April 1972 and 31st March 1973. The perinatal histories were documented soon after birth, but study members were first enrolled at age 3. Ninety-one percent of eligible births (i.e. still resident in the province of Otago) participated in this first assessment, providing a base sample of 1037 for the longitudinal study. Study members were further assessed every 2 years thereafter, up to and including age 15 and again at age 18, 21, and 26. Transportation to the research unit was provided for those living in New Zealand, but outside of Dunedin, in order to maximize the number of the study members being assessed in full. In the case of study members living overseas at age 21, an interviewer travelled to these locations. This procedure resulted in very high follow-up rates, i.e. from 90% to 97% of the study members included in the baseline sample, with a onetime low follow-up rate of 82% at age 13.⁴⁰ Prior to the interviews informed consent was obtained from either from a parent (for interview prior to age 18) or from the participant starting at age 15. The sample was representative of the population of New Zealand's South Island and was primarily of European descent.⁴⁰

Alcohol consumption in New Zealand, 1980s

The participants in the Dunedin Study gained their early experiences with alcohol at a time when alcohol consumption in New Zealand was at its highest level since statistics were first recorded in the 1880s. A gradual liberalization of alcohol policies occurred in the 1960s and 1970s. This included the end of the 'six o'clock swill', expansion of alcohol sales in sports clubs, increased expenditure on alcohol advertising, and a decrease in the price of alcohol relative to other goods. In the 1980s the majority of the study members' parents, like most New Zealanders, drank fairly regularly and study members had relative ease of access to alcohol when they were growing up.

Despite the liberalization of alcohol policies and practices, the legal status of young people in relation to alcohol remained unchanged in the 1980s. At that time it was illegal for people under 20 years old, to purchase alcohol, or for it to be sold to them. However, exemptions introduced in 1976, allowed people of 18 years and older to purchase or consume liquor in licensed premises if accompanied by somebody over 20, resulting in the de facto minimum drinking age of 18 years. Another policy change that likely has had an impact on study members encompassed an increase in advertising alcohol on broadcast media after 1986 and a more major increase after 1991.⁴¹

Measures

Amount of alcohol (expressed in millilitres of absolute alcohol) was represented by the study member's average amount consumed on a typical drinking occasion ('How many glasses do you usually drink?'). Frequency of alcohol consumption was assessed by the

average number of occasions alcohol was consumed during a certain period of time. When the study members were 11 and 13 years of age, the interviews on alcohol consumption were carried out in private at the Research Unit by the same trained interviewer. A small proportion of the sample that was not able to attend the Research Unit for assessment at ages 11 and 13, was not administered the questionnaire about alcohol. At age 15, 18 and 21, questions about alcohol were included in the home, school, or workplace interviews. One interviewer carried out most of these interviews. The amount of alcohol consumed ranged from 0-16 ml at age 11 and from 0-991 ml at age 21. We dichotomised the amount of alcohol consumption at each measurement wave by categorizing those adolescents who belonged to the quartile (25%) that reported the highest usual amounts, as the group drinking large amounts of alcohol.

Table 1. Measurement of potential predictors of drinking large amounts of alcohol among adolescents.

Predictor	reported by	age	items	answer categories	reference
Social environmental factors					
Alcohol consumption mother	adolescent	9	1	yes / no	
Alcohol consumption father	adolescent	9	1	yes / no	
Alcohol problems in family noticeable to adolescent	parent	9	1	yes / no	
Alcohol consumption friends	adolescent	11	1	yes / no	
Attitude alcohol consumption in general of parent	parent	9	6	perfectly all right / usually all right / sometimes all right / never all right	
Mother's attitude alcohol consumption adolescent	adolescent	11	1	(strongly) approves / does not mind / disapproves / strongly disapproves	
Father's attitude alcohol consumption adolescent	adolescent	11	1	(strongly) approves / does not mind / disapproves / strongly disapproves	
Friends' attitude alcohol consumption adolescent	adolescent	11	1	(strongly) approves / does not mind / disapproves / strongly disapproves	
Parents told you anything about alcohol	adolescent	11	1	negative / neutral / positive / nothing	
Has school told you anything about alcohol	adolescent	11	1	yes / no	
Family relationships	parent	9	27	true / false	43,44
Attachment to parents	adolescent	13	12	(almost) never / sometimes / often / (almost) always	45
Attachment to friends	adolescent	13	12	(almost) never / sometimes / often / (almost) always	45
I belong to organised groups, clubs or activities	adolescent	11	1	yes / no	
Recalled nr. pro-alcohol messages in media	adolescent	13	1	any number	
Material environmental factors					
Child receives pocket money	parent	11	1	yes / no	
Number of children in family	parent	11	1	number of children	
Unemployment of the father	parent	13	1	yes / no	
Individual factors					
Self-esteem	adolescent	11	10	strongly agree / agree / disagree / strongly disagree	46
Fearfulness	parent	11	5	doesn't apply / applies somewhat / certainly applies	47
Health locus of control	adolescent	13	6	strongly disagree / disagree / agree/ strongly agree	48, 49
Behavioural problems	parent	11	77	doesn't apply / applies somewhat / certainly applies	50
Attitude towards alcohol consumption	adolescent	11	3	strongly agree / agree little / disagree little / strongly disagree	
Attitude towards drunkenness	adolescent	11	7	strongly agree / agree little / disagree little / strongly disagree	
Achievement					
Performance at school	parent	11	1	average / below average / above average	
Intelligence (IQ)	adolescent	11		Wechsler Intelligence Scale for Children	51

Occupational level of the father was measured at the beginning of adolescence, at age 9, and categorized according to the Elley-Irving classification, which is specially designed for use in New Zealand. When information on occupational level of the father was missing, information collected at later measurements (until age 15) was used. Fathers' occupations were grouped in six levels, based on analyses of median education and income data from the 1981 New Zealand census for males.⁴² Due to low numbers, we combined the two lowest occupational categories, i.e. semi-skilled and unskilled.

The Dunedin Multidisciplinary Health and Development Study assessed several potential

predictors of alcohol consumption among adolescents, like social and material environmental factors, individual factors and achievement (Table 1). To enable identification of risk groups, we divided all continuous scale variables into tertiles or two groups, comparing the top or bottom quartile with the other 75% of the study population.

Analyses

Analyses were undertaken in four stages. In the first stage we studied the relation between occupation of the father and high alcohol consumption. We fitted logistic regression models, adjusted for sex, with the highest occupational group as a reference category, for each measurement wave separately. Next, we fitted a logistic GEE model that takes into account the dependence between repeated measurements within the same individual, using the GENMOD procedure of SAS 8.0.⁵² We calculated occupational differences in large amounts of alcohol consumption in the period from age 11 to 21 with a GEE model including sex, time and occupation of the father.

At the second stage, we studied which variables longitudinally predicted high alcohol consumption in the period from age 11 to 21, by fitting GEE models containing sex, time and one potential determinant successively. Variables were considered predictors of alcohol consumption when the GEE analyses showed significant χ^2 likelihood ratio test ($p < 0.05$) and at least one significantly increased odds ratio.

At the third stage, for those predictors, which showed significantly increased odds of drinking large amounts of alcohol, we studied the distribution of categories of the predictor by occupational level of the father.

Finally, at stage 4, we added significant predictors of alcohol consumption that were related to occupational level of the father, to the first GEE model (including sex, time, and occupation) in an attempt to explain the association between fathers' occupation and drinking large amounts of alcohol consumption. The contribution of the predictor to the explanation of differences in alcohol consumption was expressed by the percentage reduction in significantly elevated odds ratios of the different occupational groups (all significantly increased odds ratios of occupation of the father should decrease their value due to inclusion of predictor).

Results

Stage 1

In this New Zealand cohort of adolescents born in 1972/73, we found no relation between father's occupation and frequency of alcohol consumption among adolescents (results not shown). Significant cross-sectional occupational differences in drinking large amounts of alcohol emerged when the adolescents were aged 15 years (Table 2). Adolescents from the lowest occupational groups, aged 15 years or older, had odds of about 2½ times higher than the highest occupational groups of drinking large amounts of alcohol.

Longitudinal GEE analyses that take into account the whole adolescent period from age 11 until 21 confirmed a statistically significant association between fathers' occupational status and higher quantity alcohol consumption (Table 2). Considering the whole period,

adolescents from the lowest occupational group had almost twice the odds of being a large consumer than the highest occupational group (Table 2). Occupational differences in alcohol consumption significantly increased during this period (p-value occupation*phase = 0.0302). This confirmed the cross-sectional finding that occupational differences in alcohol consumption in this New Zealand adolescent cohort developed only at a later stage during adolescence.

Table 2. Association between occupational level of the father and drinking large amounts of alcohol during adolescence.

	age					longitudinal GEE
	11	13	15	18	21	adolescent period
Occupational level of father	OR ^a	OR ^a	OR ^a	OR ^a	OR ^a	OR ^b
higher professional, administrative	1.00	1.00	1.00	1.00	1.00	1.00
lower professional, technical	1.39	1.04	1.70	1.42	1.46	1.37
clerical, highly skilled	0.84	0.83	1.50	1.98*	1.67	1.26
skilled	0.82	0.91	1.51	2.15*	1.89*	1.34
semi-skilled, unskilled	1.02	1.40	2.80*	2.17*	2.49*	1.85*
-2 log likelihood χ^2 test occupation	0.3006	0.3804	0.0202	0.0139	0.0533	0.0106
Number of respondents	795	734	808	878	900	

a odds ratio of logistic regression adjusted for sex

b odds ratio of longitudinal GEE analyses including age 11 to 21 adjusted for sex

* 1.00 is not included in 95% confidence interval of odds ratio

Stage 2

Table 3 shows the result of longitudinal GEE analyses that indicate which factors predict the level of alcohol consumption during adolescence. Adolescents who felt that their mother or friends did not mind, or approved of them drinking alcohol, drank large amounts of alcohol more often (Table 3). Adolescents who reported having talked about alcohol in a neutral or positive way with their parents were more likely to drink large amounts of alcohol compared to their peers who got negative messages or were not informed about alcohol at all (Table 3). When parents reported noticeable alcohol problems within the family, their children were significantly more likely to consume large amounts of alcohol (Table 3). Adolescents who experienced medium or low levels of attachment to their parents drank large amounts of alcohol more often compared with peers who experienced high levels of attachment to their parents (Table 3). Next to these social determinants of alcohol consumption, lower intelligence scores significantly predicted high alcohol consumption (Table 3). None of the material (Table 3) or individual factors (Table 3) significantly predicted high alcohol consumption.

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Table 3. Association between potential predictors and drinking large amounts of alcohol during adolescence.

Social environmental factors	OR ^a	Test ^b		OR ^a	Test ^b
Alcohol consumption mother		0.2763	Have parents told you anything about alcohol		0.0216
no	1.00		negative	1.00	
yes	1.20		neutral/positive	1.36*	
			nothing	1.21	
Alcohol consumption father		0.2309	Has school told you anything about alcohol		0.9049
no	1.00		yes	1.00	
yes	0.79		nothing	1.01	
Alcohol consumption of friends		0.1085	Noticeable alcohol problems in family		0.0341
none	1.00		no	1.00	
one or more drinks	1.18		yes	1.29*	
Parental attitude towards alcohol consumption		0.0936	Family relations		0.4979
negative	1.00		best relationships	1.00	
medium	0.99		quintile with poorest relationship	1.08	
positive	1.24				
Mother's attitude towards alcohol consumption child		0.0425	Attachment to parents		0.0012
strongly disapprove	1.00		high	1.00	
disapprove	1.17		medium	1.42*	
does not mind	1.40*		low	1.50*	
(strongly) approves	1.44				
Father's attitude towards alcohol consumption child		0.1312	Attachment to friends		0.8106
strongly disapprove	1.00		low	1.00	
disapprove	1.12		medium	1.08	
does not mind	1.31*		high	1.03	
(strongly) approves	1.41				
Friends' attitude towards alcohol consumption		0.0407	Recall of pro-alcohol media		0.2607
strongly disapprove	1.00		none	0.94	
disapprove	1.07		1	1.19	
does not mind	1.35*		2-3	1.03	
(strongly) approves	1.46*		4 or more	1.00	
I belong to organised groups, clubs or activities		0.0609			
yes	1.00				
no	1.28*				
Material factors					
Number of children at home		0.2066	Attitude towards alcohol consumption		0.1773
1-2	1.00		least positive	1.00	
3	0.90		medium	1.12	
4+	1.11		most positive	1.23	
Child receives pocket money		0.9594	Attitude towards drunkenness		0.1217
no	1.00		least positive	1.00	
yes	1.00		medium	1.21	
			most positive	1.23	
Father been registered unemployed last 2 years		0.2849	Fearfulness		0.8761
no	1.00		Lower scores	1.00	
yes	1.33		highest quartile	0.98	
Achievement factors			Individual factors		
Performance at school		0.4182	Self-esteem		0.2584
average	1.00		high	1.00	
below average	1.13		medium	0.86	
above average	0.90		low	0.85	
Intelligence		0.0053	Health locus of control		0.1407
higher	1.00		internal	1.00	
medium	1.12		neutral	0.99	
lower	1.42*		external	1.22	
			Behavioural problems		0.3284
			lowest	1.00	
			medium	0.88	
			highest	1.00	

a odds ratio of GEE analyses including ages 11 to 21 adjusted for sex,

b likelihood ratio χ^2 test

* 1 is not included in 95% confidence interval

Stage 3

Table 4 shows the relationship between occupational level of the father and risk categories of predictors of large amounts of alcohol consumption. Only lower intelligence scores were clearly inversely related to father’s occupational level, whereas a few other predictors were more prevalent only in the lowest occupational group, i.e. friends approving of alcohol consumption, familial alcohol problems, and medium parental attachment.

Table 4. Prevalence of risk categories of predictors of drinking large amounts of alcohol among adolescents by occupational level of the father.

Social factors	Occupational level of the father				
	highest	higher	mediate	lower	lowest
Noticeable alcohol problems in family reported by parent yes	14.7	20.0	12.6	22.0	27.5
Mother’s feeling about alcohol consumption child reported by child does not mind	40.0	25.8	37.9	32.3	37.1
(strongly) approves	2.1	3.1	0.9	3.1	3.2
Friends’ feeling about alcohol consumption child reported by child does not mind	49.4	40.4	43.8	44.4	44.2
(strongly) approves	6.7	14.9	10.4	14.4	16.7
Have your parents told you anything about alcohol neutral / positive	41.7	37.8	44.8	33.6	32.0
Attachment to parents reported by child medium	33.7	33.3	32.3	29.4	40.9
low	23.6	34.4	32.3	39.7	35.5
Achievement					
Intelligence lower	13.3	25.8	30.4	37.2	43.8

Stage 4

Table 5 shows the contribution of predictors of high alcohol consumption that were related to father’s occupational level, to the explanation of the relationship between occupational level of the father and high alcohol consumption.

Table 5. Explanation of the association between occupational level of the father and drinking large amounts of alcohol during adolescence.

Occupational level of father	basic model	+ attitude friends		+ familial alcohol problems		+ parental attachment		+ intelligence		+ all	
	OR ^a	OR ^a	% ^b	OR ^a	% ^b	OR ^a	% ^b	OR ^a	% ^b	OR ^a	% ^b
higher professional, administrative	1.00	1.00		1.00		1.00		1.00		1.00	
lower professional, technical	1.37	1.24		1.32		1.35		1.29		1.20	
clerical, highly skilled	1.26	1.16		1.16		1.21		1.15		1.11	
skilled	1.34	1.12		1.15		1.20		1.17		0.97	
semi-skilled, unskilled	1.85*	1.66*	22	1.52*	39	1.68*	20	1.65*	24	1.35	59
-2 log likelihood χ^2 test occupation	0.0106	0.0563		0.2049		0.0753		0.0569		0.2913	

a longitudinal GEE analyses including age 11 to 21 adjusted for sex and selected predictor

b reduction in odds ratio of drinking large amounts of alcohol by occupational level due to inclusion of predictor [(OR basic model – OR basic + predictor) / OR basic model – 1]

* 1.00 is not included in 95% confidence interval of odds ratio

The occurrence of noticeable alcohol problems in the family explained almost 40% of the elevated odds ratio for high alcohol consumption in offspring of the lowest occupational group. The higher prevalence of friends approving of alcohol, lower intelligence scores, and lower parental attachment in the lowest occupational group each explained about 20%. The four predictors together explained 60% of the significantly increased odds of high alcohol consumption in adolescents from the lowest occupational group, reducing it to non-significance.

Discussion

Among this New Zealand birth cohort, adolescents from lower occupational backgrounds had higher odds to drink high quantities of alcohol compared with peers from higher occupational backgrounds. These occupational differences in consuming large amounts of alcohol developed only later during the studied adolescent period. There was no relation between father's occupational level and frequency of alcohol consumption among adolescents, illustrating the different dimensions of consumption measured by these two aspects of drinking. The relation between occupational level of the father and high alcohol consumption was explained by the more frequent occurrence of familial alcohol problems and friends approving of alcohol consumption, lower intelligence scores, and lower parental attachment among adolescents from lower occupational groups.

Before further elaboration on our results, we want to discuss methodological issues concerning the study. First, we have chosen occupation of the father to indicate the socioeconomic status of the adolescent, in accordance to many other studies on socioeconomic differences during adolescence.^{11, 15-17} The Elley-Irving occupational index has proven to be a good indicator of socioeconomic status in New Zealand.⁵³ One objection against the use of occupational level to indicate socioeconomic status is the possible variability over time. The correlation ($r > 0.7$, $p = 0.000$) between the four measurements of occupational level of the father in this study (i.e. from age 9 till 15) indicate that occupational level was fairly stable during the period studied. Second, to exclude all possible concerns about causality between predictors and alcohol consumption, we have chosen to include variables measured before or at age 13, i.e. measured in the beginning of our longitudinal study on alcohol consumption. Since we studied a relatively long time frame, it might be possible that the effect of some factors, that have a particular impact on alcohol consumption at a certain (short) time, is underestimated. For example, material barriers are very likely to affect current behaviour, but this effect might dissipate over time, resulting in stronger associations using shorter time frames. Another study on the present cohort found that at age 15, both having more money to spend and being of lower SES were associated with drinking larger amounts.⁵⁴ Other factors, like personality traits, are more likely to influence behaviour during the whole studied period. However, these variables had no influence on drinking in the present analysis. It is possible that some predictors changed after the measurement at baseline. For example, material factors are relatively unstable and very likely to change, e.g. unemployment. This will result in inaccurate estimation of the effect of such factors on alcohol consumption when studying the whole adolescent period. Third, alcohol consumption was self-reported, which might have resulted in underestimation of the

amount of alcohol consumed. We, however, believe that this does not substantially interfere with the relative rank of study members in terms of alcohol consumption and hence the classification in the group drinking large amounts of alcohol.⁵⁵

Half of the explanation for the association between fathers' occupational level and drinking large amounts of alcohol relate to the adolescents' family situation. Adolescents who were poorly attached to their parents or who were exposed to contexts in which alcohol has caused problems consumed larger amounts of alcohol themselves and more often had fathers with lower occupational status. The measure of alcohol consumption of the parents used may have been too crude (yes or no) to reflect the effect of excessive familial alcohol consumption. However, the report of alcohol-related problems in the family is likely to reflect heavier drinking and be more relevant to adolescents' drinking than parental modelling. Furthermore, it may be possible that these findings reflect the contribution of genetic factors to the development of alcohol consumption patterns.^{9, 20, 22} It may also be that both generations are faced with similar social environments, which can not be captured or measured exactly with variables available in the described analyses, and that adolescents from lower socioeconomic backgrounds are likely to drink more, irrespective of the actual drinking behaviour of their parents, because alcohol consumption serves certain purposes in these particular environments.⁷

Having friends who approved of adolescent alcohol consumption predicted part of the association between father's occupational status and drinking large amounts of alcohol by adolescents. The actual alcohol consumption behaviour of friends (reported by the study member), however, was not predictive of drinking large amounts of alcohol. This finding, once again, may be due to the fact that we used too insensitive a measure for the drinking behaviour of friends (i.e. yes or no) to detect a more subtle influence of alcohol consumption of friends on adolescents' own drinking.

The lower intelligence scores of children from lower occupational backgrounds also contributed to the relation between fathers' occupation and alcohol consumption. Wills et al.¹⁸ also found that academic competence explained part of socioeconomic differences in substance use during adolescence. Less intelligent adolescents might use alcohol consumption to counterbalance their lower academic success,²⁰ or alternatively, since lower intelligence scores themselves decrease the opportunity to achieve higher education and hence higher occupational status (at age 21 χ^2 $p=0.0162$), adolescents with lower IQ scores might be ready to assume adult roles and behaviour earlier.

Intervention programs that aim to prevent alcohol consumption should be designed appropriately for adolescents from lower socioeconomic backgrounds, because they are disproportionately exposed to potent predictors of drinking large amounts of alcohol, such as living in troubled families, having friends that approve of alcohol, and lower intelligence scores. Lower intelligence scores are likely to result not only from heredity, but from environmental influences as well.^{7, 56-59} A study of changes in intellectual performance in this same New Zealand birth cohort cautiously suggested that decreases occurred in susceptible children living in negative, unstable home environments, characterized by conflicts, divorce and decreasing socioeconomic status.⁵⁷ Reviews on long-term effects of early childhood education and day-care have found persistent positive effects on achievement and academic success,⁶⁰⁻⁶¹ future socioeconomic status,⁶¹ as well as sometimes on IQ.^{56, 59, 61} Greater access to these opportunities for lower socioeconomic groups may therefore decrease their higher odds of heavier drinking in the future. Furthermore, it is important that programs include the social environment of

adolescents, i.e. help parents with possible alcohol problems, take into account the low parental attachment or try to improve it, and attempt to diminish positive attitudes towards excessive alcohol consumption, particularly among youth. This might be achieved by developing school-based interventions, for example in lower socioeconomic neighbourhoods.

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Part III

**[Socioeconomic differences in (changes in)
health related behaviour in adults]**

Chapter 4

**[Educational differences in the intention to stop smoking:
explanations based on the Theory of Planned Behavior]**

Thus far, we do not completely understand the mechanisms by which socioeconomic differences in smoking develop. In this paper we test the Theory of Planned Behavior as a potential explanatory framework for socioeconomic differences in smoking. We describe educational differences in the intention to quit smoking and attempt to understand these in the light of educational patterns in components of the Theory of Planned Behavior, i.e. attitude towards smoking cessation, perceived subjective norm concerning quitting smoking, and self-efficacy.

This cross-sectional study was part of the longitudinal GLOBE study on socioeconomic differences in the Netherlands. Components of the Theory of Planned Behavior were measured in 1997 among 602 Dutch daily smokers.

We found no educational differences in the intention to quit smoking. We report that persons with a more positive attitude towards smoking cessation and who perceived a higher subjective norm to quit intended to quit smoking significantly more often. However, positive attitude and high subjective norm both were not more prevalent in the higher educated groups, which explains the lack of educational differences in the intention to quit smoking. Higher educated respondents reported significantly higher self-efficacy to refrain from smoking, which, however, was not related to the intention to quit smoking.

We conclude that from all components of the Theory of Planned Behavior only the direct effect of self-efficacy on behaviour might contribute to educational differences in smoking cessation.

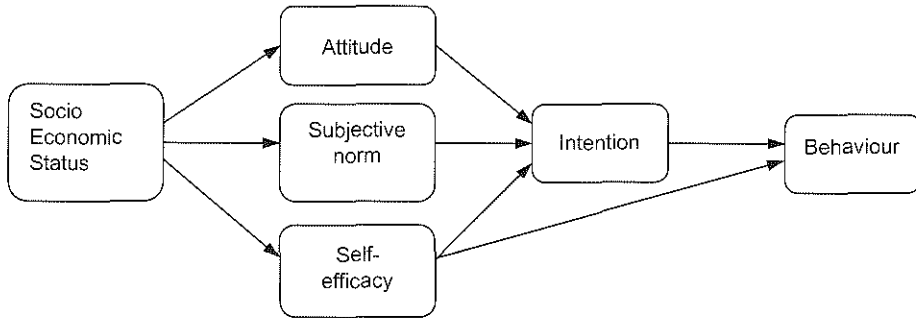
Submitted as: Mariël Droomers, Carola TM Schrijvers, Johan P Mackenbach. Educational differences in the intention to stop smoking: explanations based on the Theory of Planned Behavior.

Introduction

Over the past decades, until the early 1990s, socioeconomic differences in smoking have widened,¹⁻⁴ partly because of socioeconomic differences in smoking initiation, but mainly because lower socioeconomic groups were less successful in smoking cessation than higher socioeconomic groups.⁵⁻⁷ Thus far, we do not completely understand the mechanism by which socioeconomic differences in smoking develop.

One of the dominant psychosocial theories on behaviour that applies consummately to making choices for (un)healthy lifestyles is the Theory of Planned Behavior.⁸ This theory assumes that behaviour is predicted by the intention to engage in the behaviour and perceived control over the behaviour (Figure 1). Intentions represent a person's motivation to perform the behaviour, while perceived behavioural control reflects the extent to which a person feels he or she is able to perform the behaviour. Further, control also has an indirect influence on behaviour through behavioural intentions, such that an individual who perceives a lack of control will be less likely to intend to perform the behaviour. Next, behavioural intentions are additionally influenced by the attitude or beliefs about the consequences of the behaviour and the perceived social desirability to perform the behaviour or subjective norms. Hence, behavioural intention is a function of three direct determinants: attitudes, subjective norms, and perceived behavioural control.

Figure 1. Application of Theory of Planned Behavior to socioeconomic differences in behaviour.



In this paper we test the Theory of Planned Behavior as a potential explanatory framework for socioeconomic differences in smoking. We hypothesized that components of the Theory of Planned Behavior might be unequally distributed over socioeconomic groups and therefore possibly contribute to the explanation of socioeconomic differences in smoking. We test this hypothesis with a focus on educational differences in the intention to quit smoking and attempt to understand these in the light of educational differences in attitude towards smoking cessation, perceived subjective norm concerning quitting smoking, and behavioural control.

Methods

Population

Data were obtained from the longitudinal study on socioeconomic health differences in the Netherlands (GLOBE study).⁹ GLOBE is the Dutch acronym for ‘Health and Living Conditions of the Population of Eindhoven and its surroundings’. In 1991, a random sample of approximately 27,000 persons from the general non-institutionalised population, aged 15-74 years received a postal questionnaire (response 70.1%). A random subsample of 2,802 respondents to the questionnaire was additionally interviewed (response 79.4%) to collect more extensive background information on possible determinants of socioeconomic differences. Non-respondents did not differ from respondents with regard to socioeconomic and demographic characteristics.⁹ In 1997, we approached 2,568 persons of the subsample for follow-up measurements, since 130 (4.6%) had deceased, 25 (0.9%) moved abroad, 68 (2.4%) refused to further participate in the longitudinal study prior to the 1997 follow-up measurement, while 11 (0.4%) could not be traced. In 1997, 2,077 people filled in a postal questionnaire and participated in an interview (80.9% response). The study on the contribution of the Theory of Planned Behavior to educational differences in smoking cessation was restricted to 602 respondents who reported to be daily smokers in 1997.

Measures

Highest attained educational level has proven to be a good indicator of socioeconomic status in the Netherlands.¹⁰ Educational level indicating socioeconomic status, has the advantage that it is available for both men and women, whether they are in paid employment or not, that it generally does not change during adult life, has a high reliability and validity¹¹ and that it is simple to measure and use. Educational level was measured in the postal questionnaire in 1991. We discern the following 4 categories: higher vocational schooling and university, i.e. 16 years of education (highest), intermediate vocational schooling or higher secondary schooling, i.e. 12-13 years of education (higher), intermediate secondary or lower vocational schooling, i.e. 9-10 years of education (lower), and primary school only, i.e. 6 years of education (lowest). Thirty respondents (2.2%) did not report their educational level.

All components of the Theory of Planned Behavior were measured during the interview in the respondent's home in 1997. Intention to quit smoking was questioned with 'Do you seriously intend to quit smoking within the next month?' Answers were precoded, ranging from certainly yes (1) to certainly not (5). Attitude was assessed using 18 items that referred to what people may expect to gain or lose when they quit smoking, like 'being able to afford things you can not afford now' or 'become sulky and grumpy' or 'decrease the risk to get a serious disease'.¹² Respondents were asked if they thought that the consequence would occur when they would stop smoking. Positive attitudes were improvement of own health, improvement of health of others, and financial benefit (each 3 items). Negative attitudes were weight gain, lack of cigarettes, and increased stress or tension (each 3 items). Item scores were added up to derive at scale scores for all six separate attitudes and total positive and negative attitude (Table 1).

Table 1. Variable information on components of the Theory of Planned Behavior

Construct	items	answer categories	range	N	mean / SD	Chronbachs α
Positive attitude	9	yes, very - yes, a little - no	9-27	593	18.32 / 4.12	0.78
Negative attitude	9	yes, very - yes, a little - no	9-27	583	17.93 / 4.63	0.81
Subjective norm	5	Opinion: definitely yes - yes - a little - neutral - probably not - not - definitely not	-54-60	602	1.81 / 15.61	0.67
Self-efficacy	8	Motivation to comply: very much - much - some - not much - not at all definitely yes - yes - a little - neutral - probably not - not - definitely not	8-56	573	28.73 / 13.75	0.92

Subjective norm included normative beliefs about how smoking cessation may be valued by others and the respondent's motivation to comply with the opinion of others.¹³ Respondents stated if they thought that their family, friends, or doctor wanted them to stop smoking on a 7-point scale, ranging from certainly yes (+3) till certainly not (-3). Further they indicated how much they cared about the opinion of these people. The perceived norm was multiplied by the motivation to comply and these products were summed up (Table 1).

Perceived behavioural control was indicated by self-efficacy.^{8, 14, 15} Self-efficacy was measured by asking the respondents to rate their likelihood to succeed to refrain from smoking in 8 different situations, such as 'after dinner', 'when being offered a cigarette', or 'seeing others smoke'.¹² Answers scores were added up to arrive at a total scale score (Table 1).

All scales were recoded into quartiles, i.e. four equally sized groups, since there was no

linear relationship between attitude, subjective norm, self-efficacy and intention.

Analyses

We first describe educational differences in the intention to quit smoking and further attempt to explain these from educational differences in attitude, subjective norm and self-efficacy.

Educational differences in the intention to quit smoking are studied fitting logistic regression models adjusted for age (10 year categories), sex, marital status (married, single, and widowed or divorced), and religious affiliation (none, Catholic, and Protestant). For this purpose, we dichotomised the intention to quit smoking into positive ('likely' and 'certainly yes') versus not-positive ('maybe yes/maybe not', 'likely' and 'certainly not'). The lowest educated group was the reference group in these analyses, since we expect a higher prevalence of positive intention among the higher educated.

We followed the following three steps to determine the contribution of attitude, subjective norm, and self-efficacy to educational differences in positive intentions to quit smoking. Firstly, we fitted separate logistic regression models including confounders and one of the following variables, i.e. positive attitude, attitude regarding own health, attitude regarding health of others, attitude regarding financial benefit, negative attitude, attitude regarding weight gain, attitude regarding lack of cigarettes, attitude regarding tension, subjective norm, and self-efficacy. Secondly, we studied the educational distribution of positive and negative attitude, subjective norm, and self-efficacy, using directly age and sex standardized prevalence and univariate χ^2 tests. Thirdly, we studied the contribution of variables that predicted intention (first step) and occurred more often in higher educated groups (second step) to educational differences in intention to quit smoking by adding them successively to a logistic regression model already including confounders and education. The contribution of the variable to the educational differences in intention is evaluated by the reduction of the odds ratios of the educational groups (should be higher than 5%).

Results

We found no educational differences in positive intention to quit smoking among these Dutch daily smokers (Table 2). Compared with 11.0% of the lowest educated who reported positive intentions to quit smoking within one month, only 10.2% of the highest educated smokers wanted to quit smoking. Logistic regression analysis confirms the lack of educational differences ($p=0.643$). Higher educated groups even showed (non-significant) lower odds (0.61) to intend smoking cessation. These findings did not change when adjusted for the amount smoked at time of the measurement in 1997.

We studied which components of the Theory of Planned Behavior were related to the intention to quit smoking. More positive attitudes towards smoking cessation were significantly associated with intention to quit (Table 3). Beliefs of respondents that smoking cessation would improve their own health and the health of others were the components of positive attitude that accounted for the relation with positive intention to quit. People who believed that smoking cessation would have financial benefits did not

INTENTION TO QUIT SMOKING

statistically significantly more often intend to quit smoking within one month (not tabulated).

Table 2. Educational differences in positive intention to quit smoking

Educational level ^a	Positive intention to quit smoking			
	N	% ^b	OR ^c	95% CI ^d
lowest	109	10.2	1.00	
lower	241	10.7	0.73	0.34-1.57
higher	134	8.4	0.57	0.23-1.40
highest	88	11.0	0.61	0.23-1.60
p-value ^e			0.643	

^a 95% confidence interval does not include 1

^a highest=higher vocational schooling and university, i.e. 16 years of education, higher=intermediate vocational schooling or higher secondary schooling, i.e. 12-13 years of education, lower=intermediate secondary schooling or lower vocational schooling, i.e. 9-10 years of education, lowest=primary school only, i.e. 6 years of education

^b directly age and sex standardized prevalence

^c odds ratio of logistic regression analyses adjusted for age, gender, marital status, and religious affiliation

^d 95% confidence interval of odds ratio

^e likelihood ratio χ^2 test of educational level

Negative attitudes towards smoking cessation did not influence the intention to quit smoking within one month (Table 3). This applies to the overall score of negative attitude, as well as the three separate negative attitudes, i.e. weight gain, lack of smoking, and increased stress or tension (not tabulated). Only respondents who reported the highest, i.e. most positive subjective norms toward smoking cessation were statistically significantly more likely to intend smoking cessation (Table 3). Further analyses showed that people who more strongly comply with the opinion of others report a statistically significantly higher intention to quit smoking, while the perceived opinion of others has no significant impact on the intention to quit (not tabulated). Self-efficacy was not statistically significantly related to intention to quit smoking (Table 3). So, people who reported great confidence in their ability to stop smoking, even in difficult social situations, did not more often intend to stop smoking within one month than people who did not believe they were capable to quit.

In the next step, we studied the educational distribution of the components of the Theory of Planned Behavior (Table 4). We unexpectedly found that lower educated persons do significantly more often strongly believe that quitting smoking has positive consequences (highest quartile), like improvement of their own or others' health and financial benefit. The lower quartiles of positive attitude were less clearly related to educational level. Negative attitude towards smoking cessation was significantly inversely related to educational level (Table 4). Higher educated people less often believe that smoking cessation will be followed by weight gain, lack of cigarettes, or increased stress or tension (not tabulated) and lower educated persons more often strongly believe that smoking cessation has negative consequences, especially weight gain (not tabulated). Subjective norm towards smoking cessation did not significantly differ between educational groups (Table 4). When we studied the separate components of subjective norm it turned out that higher educated people more often felt that their surroundings encouraged smoking cessation compared to lower educated people, while the motivation to comply with others was equal over all educational groups (not tabulated). Statistically significant educational differences were observed for self-efficacy. Lower educated people have statistically significantly less faith in their ability to quit smoking (Table 4).

Table 3. Relation between components of Theory of Planned Behavior and positive intention to quit smoking.

Table 4. Educational differences in components of the Theory of Planned Behavior ^a.

		OR ^b	p-value ^c	Educational level				p-value ^d
				lowest	lower	higher	highest	
Positive attitude	highest	7.01*	0.0001	48.4	26.4	22.8	19.7	0.006
	higher	6.58*		15.5	27.9	25.1	22.0	
	lower	2.61*		15.5	20.9	32.2	29.8	
	lowest	1.00		21.1	24.8	19.9	28.5	
Negative attitude	lowest	1.67	0.2280	13.7	23.7	26.5	42.8	0.000
	lower	1.57		19.9	26.0	26.7	30.9	
	higher	0.86		38.6	24.5	20.1	17.4	
	highest	1.00		27.8	25.8	26.7	8.9	
Subjective norm	highest	4.28*	0.0026	33.8	22.0	28.4	29.8	0.479
	higher	1.81		24.2	24.2	22.9	23.0	
	lower	2.47		20.9	27.1	23.0	22.5	
	lowest	1.00		21.1	26.7	25.7	24.7	
Self-efficacy	highest	1.04	0.3782	20.0	24.8	26.2	33.1	0.004
	higher	1.84		15.1	21.6	28.0	37.0	
	lower	1.44		17.7	29.3	25.0	17.8	
	lowest	1.00		47.2	24.2	20.9	12.2	

* 95% confidence interval does not include 1

a directly age and sex standardised prevalence

b based on logistic regression analyses adjusted for age, gender, marital status, and religious affiliation

c likelihood ratio χ^2 test

d univariate cross tabulation χ^2 test

Since we did not find significant educational differences in positive intention to quit smoking we omitted the analyses in which we study the contribution of the components of the Theory of Planned Behavior to these educational differences.

Discussion

We fail to find educational differences in the intention to quit smoking, despite earlier reports from the GLOBE study stating that higher educated people quit smoking significantly more often¹⁶ and the fact that intentions and behaviour are held to be strongly related.^{8, 14-15, 17} This finding that lower socioeconomic groups do intend to quit smoking just as often as higher socioeconomic groups is, however, in agreement with results from most studies addressing this issue.^{5, 18-20} Furthermore, it is acknowledged that, notwithstanding the strong correlation between intentions and behaviour, intentions only account for about one third of the variation in behavior.^{14-15, 17} We conclude that educational differences in the intention to quit smoking are unlikely to play a role in the explanation of educational differences in smoking cessation.

According to the Theory of Planned Behavior, educational differences in behaviour might also result directly from educational differences in self-efficacy (Figure 1).⁸ In the case of smoking cessation, self-efficacy is even considered at least as important a determinant of future behaviour as intention.^{5, 15, 21} The clear educational differences in self-efficacy reported in this paper, together with the lack of educational differences in intention, imply that the direct effect of self-efficacy on behaviour is the only component of the Theory of Planned Behavior that potentially contributes to educational differences in smoking cessation. We are, however, not able to test this, because we did not follow-up smoking behaviour after the interview. Nevertheless, we suggest that interventions, which promote smoking cessation in lower socioeconomic groups, aim at improving self-efficacy.

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We fail to find significant relations between some components of the Theory of Planned Behavior and the intention to quit smoking, i.e. we only find significant relations between positive attitude and subjective norm and the intention. In general, a more favourable attitude towards smoking cessation is related to a stronger intention to quit,^{5, 15, 19-20} though some studies failed to confirm this.^{5, 22} In accordance with other Dutch studies,²³⁻²⁴ we report that persons with a high positive attitude towards smoking cessation do significantly more often intend to quit smoking within the next month, but that negative attitudes did not significantly influence the intention to quit. Subjective norm is considered the component of the Theory of Planned Behavior that contributes least to intention to change behavior.¹⁵ In the case of smoking cessation, only Abrams and Biener¹⁸ reported that subjective norm influenced intention to quit, while others failed to demonstrate such relation.^{15, 19, 22} We find highly positive subjective norms towards cessation to be significantly related to the intention to quit smoking. Despite what others consistently reported,^{5, 15, 20, 22, 25} we unexpectedly find no relationship between self-efficacy and the intention to quit. Among Dutch adults, however, the absence of this relation has been reported before.²³⁻²⁴

We report that persons with a more positive attitude towards smoking cessation and who perceived higher subjective norms to quit, intend to quit smoking significantly more often. Positive attitudes and high subjective norms are, however, not more prevalent in the higher educated groups, which explains the lack of educational differences in the intention to quit smoking. Our results show significant educational differences in positive attitude, due to lower educated groups believing more often that smoking cessation has positive consequences than higher educated persons. Normally, lower socioeconomic groups report less positive or more negative attitudes towards quitting,²⁶⁻²⁷ though some studies fail to find a relation between socioeconomic status and attitude towards smoking.^{20, 28-29} Furthermore, we find that subjective norm is not related to educational level, in accordance with results of Clark et al.⁵ and Willemsen et al.,²⁰ though the contrary has, however, been reported as well.^{18, 27}

Conclusions drawn from our results should take notice of the limitations of this study. Firstly, we have not followed-up the actual behaviour after one month, which hampers analyses of the direct effect of self-efficacy on behaviour and the affirmation of the contribution of self-efficacy to the explanation of educational differences in smoking cessation. Secondly, due to our cross-sectional design, our study population comprises adult smokers who did not yet quit smoking, despite anti-smoking public health campaigns and other social trends like diminishing social acceptability and restrictions in public places. Since cessation rates tend to be generally higher in higher socioeconomic groups,⁵⁻⁷ specifically the higher educated groups will comprise more hardcore smokers, whose attitudes, subjective norms and self-efficacy might not be generalisable to other individuals with a high education. This might explain the lack of educational differences in intention and subjective norm or the unexpected association between educational level and positive attitude towards smoking cessation. Thirdly, our results apply to the intention to quit smoking within one month. It might be possible that another time frame changes the conclusions about the explanatory power of components of the Theory of Planned Behavior with regard to educational differences in smoking cessation.

We conclude that most components of the Theory of Planned Behavior cannot contribute to educational differences in smoking cessation, mainly because of the lack of a

relation between educational level and positive intention to quit smoking. Our results once again illustrate the common finding that all socioeconomic groups seem to be equally willing to quit smoking.^{5, 18-20} Lower socioeconomic groups, however, do not succeed as often as higher socioeconomic groups.^{5-7, 30} The socioeconomic differences in behaviour must therefore originate from processes that account for the renowned gap between intention and behavior.^{14-15, 17} The GLOBE study identified several barriers that hinder lower educated groups to stop smoking, such as financial difficulties, low social support, neuroticism, and low perceived control.^{16, 31} In this paper we additionally identify low self-efficacy as a potentially important disadvantage of lower socioeconomic groups who want to stop smoking.

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**[Why do lower educated people continue smoking?
Explanations from the longitudinal GLOBE study]**

CONTINUED SMOKING

Why do lower educated people continue smoking? Explanations from the longitudinal GLOBE study.

This article describes the effect of educational level on the decision to continue smoking among 1354 initially smoking participants (age ≥ 20 years) in the Dutch GLOBE study. The effect of education on continued smoking was explained from baseline information (1991) on smoking characteristics, individual characteristics, and environmental factors. Smoking status was reassessed after 6.5 years.

Lower educated smokers more often continued smoking (odds ratio 2.09). Poor perceived health and earlier smoking initiation in lower educated groups were main predictors of educational differences in smoking maintenance. Educational differences in chronic illness, perceived control, neuroticism, and emotional support also contributed to the explanation of educational differences in continued smoking.

These results have important implications for intervention and policy.

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Introduction

Smoking remains a major public health concern because of its prominent, yet preventable, impact on morbidity and mortality. Smoking, and hence its related health risks, is much more prevalent in lower socioeconomic groups (differences of 8%-30%) than in higher socioeconomic groups.¹⁻⁵ Because of the strong impact of smoking on health, these socioeconomic differences in smoking contribute substantially to socioeconomic differences in health⁶ and mortality.⁷⁻⁹

Mainly because of health policies and interventions discouraging smoking, the prevalence of smoking decreased substantially until the early 1990s.^{3, 10-13} Socioeconomic differences in smoking, however, in most cases have increased.^{1,3, 5, 10, 12, 14-15} The increasing gap in smoking prevalence between socioeconomic groups is partly explained by socioeconomic differences in smoking initiation, especially during adolescence, as well as differences in smoking cessation. Cessation rates tend to be generally higher in higher socioeconomic groups, whereas lower socioeconomic groups more often continue smoking,¹⁶⁻²⁴ though some studies did not find such socioeconomic differences in smoking cessation.²⁵⁻²⁶

Recapitulating, people in poor socioeconomic circumstances have high rates of smoking and more often continue smoking despite anti-smoking public health campaigns and other social trends like diminishing social acceptability and restrictions both at work and in public places. A better understanding of the reasons why lower socioeconomic groups more often continue to smoke could lead to a more equitable distribution of health. We used data from the longitudinal GLOBE study with a 6.5 years follow-up period to describe the effects of educational level on continued smoking in an adult Dutch population. In addition, the GLOBE study provided a unique opportunity to study explanations of educational differences in continued smoking because of the collection of extensive data on characteristics of smoking behaviour, individual factors and environmental factors.

Characteristics of smoking behaviour are among the major determinants of continued smoking. People who smoke more heavily, have a higher probability to continue smoking.^{17, 19-27} Some studies, however, reported that the amount smoked does not

influence smoking cessation.^{25, 28} Another characteristic is the amount of time people have smoked before they attempt to quit. People who have smoked for a longer period²⁴ and people who started smoking at younger ages²⁷ are less likely to quit smoking. Those who have never tried to quit before are generally more likely to continue smoking as compared with those who have tried quitting smoking before.^{17, 19-20, 23, 27}

The second group of predictors of continued smoking considered in our study were individual factors. For example, personality characteristics, like high perceived control, low neuroticism, or hostility, play a significant role in successful smoking cessation.²⁹⁻³¹ Furthermore, people who lack effective coping skills are more likely to continue smoking.³² The majority of previous daily smokers mention health concerns as the main reason for smoking cessation.^{12-13, 27} Health status, however, did not affect subsequent changes in smoking behavior,^{17, 22-23, 28} except in one study that found coronary heart disease and hospitalisation to be among the strongest predictors of short-term smoking cessation.²⁵

The environment exerts considerable influence on individual behavior.^{5, 31, 33-34} Smokers often view smoking as an effective means of coping with minor and major stressful situations in daily life.^{10, 30-32} Stressors, like unemployment,^{14, 18} occurrence of life events,²⁰ psychological stress,³⁵ and living in poor economic conditions^{14, 21, 36} have been reported to increase smoking initiation or encourage smoking maintenance. Social support from the environment seems critical for changing smoking behaviour. For example, emotional social support is known to be strongly associated with quitting smoking.^{21, 28, 30-31, 37} In this same line, it is often reported that married people more often succeed in smoking cessation compared with unmarried, divorced, or widowed persons.^{14, 18-19, 21, 24-25}

Predictors of continued smoking generally are more prevalent in lower socioeconomic groups.³⁸⁻³⁹ For example, results from the GLOBE study showed that poor health,⁶ low levels of perceived control⁴⁰ or material disadvantages⁶ occur more often in lower socioeconomic groups and may therefore give rise to (i.e. explain) socioeconomic differences in unhealthy behavioural choices, such as continued smoking.

In this article, we describe the effects of educational level on continued smoking among an adult Dutch population and subsequently attempt to explain the educational differences using information on characteristics of smoking behaviour, individual factors and environmental factors.

Method

Population

Data were obtained from the longitudinal study on socioeconomic health differences in the Netherlands (GLOBE study).⁴¹ GLOBE is the Dutch acronym for 'Health and Living Conditions of the Population of Eindhoven and its Surroundings'. In 1991, a random sample of approximately 27,000 persons from the general non-institutionalised population, aged 15-74 years, was drawn from 18 municipal population registers in the south-eastern Netherlands. The study started with a postal survey (response 70.1%), which was returned slightly more often by the well-to-do (indicated by postal code), by women, and by older people.⁴¹ To increase the cost-effectiveness of our study, more extensive information on possibly explanatory factors involved in socioeconomic

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inequalities was collected among only two subsamples. One subsample overrepresented people who reported specific chronic diseases in the postal questionnaire (i.e. chronic lung disease, severe heart disease, diabetes and persistent back trouble) in order to increase the power to study socioeconomic differences in the use of health services (response rate 72.3% N=2,865).⁴² The other subsample consisted of a random sample of respondents to the postal questionnaire (response rate=79.4% N=2,802). Differential non-response occurred only in the subsample which overrepresented chronically ill persons, where younger and single people less often agreed to participate.⁴²

In 1997, follow-up data were collected among the two subpopulations. Of the 5,667 subjects participating in the interviews in 1991, 328 (5.8%) were deceased, 39 (0.7%) had moved abroad, 316 (5.6%) refused to participate further in the longitudinal study prior to the 1997 follow-up measurement, and 37 (0.7%) could not be traced. This left 4,947 persons (87.3%) eligible for enrolment in the follow-up measurement in 1997, of which 4,246 persons returned the postal questionnaire (response rate=85.8%). We restricted the analyses on continued smoking to 1,387 respondents who reported to be daily smokers and were 20 years or older in 1991 (the latter requirement was designed to exclude adolescents who were still engaged in experimental smoking behaviour).

Measures

Self-reported smoking status was augmented in the postal questionnaires in 1991 and 1997. Respondents were asked, 'Do you smoke occasionally?' Answers were coded as 1 (yes), 2 (no, but I used to), and 3 (no, never). In the following question, (ex)smokers stated how many cigarettes they smoked per day. Only respondents who claimed to smoke one or more cigarettes per day (almost all) were considered smokers. Three initial smokers did not answer the question on smoking behaviour in 1997 (0.2%).

Educational level has proven to be a good indicator of socioeconomic status in the Netherlands.⁴³ Highest attained educational level was measured in the postal questionnaire in 1991. We discerned the following four categories: higher vocational schooling and university (i.e. 16 years of education; highest), intermediate vocational schooling or higher secondary schooling (i.e. 12-13 years of education; higher), intermediate secondary or lower vocational schooling (i.e. 9-10 years of education; lower), and primary school only (i.e. 6 years of education; lowest). Thirty respondents (2.2%) did not report their educational level. The use of educational level to indicate socioeconomic status has the advantage that it is available for both men and women, whether they are in paid employment or not; in addition, it does not change during adult life, it has a high reliability and validity,⁴⁴ and it is simple to measure and use.

Characteristics of smoking behaviour measured in the postal questionnaire in 1991 were as follows: average number of cigarettes smoked per day (categorized per 10 cigarettes up to 31 or more) to indicate dependence, start with smoking before the age of 18 years, and previously attempted to quit smoking (yes or no).

Individual factors included perceived general health, chronic illness, perceived control, neuroticism, and two different coping styles. These factors were assessed during the interview in 1991, except perceived health and chronic illness, which were assessed in the postal questionnaire. Perceived general health was assessed by the question, 'How do you rate your health in general?'.⁴⁵ The answer was dichotomised into (very) good versus less-

than-good. Chronic illness was considered present when respondents stated that they suffered from at least 1 of 23 chronic conditions on a checklist,⁴⁵ of which some were severe (such as cancer and heart disease) and others were less severe (like migraine or varicose veins). Perceived control was measured as locus of control using a questionnaire based on Rotter's Locus of Control scale.⁴⁶ A Dutch translation of the Eysenck Personality Questionnaire was used to measure neuroticism.⁴⁷ Palliative and active problem focussing coping styles were assessed using part of a Dutch questionnaire⁴⁸ on different reactions (items) in times of problems. Palliative coping was characterized by avoidance, like 'try to think of something else' or 'engage in other, pleasant activities', whereas active problem focusing involved directed action to deal with the problem. More information on scale variables is provided in Table 1. Scores on all scales were divided into quartiles.

We distinguished between psychosocial and material environmental factors. Psychosocial environmental factors were life events, long lasting difficulties, and social support. All of these factors, except life events, were measured during the interview in 1991. Nine negative life events in the preceding year (e.g. serious illness or death of important persons, substantial drop in income, or being a victim of robbery or theft) were assessed.⁴⁹ Long lasting difficulties were measured during the interview with an adapted version of the Dutch Long Lasting Difficulties List.⁵⁰ Respondents indicated if any of five difficulties with health problems of other people, like chronic illness or disability, occurred during the last year. Difficulties with relations were assessed with eight items addressing conflicts or difficulties with partner, family members or friends. The item scores ranged from 0 (no problem or not applicable) to 4 (serious problem) and were added up to a total score. Social support was measured using a shortened version of a Dutch questionnaire.⁵¹ Respondents stated the three most significant persons in their lives and subsequently indicated how often these persons provided several examples of emotional and instrumental support (Table 1). Scores on social support were divided into quartiles.

Table 1. Information on scale variables

Construct	items	coding	range	Cronbach α ⁵²
Locus of control	11	totally agree - agree - equal - don't agree - don't agree at all	11-55	0.84
Neuroticism	12	yes - no	0-12	0.81
Palliative coping	6	seldom/never - sometimes - often - very often/always	8-32	0.71
Active coping	8		6-24	0.80
Emotional social support	5	never/no - sometimes - often/sure	0-30	0.60
Instrumental social support	4		0-24	0.67

Material environmental factors were equivalent income, the occurrence of financial problems, employment status, situational difficulties, and housing and neighbourhood circumstances. All, except financial problems, were measured during the interview in 1991. Equivalent income was defined as total net household income divided by the square root of the number of persons depending on that income, giving more weight to adults (1) than to children (0.7),⁵³ and divided into quartiles. Financial problems (i.e. not being able to pay the rent, electricity or food during the preceding year) were precoded into three categories (none, some, and many). Participants' employment status was categorized as follows: employed, unemployed, long-term work disability, (early) retired, housekeeper (engaged in household duties) or other (students, those living by private means, and

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military conscripts). Situational difficulties included five items on problems at work, studies, finance, and living environment during the preceding year.⁵⁰ The item scores ranged from 0 (no problem or not applicable) to 4 (serious problem) and were added up to a total score. Housing conditions were measured with three questions about the presence of draft, cold, or moist in the residence during the year preceding the postal survey.⁴⁹ Four items on adverse neighbourhood conditions included the presence of stench, noise from neighbours, noise from traffic, and criminality.⁴⁹

Analyses

After excluding persons with missing values on any of the variables used in the analyses (33 respondents; 2.4%), 1,354 people were left for analyses. All variables were coded as dummy variables. Age and sex were confounders in all analyses. Furthermore, we adjusted for the overrepresentation of chronically ill persons by proportionately weighting data of the different groups (chronically ill and healthy people) to resemble the composition of the sample of the population that responded to the postal questionnaire in 1991.

We calculated the effect of educational level on continued smoking by fitting a logistic regression model that included educational level and confounders, using the highest educated group as the reference (Model A). To test if predictors explained educational differences in the decision to continue smoking, we followed the following procedure. First, we investigated which variables individually predicted continued smoking using separate logistic regression models for each predictor, not taking into account educational level. Variables were considered predictors of continued smoking when they showed a statistically significant likelihood ratio chi-square test ($p < 0.05$), and a clear relationship with continued smoking (at least one statistically significantly increased odds ratio or odds ratio > 1.5). Second, we examined the relation between educational level and predictors of continued smoking identified in the first step of analyses, using directly age and sex standardized prevalences of risk categories of the predictors as a function of educational level. Third, we analysed logistic models that included education and, successively, each predictor of continued smoking - which was inversely related to education - in order to quantify the contribution of the predictor to the explanation of educational differences in continued smoking. This contribution was expressed by the reduction in odds ratios of the different educational groups (should be higher than 5% in at least one of the educational groups and no substantial increase of other odds ratios) and the part of the reduction in deviance attributable to education, which was accounted for by inclusion of the predictor in the model (see the footnote in Table 5). Finally, the last logistic model included education and all selected predictors simultaneously to quantify the part of educational differences in continued smoking that was explained by these predictors.

Results

Though overall smoking prevalence in this adult Dutch population decreased between 1991 and 1997, from 34% to 29%, educational differences in smoking increased during this same period (Table 2).

Table 2. Educational differences in smoking in 1991 and 1997 and in continued smoking between 1991 and 1997

Educational level ^a	1991			1997			Continued smoking 1991-1997		
	N ^b	% smokers	OR	N ^b	% smokers	OR	N ^c	% continuing smokers	OR continued smoking
highest	779	28.6	1.00	779	22.3	1.00	206	67.7	1.00
higher	855	35.0	1.53 *	856	28.2	1.53 *	294	73.1	1.29
lower	1558	35.6	1.97 *	1559	31.7	2.26 *	550	81.2	2.09 *
lowest	780	37.4	2.72 *	790	32.9	3.04 *	304	81.0	2.09 *
Total	3972	34.4		3984	29.2		1352	77.1	

* p<0.05

a highest=higher vocational schooling and university, i.e. 16 years of education, higher=intermediate vocational schooling or higher secondary schooling, i.e. 12-13 years of education, lower=intermediate secondary schooling or lower vocational schooling, i.e. 9-10 years of education, lowest=primary school only, i.e. 6 years of education

b respondents to interview in 1991 and 1997; numbers differ due to different numbers of cases with missing values

c respondents to interview in 1991 and 1997 who smoked in 1991

The increased educational differences were the result of more continued smoking in lower educated groups (81.0%) compared with the highest educated (67.7%) (Table 2). We found no educational differences in smoking initiation ($p=0.2718$) among this adult Dutch population (not tabulated), that is, 4.1% of the lower educated non-smokers in 1991 started smoking during follow-up compared with 3.8% of the highest educated groups.

Table 3a shows the relationship between characteristics of smoking behaviour and continued smoking between 1991 and 1997. Only the age at which smoking was initiated significantly influenced continued smoking. Persons who started smoking before the age of 18 were 1.5 times more likely to continue smoking during the study period.

Table 3a. Relation between potential predictors and continued smoking.

Smoking characteristics	OR ^a	95%CI ^b	test ^c	OR ^a	95%CI ^b	test ^c
Number of cigarettes smoked			0.7937	Age of smoking initiation		0.0037
> 30	1.00			18 years or older	1.00	
21-30	0.88	0.43-1.84		17 years or younger	1.49	1.14-1.96
11-20	1.07	0.55-2.10				
1-10	0.90	0.46-1.78				
pipe / cigars	1.01	0.46-2.20				
Tried to stop smoking before			0.8465			
yes	1.00					
no	0.97	0.69-1.35				

a odds ratio of continued smoking

b 95% confidence interval of OR

c likelihood ratio χ^2 test

Individual factors influenced smoking maintenance as well (Table 3b). People who reported their health to be less than good in 1991 or who suffered from at least one chronic illness had significantly higher odds of continuing to smoke. The group with an external locus of control and highly neurotic respondents also had significantly higher odds of continuing to smoke.

Psychosocial environmental factors that determined smoking maintenance during the study period were the occurrence of life events, difficulties with relationships, and low emotional social support (Table 3b). Persons who experienced two or more life events in the year preceding the 1991 measurement showed significantly increased odds ratios. Respondents with some or many relationship difficulties also continued smoking statistically significantly more often, whereas the group with most difficulties experienced a lower, non-significantly increased likelihood to continue smoking. Persons within the two lower quartiles of the emotional social support scale had significantly increased odds

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ratios of continued smoking during the study period. None of the material environmental factors were statistically significantly related to smoking maintenance (Table 3b).

Table 3b. Relation between potential predictors and continued smoking.							
Individual factors	OR ^a	95%CI ^b	test ^c		OR ^a	95%CI ^b	test ^c
Active coping			0.3652	Palliative coping			0.5653
highly	1.00			hardly	1.00		
amply	1.08	0.76-1.55		some	1.11	0.79-1.58	
some	1.15	0.79-1.68		amply	1.29	0.89-1.86	
hardly	1.40	0.95-2.06		highly	1.06	0.73-1.53	
Chronic illness			0.0112	Perceived health			0.0080
no	1.00			(very) good	1.00		
yes	1.41	1.08-1.83		less than good	1.50	1.11-2.04	
Locus of control			0.0121	Neuroticism			0.0306
internal	1.00			hardly	1.00		
2	0.98	0.69-1.38		2	1.13	0.81-1.57	
3	1.01	0.70-1.46		3	1.16	0.80-1.68	
external	1.75	1.15-2.66		highly	1.73	1.19-2.52	
Psychosocial environmental factors							
Life events			0.0038	Social emotional support			0.0125
none	1.00			highly	1.00		
1	0.89	0.67-1.19		amply	1.03	0.73-1.45	
2	1.56	1.04-2.33		some	1.41	1.00-2.00	
3 or more events	2.53	1.15-5.56		hardly	1.74	1.18-2.56	
Long lasting difficulties with health of others			0.3201	Social instrumental support			0.1510
none	1.00			highly	1.00		
1	1.24	0.92-1.67		amply	0.86	0.60-1.24	
2 or more difficulties	1.20	0.78-1.84		some	0.95	0.67-1.35	
Long lasting difficulties with relationships			0.0031	hardly	1.35	0.89-2.04	
none	1.00						
few	1.24	0.88-1.75					
some	1.65	1.00-2.72					
many	2.71	1.49-4.94					
most	1.31	0.86-2.02					
Material environmental factors							
Equivalent income			0.1832	Situational difficulties			0.3770
highest	1.00			none	1.00		
higher	0.80	0.55-1.16		few	0.90	0.63-1.29	
lower	0.93	0.63-1.38		some	1.24	0.78-1.99	
lowest	1.25	0.82-1.90		many	1.33	0.86-2.06	
Employment status			0.0673	Neighbourhood conditions			0.2977
employed	1.00			no problems	1.00		
unemployed	1.57	0.81-3.05		1 problem	1.16	0.84-1.62	
disabled	2.30	1.25-4.25		2 or more problems	0.81	0.55-1.19	
retired	1.22	0.70-2.14					
housekeeper	1.07	0.70-1.64					
other	1.50	0.70-3.20					
Financial problems			0.1109	Housing conditions			0.2405
none	1.00			no problems	1.00		
some	1.30	0.92-1.84		1	0.74	0.52-1.05	
big	1.23	0.68-2.21		2 or 3 problems	1.02	0.68-1.52	

a odds ratio of continued smoking

b 95% confidence interval of OR

c likelihood ratio χ^2 test

Table 4 shows the relationship between predictors of continued smoking between 1991 and 1997 and educational level. Age of smoking initiation showed a clear educational gradient, i.e. initiation before the age of 18 occurred most often in lower educated groups. Less-than-good perceived health, external locus of control, and neuroticism also showed

clear inverse educational gradients. Chronic illness at baseline was clearly less prevalent only in the highest educated group, with no differences between the other educational groups. The occurrence of two or more life events showed a clear inverse educational gradient. Some relational difficulties unexpectedly were more prevalent in higher educated groups, whereas many difficulties occurred more often in the lower educated groups. Persons who received hardly any emotional social support were clearly more prevalent in the lowest educated group, whereas we observed no relationship between educational level and some emotional social support.

Table 4. Prevalence of risk categories of predictors of continued smoking per educational group among smokers in 1991.

		Educational level ^a			
		lowest	lower	higher	highest
Smoking characteristics					
Age at which smoking started	17 or younger	68.6	61.0	59.5	38.1
Individual factors					
Self-perceived health	less than good	45.1	28.5	21.7	13.9
Chronic illness	yes	47.2	45.9	49.4	28.9
Locus of control	most external	41.2	22.9	14.5	4.9
Neuroticism	highly	34.8	22.3	22.3	15.2
Environmental factors					
Life events	2	19.7	13.7	12.9	13.2
	3 or more events	7.1	4.7	5.5	3.4
Long-lasting difficulties with relationships	some	7.7	8.4	8.0	14.8
	many	11.7	10.2	7.7	6.3
	most	17.9	9.5	9.3	14.0
Emotional social support	some	25.9	31.4	24.2	22.0
	hardly	31.4	21.7	21.5	23.1

a highest=higher vocational schooling and university, i.e. 16 years of education, higher=intermediate vocational schooling or higher secondary schooling, i.e. 12-13 years of education, lower=intermediate secondary schooling or lower vocational schooling, i.e. 9-10 years of education, lowest=primary school only, i.e. 6 years of education

A substantial part of educational differences in continued smoking between 1991 and 1997 was explained by age of smoking initiation (Table 5). Almost 15% of the increased odds ratios of the two lower educated groups was explained, and 22% of the educational variation was accounted for.

Table 5 also shows the contribution of individual factors to the explanation of educational differences in continued smoking. Perceived general health accounted for the largest contribution to the explanation of educational differences, with decreases in odds ratios of 16% in the lower educated group and 20% in the lowest educated group, whereas 27% of the educational variation was explained. Chronic illness explained 6% of the increased odds of both lower educated groups and 5% of the educational variability. Locus of control contributed only to the explanation of the increased odds to continue smoking in the lower educated group, and it accounted for 14% of the educational variation. The inclusion of neuroticism more substantially decreased the odds ratios of both lower educated groups, though this variable explained only about 8% of the educational variability.

Environmental factors did not substantially contribute to the explanation of educational differences in continued smoking (Table 5). Only emotional social support contributed to the explanation of educational differences (i.e., the odds ratios decreased by 5% in the lower educated group and 15% in the lowest educated group), whereas 6.5% of the educational variability was accounted for by emotional social support.

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Table 5. Explanation of educational differences in continued smoking.

Model		Educational level ^a				ΔRD education ^b	% ΔRD ^c
		highest	high	low	lowest		
Model A	OR ^d	1.00	1.29	2.09*	2.09*		
Model A + smoking initiation age	OR ^d	1.00	1.21	1.94*	1.95*	4.3027	22.1
	% ^e			14	13		
Model A + perceived general health	OR ^d	1.00	1.26	1.92*	1.87*	5.253	27.0
	% ^e			16	20		
Model A + chronic illness	OR ^d	1.00	1.25	2.03*	2.03*	1.038	5.3
	% ^e			6	6		
Model A + locus of control	OR ^d	1.00	1.25	2.03*	2.08*	2.670	13.7
	% ^e			6	1		
Model A + neuroticism	OR ^d	1.00	1.25	2.04*	1.96*	1.595	8.2
	% ^e			5	12		
Model A + life events	OR ^d	1.00	1.27	2.08*	2.06*	0.393	2.0
	% ^e			1	3		
Model A + relational difficulties	OR ^d	1.00	1.35	2.12*	2.13*	0.355	1.7
	% ^e			0	0		
Model A + emotional social support	OR ^d	1.00	1.21	2.04*	1.93*	1.272	6.5
	% ^e			5	15		
Model A + all predictors	OR ^d	1.00	1.05	1.76*	1.72*	8.098	41.6
	% ^e			30	34		

Note: Model A includes confounders and educational level

* p<0.05

a highest=higher vocational schooling and university, i.e. 16 years of education, higher=intermediate vocational schooling or higher secondary schooling, i.e. 12-13 years of education, lower=intermediate secondary schooling or lower vocational schooling, i.e. 9-10 years of education, lowest=primary school only, i.e. 6 years of education

b ΔRD = [RD due to education of model A= 19.460] – [RD due to education of model A + predictor]

c percentage explained of RD due to education in model A by inclusion predictor = [ΔRD/19.460]*100%

d odds ratio logistic regression analysis

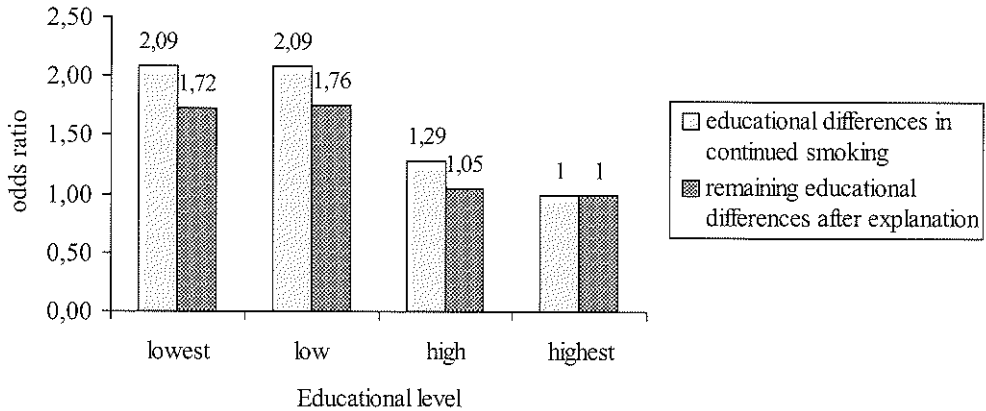
e % reduction in odds ratio = [OR model A – OR model A + predictor]/[OR model A – 1]

In summary, early smoking initiation, poor perceived general health, chronic illness, low perceived control, neuroticism, and low emotional support in the lower educated groups contributed to the explanation of educational differences in continued smoking. Figure 1 shows the educational differences in continued smoking we reported for this Dutch adult population during 6.5 years of follow-up in the striped bar. The checked bar indicates the educational differences in continued smoking after adjustment for the six predictors mentioned above. All together, these variables predicted one third of the chance to continue smoking in the two lowest educated groups, though both odds ratios were still significantly elevated. Furthermore, all selected predictors together accounted for 42% of the educational variability (Table 5).

Discussion

In this study, lower educated Dutch smokers were significantly more likely to continue smoking during 6.5 years of follow-up. Perceived general health and age of smoking initiation were the major predictors of educational differences in smoking maintenance. Furthermore, educational differences in prevalence of chronic illness, perceived control, neuroticism, and emotional social support contributed to the explanation of educational differences in continued smoking. Together these predictors explained one third of the elevated odds ratios in the two lower educated groups, and accounted for almost half of the educational variability.

Figure 1. Explanation of educational differences in continued smoking by predictors, that is, age of smoking initiation, perceived general health, chronic illness, locus of control, neuroticism, and emotional social support.



Before further elaboration on these results, we discuss limitations of the study. First, respondents for whom no follow-up information was available might differ from respondents who remained in the study. The percentages of those lost to follow-up before 1997 and non-responders in 1997 were significantly higher among lower educated groups (lost to follow-up=21.4% in lowest educated groups vs. 10.5% in highest educated groups; non-response in 1997=13.1% in lowest educated groups vs. 9.4% among the highest educated groups). We also lost relatively more smokers between 1991 and 1997. Furthermore, those not included in the follow-up showed a higher prevalence of some predictors of continued smoking, like poor perceived health, the occurrence of chronic conditions, low emotional social support, external locus of control, and neuroticism. The group lost to follow-up hence can be expected to experience higher odds to continue smoking. In summary, we might have underestimated educational differences in continued smoking in our study population as well as the contribution of predictors to these educational differences.

Second, smoking behaviour was self-reported in the postal questionnaire. Self-administered questionnaires have proved to be an accurate source of information on smoking habits,⁵⁴⁻⁵⁵ with no significant differences between social classes in the misclassification of smokers as nonsmokers.⁵⁶ Also, the information on most predictors was self-reported. Relations between predictors and continued smoking therefore might result from reporting bias affecting both predictors and continued smoking. However, we believe that it is very unlikely that smokers in 1991 reported biased information on predictors related to their subsequent smoking status in 1997.

Third, the time frame used in this study might affect the predictive power of variables concerning educational differences in continued smoking. Interpreting the results described in this article, one has to bear in mind that these are obtained after 6.5 years of follow-up. Furthermore, we do not have any information on interim status of predictors, the exact year in which the respondents stopped smoking, or relapses during this follow-up period.

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Age of smoking initiation was one of the major predictors of educational differences in continued smoking, emphasizing the necessity for effective interventions that delay or prevent smoking initiation in (lower educated) youngsters. Our findings imply that school-based smoking prevention programs, which have proved to be particularly effective in delaying the onset of tobacco use in the United States,⁵⁷ are a potential tool to additionally diminish future difficulties with smoking cessation in lower socioeconomic groups. Such health promotion programs targeted at (lower socioeconomic) adolescents are more likely to succeed when combined with attempts to create a supportive environment with, for example, high social pressure in favour of smoking abstinence and low availability of cigarettes through taxation and age limitations for purchase.

Many people link smoking cessation with the prevention of health problems.^{12-13, 27} Contrary to what one might subsequently expect, we report that poor perceived general health was the major predictor of the higher odds to continue smoking in lower educated groups. Also the presence of chronic illness contributed to educational differences in continued smoking. Most other studies have reported no effect of health on continued smoking^{17, 22-23, 28} or, on the contrary, have found less healthy respondents to quit smoking.²⁵ We believe that our results can be interpreted as indicative of smoking being used as a coping mechanism more often among lower socioeconomic groups. The stressful feelings of discomfort and poor health that are more often reported by lower educated groups seem to be dealt with by continued smoking, one of the few coping styles lower socioeconomic groups have at their disposal. Such a paradoxical mechanism has been brought up previously to explain similar findings.^{10, 21}

Other researchers have suggested that smoking might serve as a coping mechanism through which people deal with environmental stress as well. The GLOBE study includes a wide range and virtually complete coverage of environmental stressors.^{32, 58-59} Our results show that these stressors, however, did not substantially contribute to the explanation of educational differences in continued smoking. Additional analyses on the contribution of work-related stress to educational differences in continued smoking equally showed no effect (not tabulated). Because of low employment participation, these data were only available for less than half of our study population. The minimal impact of differential exposure to stress on educational differences in continued smoking we report here, however, is in accordance with the majority of other studies on this subject that state that well-established stressors contribute only minimally to socioeconomic differences in the consequences of stress.⁶⁰⁻⁶²

We report that material stressors, like financial problems and low equivalent income, did not influence smokers to change their behaviour during follow-up (Table 3). This lack of any overall effect might result from two contradicting mechanisms by which material stress affect smokers. On the one hand is the stress of living in deprivation coped with through smoking, a mechanism that hinders smoking cessation.^{10, 36} On the other hand material hardship forces people to cut expenses on cigarettes and stop smoking.^{13, 27, 63}

When smoking is considered a reaction to environmental stressors and poor health, it can be argued that differential vulnerability to stress (i.e. socioeconomic differences in coping^{30, 59-60}) additionally explains educational differences in smoking maintenance. However, moderation of stress by coping resources (stressor x coping), such as social support, coping styles and personality, did not further explain educational differences in continued smoking (not tabulated). Nevertheless, in this article we have reported that

coping resources (i.e., social support, locus of control, and neuroticism) contributed directly to educational differences in continued smoking, implying that increased vulnerability of lower educated groups is an important issue.

The particular personality profile of the lower educated (i.e., low perceived control and high neuroticism) partly explained their higher odds to continue smoking. Lower educated people continued smoking because they believe that their personal life and health can be only slightly controlled by their own behaviour, and neurotic (i.e., instable and nervous) people often need smoking to cope with daily life. Intervention programs to promote smoking cessation in lower educated groups should therefore practice other, effective ways of coping and harp on the possibility and effectiveness of taking action to control one's own life and health. Emotional social support is probably better considered an important resource enabling a person to cope with smoking cessation and other stress^{5, 30-31, 37} instead of a source of stress urging people to continue smoking. Health promotion programs to encourage smoking cessation should therefore include measures to increase the support in the environment of lower educated people who try to quit smoking.

Programs designed to help smokers quit their smoking habit until now have achieved only limited success, and their impact has even been less in lower socioeconomic groups.^{5, 15, 63} Therefore, there is a need for effective programs to help smokers from lower socioeconomic groups to quit and hence decrease socioeconomic differences in smoking. In the future, cessation programs should take into account that (lower educated) adults who still smoke have certain personality characteristics, like neuroticism and low perceived control, that affect their ability to succeed in smoking cessation attempts. At the same time, important barriers to change smoking behaviour, like poor health and low social support, need to be addressed by either individual or environmental measures.

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**[Educational differences in excessive alcohol consumption
the role of psychosocial and material stressors]**

Educational differences in excessive alcohol consumption: the role of psychosocial and material stressors.

Socioeconomic differences in health are determined mainly by socioeconomic differences in unhealthy behaviour. Little is known, however, about the mechanisms that account for socioeconomic differences in unhealthy behaviour, such as excessive alcohol consumption. In this paper we examined educational differences in excessive alcohol consumption in the Netherlands and whether these may be explained by educational differences in experienced stress and stress-moderating factors.

Data were obtained from the baseline survey of the Longitudinal Study on Socio Economic Health Differences in 1991. Excessive drinking was defined as drinking more than six glasses on 3 or more days a week, or more than four glasses on 5 or more days a week. Socioeconomic status was indicated by educational level. Stressors were divided into psychosocial and material factors. Analyses were performed for women (n=756) and men (n=1,006) separately, among drinkers only.

Excessive alcohol consumption was more common among lower educational groups. Material stressors, such as financial problems, deprivation, and income, were related to part of the educational gradient in excessive drinking. Differences in stress moderating factors were not related to the educational gradient in excessive drinking.

Our results suggest that improvement of material conditions in the lower educational groups could result in a reduction of socioeconomic differences in excessive alcohol consumption.

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Introduction

The unequal distribution of lifestyle risk factors for poor health across socioeconomic groups is regarded an important contributor to socioeconomic differences in health.¹⁻⁴ Excessive alcohol consumption is one of the lifestyle risk factors, that is known to be closely related to morbidity and mortality. For example, several forms of cancer, cardiovascular diseases and other chronic illnesses occur more often among heavy drinkers than among light or moderate drinkers.⁵⁻⁶

Within industrialized countries, excessive alcohol consumption is related to socioeconomic status. The prevalence of excessive drinking is higher among men from lower socioeconomic groups than among men from higher socioeconomic groups.⁷⁻¹⁴ For women the relationship between socioeconomic status and excessive alcohol consumption is less clear. Some studies observe more excessive drinking among women from higher socioeconomic groups,¹⁵ while others find that women from lower socioeconomic groups more often engage in excessive alcohol consumption.^{8-9, 11-12, 14, 16}

In an attempt to understand the mechanism that accounts for the socioeconomic differences in excessive alcohol consumption, we applied a generally accepted theory on the explanation of excessive alcohol consumption, i.e. the tension reduction theory,¹⁷ to explanatory analyses on the explanation of educational differences in excessive alcohol consumption. To our knowledge this has not been investigated before. According to this theory, alcohol reduces the stress response and thus is seen as particularly reinforcing when consumed in a stressful context.¹⁷ Several studies support this theory and indicate different stressors, such as unemployment,^{9, 15, 18} lack of social relationships or support,^{15, 19} financial problems,²⁰ life events,¹⁶ and feelings of deprivation.¹⁵ On the other hand, there are also studies that report weak relationships between stress and alcohol involvement.²⁰⁻²² According to the tension

reduction theory, one explanation for socioeconomic differences in excessive alcohol consumption could be that the amount of stress, or the ability to cope with it, is related to socioeconomic status.

Two types of stress can be distinguished, i.e. stress arising from material and from psychosocial factors. Psychosocial stressors are immaterial factors, such as problems with relationships or the occurrence of life events like unemployment, and divorce. Most studies report that people who experience psychosocial stress more often engage in excessive alcohol drinking,^{16, 18-19, 23-24} although there are also less conclusive results on the subject.²² Material factors relate to (dis)advantages inherent in society, to which some people have no choice but to be exposed.^{3, 25} Factors mentioned in this context are, for example, quality of housing,^{3, 25-27} unemployment,^{3, 25} air pollution and other neighbourhood aspects,²⁵⁻²⁷ income,²⁵ and material deprivation.²⁵⁻²⁶ Material factors may encourage alcohol consumption by means of stress directly resulting from having to live with material and structural restrictions.^{20, 22-24, 28} In addition, material factors could also induce stress via the mechanism of relative deprivation, resulting from an unequal distribution of material or structural assets over society.^{3, 26, 29} This type of stress occurs as a result of being unable to share the amenities or facilities provided within a (rich) society, or being unable to fulfil social and occupational obligations due to limited resources.^{3, 29} Psychosocial and material stressors are distributed unequally over socioeconomic groups^{3, 25, 30} and may therefore give rise to socioeconomic differences in excessive alcohol consumption.

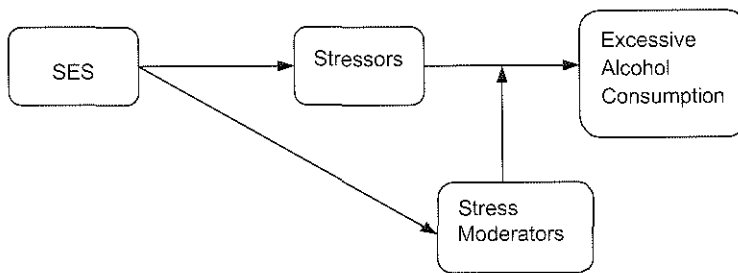
According to the tension reduction theory, the need to drink alcohol in reaction to certain stressful events or circumstances is additionally influenced by stress moderating factors. Stress moderators are, for example, personality characteristics or the amount of social support received^{7, 15-16, 20, 22, 31} and are likely to be related to social class. Socioeconomic differences in excessive alcohol consumption may accordingly, result from socioeconomic differences in stress-moderating factors, independent of the actual amount of stress experienced.

In summary, we applied the tension reduction theory to the subject of socioeconomic differences in excessive alcohol consumption. In this causal model, socioeconomic differences in excessive alcohol consumption can result from socioeconomic differences in exposure to stress or from socioeconomic differences in the effectiveness of coping with stress (Figure 1).

This paper focuses on the relation between educational differences in excessive alcohol consumption, the amount of stress experienced, and stress moderating factors. Knowledge of the stressors or stress-moderating factors which induce excessive alcohol consumption among lower educational groups may result in a further understanding of the mechanisms that account for educational differences in excessive alcohol consumption and related differences in health.

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Figure 1. Causal model linking socioeconomic status (SES), stressors, stress moderators, and excessive alcohol consumption



Methods

Population

Data were obtained from the baseline survey of the Longitudinal Study on Socio Economic Health Differences (LS-SEHD). Follow-up data are not yet available. The design and objective of the study have been described in detail elsewhere.³² The study population was a random sample of the non-institutionalised, general, Dutch population living in the city of Eindhoven and surroundings, aged 15–74 years. In this sample, people of 45 years and older and persons originating from higher and lower socioeconomic strata (indicated by zip code) were overrepresented. A self-administered postal questionnaire, which inquired about health, lifestyle, socioeconomic status, and other related subjects was completed by 18,973 persons in Spring 1991 (70.1% response). In a random subsample of the respondents to the postal questionnaire, containing 2,802 people (79.4% response), more extensive information on the background and possible explanations of socioeconomic inequalities in health and behaviour was collected during a successive interview at the respondent's home. Non-respondents did not differ substantially from the study population in socioeconomic and demographic characteristics, such as source of income, or presence of financial problems.³²

We restricted our analyses to those who responded to both the questionnaire and the interview. Furthermore we selected respondents of 25 years and older ($n = 2,462$) in order to obtain a population with a more or less stable alcohol consumption pattern. Only the drinking population was considered because there are likely to be different reasons for not drinking at all compared to excessive drinking.⁶ As a consequence, teetotalers were excluded from the analyses ($n = 566$).

Measures

Highest attained educational level was used as the single variable to indicate socioeconomic status (SES). The international discussion on indicators of socioeconomic status does not favour one socioeconomic variable.³³⁻³⁴ In addition, in the Netherlands, educational level is considered a good indicator of socioeconomic status.³⁵ Furthermore, educational level has the advantage of being available for both men and women, whether they are in paid employment or not, being stable during adult life, having a high reliability and validity,³⁵ and

being simple to measure and use. Educational level was measured in the postal questionnaire and divided into four categories, i.e. primary school only (low), lower secondary or vocational schooling (second lowest), intermediate vocational schooling or intermediate / higher secondary schooling (second highest), and higher vocational schooling and university (high). Twenty-eight respondents (1.5%) did not report their educational level.

Alcohol consumption was requested in the postal questionnaire using the quantity-frequency approach. This approach determines the average consumption by inquiring how many days per week on average alcoholic beverages are consumed (frequency) and how many glasses on average are taken on such a drinking occasion (quantity). Excessive drinking was defined as drinking more than six glasses on 3 or more days a week or more than four glasses on 5 or more days a week.³⁶⁻³⁷ The same definition was used for men and women. Information on alcohol consumption was missing for 119 respondents (6.2%).

Psychosocial stressors in our data set were life events and long-lasting difficulties. Life events were measured in the postal questionnaire, using a 9-item checklist of negative events during the preceding year, e.g. serious illness or death of persons important to the respondent, substantial drop in income, moving, or being a victim of robbery or theft.³⁸ The number of life events experienced was divided into four categories (0, 1, 2, 3 or more). Long lasting difficulties were inquired after during the interview with an adapted version of the Dutch Long Lasting Difficulties List.³⁹ Using this list, two different types of difficulties were distinguished. 'Difficulties with health problems of significant others' (5 items) were classified according to whether respondents reported zero, one, two, or three or more problems in the past year. 'Problems with relations' considered social contacts with parents, partner, neighbours, etc. The scores on each of the 8 items ranged from 0 (no problem or not applicable) to 3 (serious problem). The scores for each item were added up, resulting in a score of 0, 1, 2, 3, or 4 or higher.

Material stressors measured in the LS-SEHD were equivalent income, the occurrence of financial problems, employment status, material and social deprivation, housing and neighbourhood conditions and crowding. Information on income, material and social deprivation was elicited during the interview. Questions on all other material stressors were included in the questionnaire. Equivalent income was defined as total net household income divided by the number of persons depending on that income, giving more weight to adults. Equivalent income was classified into five equally sized groups (quintals). Financial problems, i.e. not being able to pay rent, electricity, or food during the preceding year, were precoded into three categories (none, some, and big). Employment status was elicited from a question inquiring about the main daily activity of the respondent. We distinguished between paid employment, unemployed, long-term work disability, (early) retired, housekeepers (those engaged in household duties, m/f), and others. Material and social deprivation were considered present when respondents were not able to afford at least one of six material assets (such as telephone, basic food, etc.) or to participate in three or more social activities because of a lack of money. Housing conditions were examined by asking whether any of three housing problems (draft, cold, and damp) were present (0, 1, 2 or more problems). Four items on adverse neighbourhood conditions included smells, noise from neighbours, noise from traffic, and criminality (0, 1, 2 or more problems). Crowding was defined as the number of persons in the household divided by the number of rooms.

Stress-moderating factors, i.e. personal coping styles, locus of control, neuroticism and social support were all elicited during the interview. The Dutch questionnaire that was used to

inquire after coping styles included 41 items on seven different coping styles.⁴⁰ Respondents using the 'negative' coping styles, like avoidance behaviour, depressive reaction pattern, and palliative reaction pattern, are thought to turn more likely to excessive alcohol consumption in times of stress than people who apply 'positive' styles, i.e. active problem focusing, social support seeking, optimism, disclosure of emotions. Locus of control was measured using the unidimensional, 12-item questionnaire of Ormel,⁴¹ based on Rotter's locus of control scale. A Dutch, 12-item translation of the Eysenck Personality Questionnaire was used to measure neuroticism.⁴² Social support was measured using a shortened version of a Dutch questionnaire,⁴³ that differentiates between an emotional and instrumental kind of social support. The scores of the coping styles, locus of control, neuroticism and social support were classified into quintals. The upper quintal comprised the 20 % of the population with the highest scores on the scales, i.e. the most neurotic people, persons with the most external locus of control or the greatest lack of social support.

Analyses

Analyses have been carried out separately for women ($n=756$) and men ($n=1,006$), since other studies have shown that the relationship between stress and alcohol consumption differs between the sexes,^{17, 30} and because of a significant interaction between sex and educational level ($p < 0.001$). Persons with missing values on any of the variables used in the analyses were excluded ($n=134$). All variables, except crowding, were coded as dummy variables.

Logistic regression models were fitted to estimate educational differences in excessive alcohol consumption, using the highest educational group as the reference category. The influence of the confounders age (10 5-year categories), marital status (4 categories), degree of urbanization (4 categories) and religious affiliation (3 categories) was adjusted for in all analyses.

To test if psychosocial and material stressors were related to educational differences in excessive alcohol consumption, the following procedure was followed. First, stressors were considered correlates of excessive alcohol consumption when the reduction in deviance of the model including the stressor compared to a model containing confounders only was statistically significant ($p < 0.1$) or when the stressor showed a relationship with excessive drinking, i.e. a gradient in odds ratios. Second, we examined whether the correlates were related to educational level, calculating directly age-standardised frequencies. In subsequent analyses, each correlate of excessive alcohol consumption, which was related to educational level, was added to a logistic model containing education, confounders and excessive alcohol consumption, in order to quantify the contribution of a correlate to the educational differences in excessive alcohol consumption. This contribution was expressed by the reduction in odds ratios of the different educational groups due to addition of the correlate. In addition, we studied whether stress-moderating factors were related to the educational differences in excessive alcohol drinking. First, we examined the distribution of stress-moderating factors across educational groups, calculating directly age-standardized frequencies. Subsequently, interaction terms combining all stress moderating factors with all stressors were added to a logistic model containing education, confounders, excessive alcohol consumption, and the stressor and stress-moderating factor concerned. Furthermore, we performed stratified analyses on the effect of each stressor on excessive alcohol consumption

in all four educational groups separately. Differences in the magnitude of the odds ratios of the same stressor in different educational groups can be an indication of a possibly different effect of stress-moderating factors in the various educational groups.

Results

Among the alcohol-consuming population under survey, men drank excessively more often than women (15.2 and 3.3% respectively). Excessive alcohol consumption occurred more often in lower educational groups compared to the highest educational group among both men and women (Table 1). This was expressed by the prevalence as well as adjusted odds ratios, although for women the latter were not statistically significant (Table 1).

Educational differences in excessive alcohol consumption in women were not statistically significant. This is probably due to limited power because of a low number of women who drank excessively. Results from further analyses on the correlates of educational differences among women, following the procedure describe above, are therefore not further elaborated upon. We will, however, show the results of the analyses for both men and women, to enable the reader to see the similarity between the results concerning both sexes.

Table 1. Educational level and occurrence of excessive alcohol consumption. Drinkers only, 25-74 years of age.

Education	Men			Women		
	Number	% ^a	OR ^b (CI)	Number	% ^a	OR ^b (CI)
High	296	11.0	1.00	122	1.0	1.00
2	253	14.0	1.18 (0.70-2.02)	153	3.7	3.21 (0.60-17.18)
3	318	18.2	1.72 (1.05-2.81)	350	3.4	3.39 (0.67-17.05)
Low	139	24.5	2.01 (1.11-3.63)	131	3.9	4.13 (0.67-25.69)
Total	1006	15.2		756	3.3	

^a directly age and sex standardized prevalence

^b odds ratio of excessive alcohol consumption versus light or moderate drinking, adjusted for age, marital status, religious affiliation, and degree of urbanization and 95% confidence interval

Table 2 shows the relationship of all stressors with excessive alcohol consumption. In men, long-lasting difficulties relating to the health of others was the only psychosocial stressor that was positively related to excessive drinking (not significant) (Table 2). The material factors financial problems (not significant), employment status (unemployment), material deprivation, and poor housing conditions, were positively related to excessive alcohol consumption among men (Table 2). Among women, the psychosocial stressors life events and difficulties with the health of others were positively associated (both not significant) with excessive alcohol consumption (Table 2). Furthermore, equivalent income (not significant), financial problems, material deprivation, social deprivation (not significant), and crowding showed positive associations with excessive drinking among women. Poor housing and neighbourhood conditions (not significant) were negatively related to excessive alcohol consumption among women, i.e. more problems were associated with a lower odds of excessive drinking (Table 2).

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Table 2. Association between psychosocial stressors and excessive alcohol consumption, 25-74 years old.

		Men		Women	
		OR ^a	p-value ^b	OR ^a	p-value ^b
Psychosocial stressors					
Life events	0	1.00	ns	1.00	ns
	1	1.06		1.70	
	2	1.40		1.97	
	3 or more	1.20		2.82	
Long-lasting difficulties health of others	0	1.00	ns	1.00	ns
	1 problem	1.05		1.82	
	2 problems	1.09		2.31	
	3 or more problems	3.20*		3.09	
Long-lasting difficulties relationships	0	1.00	ns	1.00	ns
	1	0.80		1.32	
	2	0.91		0.70	
	3	0.68		0.38 ^c	
	4 or more	1.21			
Material stressors					
Equivalent income (Dutch guilders)	2750-5800	1.00	ns	1.00	ns
	2085-2750	0.91		1.75	
	1600-2085	1.05		2.27	
	1250-1600	1.07		1.25 ^d	
	600-1250	1.09			
Financial problems	none	1.00	ns	1.00	<0.005
	some	1.46		1.86	
	big	1.92		14.25*	
Employment status	employed	1.00	<0.001	1.00	ns
	unemployed	3.50*		-	
	work disability	0.90		2.46	
	(early) retired	0.34*		0.94	
	housekeepers (m/f)	-		1.43	
	other	0.21 ^e		0.00 ^f	
Material deprivation	no	1.00	<0.1	1.00	<0.05
	yes	3.05		10.19*	
Social deprivation	no	1.00	ns	1.00	ns
	yes	0.91		4.17	
Housing conditions	0 problem	1.00	<0.1	1.00	<0.1
	1 problem	0.82		0.29 ^g	
	2 or more problems	1.83*			
Neighbourhood conditions	0 problem	1.00	ns	1.00	ns
	1 problem	0.92		0.49	
	2 or more problems	1.35		0.24	
Crowding		1.06	ns	4.32	<0.1

^a odds ratio adjusted for the confounders age, marital status, religious affiliation and degree of urbanization

^b p-value of likelihood ratio χ^2 test

* 95% confidence interval does not include 1

^c Due to low prevalence of excessive drinking in women, categories were combined into 3 or more

^d Due to low prevalence of excessive drinking in women, categories were combined into 600-1600

^e Due to low number of house persons among men, the categories house persons and others were combined

^f Due to low number of unemployed women, the categories unemployed and others were combined

^g Due to the low prevalence of excessive drinking in women, categories were combined into 1 or more problems

The distribution of stressors over the educational groups is shown in Table 3. Financial problems, unemployment, material deprivation, and housing problems are correlates of excessive drinking among men, which were observed more often among the lower educational groups (Table 3). For women, Table 3 shows an unequal educational distribution of the correlates long-lasting difficulties with health of others, low equivalent income, financial problems, and material and social deprivation, i.e. these occurred more often in the lower educational groups.

Table 3. Percentage of persons in risk categories of stressors by educational level, age standardized, 25-74 years of age, drinkers only.

Psychosocial stressors	Men				Women			
	Low	Educational level		High	Low	Educational level		High
		2	3			2	3	
Life events ^b								
2 events	17.0	12.3	13.0	13.9	16.5	13.6	16.1	15.6
3 or more events	6.6	3.8	4.0	3.6	6.9	5.6	2.1	5.4
Long lasting difficulties								
-health others ^{a, b}								
2 difficulties	10.1	9.6	9.1	10.8	11.5	12.0	8.5	4.9
3 or more difficulties	3.3	1.6	3.1	1.9	1.0	2.3	3.4	0.7
-relationships								
3	11.2	8.2	8.5	9.5	20.7 ^c	16.1 ^c	10.4 ^c	24.8 ^c
4 or more	13.5	8.2	10.1	10.3				
Material stressors								
Equivalent income ^b								
lowest : 600-1250	37.7	12.4	6.2	3.4				
lowest: 600-1600					54.2	37.7	18.2	9.8
Financial problems ^{a, b}								
some	29.7	17.4	11.1	6.2	21.6	15.8	9.8	9.4
big	6.7	2.6	3.0	1.7	15.6	3.0	1.0	0.6
Employment status								
unemployed ^a	10.5	2.6	3.5	2.3	1.8	2.9	0.0	4.5
work disability	14.9	11.1	6.5	3.5	6.2	4.2	3.2	3.3
(early) retired	10.5	23.7	26.4	24.5	1.8	6.1	7.4	12.1
Materially deprived ^{a, b}	8.0	0.3	0.3	1.1	7.1	1.5	0.3	1.3
Socially deprived ^b	8.5	1.5	0.3	0.7	13.5	3.9	1.0	3.0
Housing conditions ^a								
1 problem	18.3	13.9	13.2	10.1	34.8 ^d	22.6 ^d	17.7 ^d	18.8 ^d
2 or more problems	11.6	6.5	4.1	7.2				
Neighbourhood conditions								
2 or more problems	13.9	15.1	11.4	10.5	12.8	9.3	13.0	13.3
Crowding ^{b, e}	0.70	0.67	0.62	0.57	0.65	0.65	0.58	0.54

^a Positively related to excessive alcohol consumption in men

^b Positively related to excessive alcohol consumption in women

^c Due to the low prevalence of excessive drinking in women, categories are combined into '3 or more problems'

^d Due to the low prevalence of excessive drinking in women, categories are combined into '1 or more problems'

^e Standardized means

Subsequently, we examined the contribution of the stressors to the educational differences in excessive alcohol consumption. Only stressors that were related to excessive alcohol consumption are discussed here. None of the psychosocial stressors were found to be correlated to the educational gradient in excessive drinking among men or women (results not shown), because the relationship with either excessive alcohol consumption or educational level was lacking. Several material factors, however, were found to be related to the educational gradient among excessive alcohol consumption in men, i.e. financial problems, employment status and material deprivation (Table 4). In women, equivalent income, financial problems, and material and social deprivation seemed related to the relation between educational level and excessive alcohol consumption (Table 5).

Among men, financial problems contributed most to the observed educational differences in excessive alcohol consumption (Table 4). When material deprivation, employment status, and financial problems were added to the model simultaneously, the odds ratios of the second highest, second lowest, and lowest educational groups decreased by 11, 6, and 34%, respectively. After adjustment for the three stressors, only the odds ratio of the group with the second lowest educational level was still significantly larger than 1.

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Table 4. Educational differences in excessive alcohol consumption among men, adjusting for material factors separately and simultaneously. Drinkers only, 25-74 years.

Education	Education + confounders ^a (Model A)		Model A + financial problems		Model A + material deprivation		Model A + employment status		Model A + all	
	OR ^b	% ^c	OR ^b	% ^c	OR ^b	% ^c	OR ^b	% ^c	OR ^b	% ^c
High	1.00		1.00		1.00		1.00		1.00	
2	1.18		1.16	11	1.20	0	1.16	11	1.16	11
3	1.72*		1.65*	10	1.72*	0	1.72*	0	1.68*	6
Low	2.01*		1.80	21	1.86*	15	1.89*	12	1.67	34

a confounders were age, marital status, religious affiliation, degree of urbanization

b odds ratio

c % reduction in odds ratio computed by $(OR \text{ model A} - OR \text{ model B}) / (OR \text{ model A} - 1)$

* 95% confidence interval does not include 1

The analyses for women show that financial problems and equivalent income were more strongly related to the higher prevalence of excessive alcohol consumption among lower educational groups (Table 5). When all were together included in the model, the selected material factors accounted for 30 and 87% of the odds ratios of the second lowest and lowest educational group, respectively. These results should, however, be interpreted carefully, since the association between educational level and excessive alcohol consumption among women was not statistically significant.

Table 5. Educational differences in excessive alcohol consumption among women, adjusting for material factors separately and simultaneously. Drinkers only, 25-74 years of age.

Education	Education + confounders ^a (Model A)		Model A + equivalent income		Model A + financial problems		Model A + material deprivation		Model A + social deprivation		Model A + all	
	OR ^b	% ^c	OR ^b	% ^c	OR ^b	% ^c	OR ^b	% ^c	OR ^b	% ^c	OR ^b	% ^c
High	1.00		1.00		1.00		1.00		1.00		1.00	
2	3.21		3.05	7	3.23	0	3.18	1	3.29	0	3.68	0
3	3.39		2.46	39	2.52	36	3.18	9	3.32	3	2.67	30
Low	4.13		2.63	48	2.19	62	3.07	34	3.67	15	1.41	87

a confounders were age, marital status, religious affiliation, degree of urbanization

b odds ratio

c % reduction in odds ratio computed by $(OR \text{ model A} - OR \text{ model B}) / (OR \text{ model A} - 1)$

* 95% confidence interval does not include 1

We also studied the relationship between possible stress-moderating factors and educational differences in excessive alcohol consumption. Table 6 shows the educational distribution of people in the upper quintal of stress-moderating factors. Among men, active problem focusing, social support seeking, avoidance behaviour, an external locus of control, and neuroticism were unequally distributed over educational groups. Among women, active problem focusing, avoidance behaviour, an external locus of control, and neuroticism were associated with educational level. Also, a depressive reaction pattern was, though not consistently, unequally distributed over the educational groups, among both men and women. A few of the direct interactions between each of all stress-moderating factors and each of all stressors were statistically significant ($p < 0.10$), i.e. about 7% of all analyses, but none of these substantially changed the odds ratios of education (results not shown). Stratified analyses within each educational group also showed no discrepancies in the relationship between stressors and excessive alcohol consumption across educational groups (results not shown).

These findings imply that the reaction to a given amount of stress concerning excessive alcohol consumption did not differ between the four educational groups, i.e. stress-

moderating factors were not related to the observed educational gradient in excessive alcohol consumption.

Table 6. Percentage of persons in the upper quintal (high scores) of stress-moderating factors by educational level, age standardized.

Stress-moderating factor	Men				Women			
	Low	2	3	High	Low	2	3	High
Coping styles								
Active problem focusing	15.0	22.5	25.4	36.9	5.4	12.8	15.6	18.1
Social support seeking	7.5	11.6	10.7	16.2	27.0	21.2	33.1	28.8
Optimism	20.9	22.4	18.3	18.1	26.2	26.3	30.7	25.0
Disclosure of emotions	13.1	14.2	14.0	12.1	13.7	12.3	10.3	15.6
Avoidance behaviour	12.4	8.9	4.9	4.5	17.2	9.0	9.4	5.7
Depressive reaction pattern	17.9	15.4	9.3	13.0	30.7	13.2	20.1	16.2
Palliative reaction pattern	13.1	9.4	10.4	10.1	22.1	21.5	11.8	15.1
External locus of control	43.4	21.4	9.7	4.2	22.8	12.3	10.7	1.3
Neuroticism	16.6	10.7	5.3	3.2	32.6	13.5	14.2	8.7
Social support								
Emotional	8.2	10.8	15.1	12.1	24.3	22.2	26.3	25.8
Instrumental	16.5	13.8	13.2	15.6	16.3	15.7	9.6	16.2

Discussion

In this study among an alcohol drinking population, excessive alcohol consumption was observed more often among men with a lower educational level. This finding is consistent with other figures relating to the Dutch population^{8,11} and with surveys in other countries.^{7,9-10,12-14,16} We found that excessive alcohol consumption occurred more often among women from lower educational levels, although this relationship was not statistically significant. The direction of the relationship is, however, consistent with the majority of studies on socioeconomic patterns in excessive alcohol consumption among women.^{8-9,11-12,14,16}

The higher prevalence of excessive alcohol consumption among the lower educational groups was partly related to a higher amount of experienced stress resulting from material limitations. There was no evidence to support the hypothesis that lower educational groups cope with stressful situations in a less effective way.

Before further elaboration on the results, limitations of the present study deserve to be mentioned. In the first place, it should be kept in mind that the data used to answer our research questions are cross-sectional, i.e. correlates were measured at the same time as alcohol consumption. For example, stress resulting from financial problems seems to encourage excessive alcohol consumption, but on the other hand, excessive alcohol consumption may also be the reason for financial problems because of the amount of money spent on buying alcohol. Longitudinal studies, however, report a causal relationship between stressors and excessive alcohol consumption.^{15, 18-19, 22-24} We therefore believe that the associations found in this study, at least partly, reflect causal relationships. This should, however, be confirmed using longitudinal data, which include baseline measurements of educational level, alcohol consumption, and stressors, complemented with follow-up measurements of alcohol consumption in time.

Second, results presented here might be biased by non-responses. If the relationships between stressors and educational level or alcohol consumption among non-respondents differ from the association we found among the respondents, some of the contribution of

the stressors would have been incorrectly estimated. Since the non-respondents did not differ substantially from the study population,³² we assumed that non-response did not substantially affect the findings presented here.

Third, the measure of alcohol consumption was based on self-reported data. Although the information was requested in a postal questionnaire, it is possible that respondents adjusted their answers towards socially acceptable levels of alcohol consumption. This would result in an underrating of the prevalence of excessive alcohol consumption.^{12, 44} The rare literature on under reporting of alcohol consumption in relation to socioeconomic status shows no differences between socioeconomic groups in the extent of underreporting.^{36, 45} Therefore, we do not expect this bias to be a substantial influence on the presented results.

Finally, the occurrence of stressors was reported by the respondents themselves. Misclassification could have occurred in reporting sensitive information, such as income or deprivation. This can only affect obtained results when the misclassification was related to educational level. Psychosocial stressors seem least sensitive to perceptions of social desirability and, consequently, to deliberate underreporting related to educational level. The occurrence of material restrictions, however, may be perceived as more embarrassing and could therefore be underestimated when measured using self-administered questionnaires. Underreporting of material stressors may occur more often among lower socioeconomic groups. In this case, the association between material factors and educational differences in excessive alcohol consumption would have been underestimated. This implies that the actual correlation between material factors and the educational gradient in excessive drinking could be even more substantial.

In this paper, we examined the influence of stress and the role of stress-mediating factors on the educational gradient in excessive alcohol drinking. None of the available psychosocial stressors in this study was related to the educational gradient in excessive alcohol consumption in men. This is consistent with conclusions of other studies on the effect of psychosocially stressful situations on alcohol consumption in the general population.^{7, 17, 21-22} Material factors, however, were related to a part of the educational differences in excessive alcohol drinking among men. Material conditions were also major correlates of the socioeconomic gradient in smoking, using data from the same study population.⁴⁶ Furthermore, it was concluded that the impact of material factors on socioeconomic differences in health was partly effected through behavioural factors, i.e. a substantial part of behavioural factors was embedded in material factors.⁴⁷ Our analyses confirmed that educational differences in behaviour i.e. excessive alcohol consumption are partly related to differences in material conditions.

In this study we found no differences in reactions to stress between educational groups. It is often theorized that the reaction to stress is influenced by stress-moderating factors,^{7, 15-16, 20, 22, 31} but there is little in the literature about the contribution of these factors to socioeconomic differences in stress-related behaviour.

In summary, the tension reduction theory on excessive alcohol consumption applied only partly to educational differences in excessive drinking. Reasons for this can be that, on the one hand, other stress-inducing factors, which were not available in our data set, account for the remaining gradient. For example, stress at work could play a role. On the other hand, in addition to the tension reduction theory, literature on alcohol consumption mentions other possible motives for excessive alcohol consumption, e.g. cultural factors, such as peer behaviour or parental or family attitudes towards alcohol consumption^{14, 23, 48-49} which could

influence the alcohol consumption pattern to a different extent in the different socioeconomic groups.

Our results show that excessive alcohol consumption occurs more often in lower educational groups. When trying to improve public health by promoting a healthier life style, such as less excessive alcohol consumption, the focus should therefore be on lower socioeconomic groups. Results presented here cross-sectionally relate the educational gradient in excessive alcohol consumption mainly to an unequal distribution of material factors. Provided that our results will be replicated by future longitudinal research, the following implications for health promotion emerge. Material factors, i.e. structural and economic determinants of health related behaviour, are mainly beyond individual control. Health promotion campaigns with the aim to discourage excessive drinking therefore would be insufficient, because structural restrictions limit the individual choice of the targeted groups. Additional policy measures should accordingly be applied to deal with material restrictions of the lower socioeconomic groups. These should aim for a more equal distribution of material factors, such as income and related problems, for example by means of financial counselling or subsidies for the lower socioeconomic groups.

Acknowledgements

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**[Educational differences in starting excessive alcohol consumption:
explanations from the longitudinal GLOBE study]**

This paper describes educational differences in starting excessive alcohol consumption during 6½ years of follow-up among 1,648 initially alcohol-consuming Dutch adults. The longitudinal GLOBE study provides the unique possibility to study explanations for educational differences due to the collection of extensive baseline information on educational level, alcohol consumption, stressors (tension reduction theory) and vulnerability indicators (differential vulnerability theory) in 1991. Alcohol consumption was again assessed in 1997. We report that lower educated people were almost three times more likely to start excessive alcohol consumption during follow-up compared to the highest educated persons. Both educational differences in exposure to stressors (financial problems) and vulnerability (low social support) contributed to the educational differences in starting excessive alcohol consumption and explained 23% of the educational variation in starting excessive alcohol consumption. Remaining educational differences were however still statistically significant. These results are discussed with regard to implications for interventions and possible additional explanatory mechanisms.

Submitted as: Mariël Droomers, Carola TM Schrijvers, Johan P Mackenbach. Educational differences in starting excessive alcohol consumption; explanations from the longitudinal GLOBE study.

Introduction

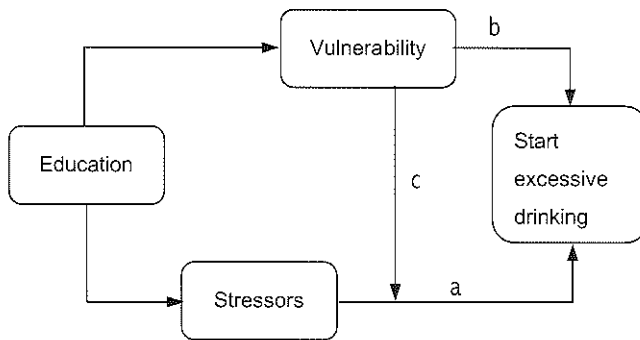
Excessive alcohol consumption is an important threat to public health, because it increases the risk of several forms of cancer, cardiovascular diseases, other chronic illnesses, and premature mortality.¹⁻² Furthermore, excessive drinking is distributed unequally over different social groups, i.e. excessive alcohol consumption more often occurs among lower socioeconomic groups.³⁻⁶ Socioeconomic differences in excessive drinking tend to grow during adulthood, because people from lower socioeconomic groups more often become excessive drinkers during their adult life compared to higher socioeconomic groups.⁷⁻⁹ Identification of predictors of socioeconomic differences in starting excessive alcohol consumption would be valuable to health professionals and politicians concerned about the prevention of socioeconomic differences in excessive drinking and related health and social problems.

One explanation for socioeconomic differences in starting excessive alcohol consumption could be that lower socioeconomic groups experience more stress, so-called differential exposure and therefore start excessive alcohol consumption more often (Figure 1;a).¹⁰⁻¹⁴ This assumption is based on the tension reduction theory,¹⁵ which states that alcohol reduces the stress response and thus often is consumed in a stressful context.¹⁵⁻¹⁸

The second possible explanation is that lower socioeconomic groups are more vulnerable to stress and therefore more likely than higher socioeconomic groups to start excessive alcohol consumption at any given level of exposure to stressful experiences, i.e. the differential vulnerability theory.^{11, 14, 17, 19} Vulnerability is commonly conceptualised as the lack of social resources, e.g. social support and certain personality characteristics, e.g. neuroticism.^{14, 19-20} The theory implies two possible pathways in the explanation of educational differences in starting excessive alcohol consumption. First, vulnerability may directly influence starting excessive drinking independent of the exposure to stress, i.e. people who lack social control due to absence of a supportive social network might be more likely to start excessive drinking.^{13, 18, 21-22} Accordingly, higher vulnerability in lower educated groups will lead to a consistently higher risk to start excessive drinking in lower

educational groups at any given exposure to stress (Figure 1;b). Second, vulnerability may moderate the relationship between stress and starting excessive alcohol consumption, in the sense that people who, for example, can rely on social support generally are less affected by stress.^{11, 13, 16, 23} Accordingly, higher vulnerability in lower educated groups may lead to stronger relations between stressors and starting excessive drinking, i.e. steeper slopes, in the lower educated groups compared to the higher educated (Figure 1;c).

Figure 1. Explanatory model



This paper describes educational differences in starting excessive alcohol consumption during six-and-a-half years of follow-up among an adult, initially alcohol-consuming Dutch population. The longitudinal GLOBE study provides the unique possibility to study explanations for educational differences in starting excessive drinking, because extensive baseline information on a range of stressors and vulnerability indicators has been collected.

Methods

Population

Data were obtained from the longitudinal study on socioeconomic health differences in the Netherlands (GLOBE study).²⁴ GLOBE is the Dutch acronym for 'Health and Living Conditions of the Population of Eindhoven and its surroundings'. In 1991, a random sample of approximately 27,000 persons from the general non-institutionalised population, aged 15-74 years, was drawn from 18 municipal population registers in the south-eastern Netherlands. The study started with a postal survey (response 70.1%), which was slightly more often returned by the well-to-do (indicated by postal code), women and older people.²⁴ To increase the cost-effectiveness of our study, more extensive information on possibly explanatory factors involved in socioeconomic inequalities was only collected among two subsamples, using structured interviews conducted at the respondents' home. One subsample overrepresented people who reported specific chronic diseases in the postal questionnaire, i.e. chronic lung disease,

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severe heart disease, diabetes and persistent back trouble, in order to increase the power to study socioeconomic differences in the use of health services (response 72.3% N=2,865).²⁵ The other subsample consisted of a random sample of respondents to the postal questionnaire (response 79.4% N=2,802). Differential non-response only occurred in the subsample which overrepresented chronically ill persons, where younger and single people less often agreed to participate.²⁵

In 1997, follow-up data was collected among the two subpopulations. Of the 5,667 subjects participating in the interviews in 1991, 328 (5.8%) had deceased, 39 (0.7%) moved abroad, 316 (5.6%) refused to further participate in the longitudinal study prior to the 1997 follow-up measurement, while 37 (0.7%) could not be traced. This left 4947 persons (87.3%) eligible for enrolment in the follow-up measurement in 1997, of which 4,246 persons returned the postal questionnaire (response 85.8%). The two subpopulations reported similar alcohol consumption patterns in 1991 and 1997, as well as changes in alcohol consumption, i.e. start of excessive drinking. We excluded abstainers in 1991 (940 persons) from the analyses on starting excessive alcohol consumption, since these people most likely have profound reasons not to drink at all and therefore do not really belong to the group at risk to start excessive drinking (0.4% of abstainers in our study population start excessive drinking during follow-up). Further, we restricted the analyses to respondents who reported light or moderate alcohol consumption in 1991 and aged 20 to 54 years in 1991 (1,696 persons), because no educational differences in starting excessive alcohol consumption were observed in older respondents.

Measures

Educational level has proven to be the best indicator of socioeconomic status in the Netherlands.²⁶ Highest attained educational level was measured in the postal questionnaire in 1991. We discern the following 4 categories: higher vocational schooling and university, i.e. 16 years of education (highest), intermediate vocational schooling or higher secondary schooling, i.e. 12-13 years of education (higher), intermediate secondary or lower vocational schooling, i.e. 9-10 years of education (lower), and primary school only, i.e. 6 years of education (lowest). 22 Respondents (1.3%) did not report their educational level. Educational level has the advantage of being available for both men and women, whether they are in paid employment or not, being stable during adult life, having a high reliability and validity²⁷ and being simple to measure and use.

Alcohol consumption was recorded in the postal questionnaire in 1991 and 1997 using a quantity-frequency approach. We inquired how many days per week on average alcoholic beverages are consumed (frequency) and how many glasses on average are taken on such a drinking occasion (quantity). Information on alcohol consumption in 1997 was missing for 26 respondents (1.5%). Excessive alcohol consumption was defined as drinking more than 6 glasses on three or more days a week or more than 4 glasses on five or more days a week for both men and women.²⁸⁻²⁹ This definition is related to the occurrence of alcohol-related social and health problems.³⁰⁻³¹ Starting excessive alcohol consumption was defined as being a light or moderate drinker in 1991, and reporting excessive alcohol consumption in 1997, analogous to other studies on changes in alcohol consumption.^{7, 9,}

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Two types of stressors were distinguished in this study, i.e. psychosocial¹⁰⁻¹¹ and material or structural stressors.^{14, 17} Psychosocial stressors measured with the postal questionnaire in 1991 were life events,³³ perceived general health³⁴ and severe chronic disease,³⁴ while long lasting difficulties³⁵ were addressed during the interview. Material stressors measured in 1991 were equivalent income, financial problems, employment status, housing and neighbourhood conditions,³³ and situational difficulties.³⁵ Income and situational difficulties were questioned during the interview, while all other material stressors were measured with the postal questionnaire.

Vulnerability is commonly conceptualised as the lack of social resources and certain personality characteristics.^{14, 19-20} The GLOBE study included measures of locus of control,³⁶ neuroticism,³⁷ palliative and active coping styles,³⁸ and social support³⁹ during the interviews in 1991 (Table 1). Scores on all scales were divided into quartiles.

Table 1. Variable information on vulnerability indicators

Construct	items	coding	range	Cronbach α ⁴⁸
Locus of control	11	totally agree - agree - equal - don't agree - don't agree at all	11-55	0.84
Neuroticism	12	yes - no	0-12	0.81
Palliative coping	6	seldom/never - sometimes - often - very often/always	8-32	0.71
Active coping	8		6-24	0.80
Emotional social support	5	never/no - sometimes - often/sure	0-30	0.60
Instrumental social support	4		0-24	0.67

Analyses

After excluding persons with missing values on any of the variables used in the analyses (48 respondents; 2.8%), 1,648 people were included in the analyses. All variables were coded as dummy variables. We adjusted for the confounders age, gender, and alcohol consumption at baseline in all analyses. Further, we adjusted for the overrepresentation of chronically ill by proportionately weighting data of the different groups (chronically ill and healthy people) to resemble the composition of the sample of the population that responded to the postal questionnaire in 1991.

We did not distinguish between men and women, since educational differences in starting excessive drinking did not differ between both sexes ($p=0.9019$). Further, earlier cross-sectional analyses using data of the GLOBE population showed similar determinants of educational differences in excessive alcohol consumption for men and women.⁴

First, educational differences in starting excessive alcohol consumption were analysed using a logistic regression model with the highest educated group as a reference category.

To test if differential exposure to stressors explained educational differences in starting excessive alcohol consumption, the following procedure was followed (Table 2). First, we studied which stressors were related to the start of excessive drinking, i.e. which stressors showed statistically significant likelihood χ^2 test or increased odds ratio(s) higher than 1.5. Second, we studied the prevalence of risk categories of stressors identified in the first step in different educational groups for predictors of educational differences in behaviour must be correlated with educational level.

Third, each stressor, which was related to the start of excessive drinking and educational level, was separately added to a logistic model already including education, in order to quantify the contribution of the stressor to the explanation of educational differences in

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starting excessive alcohol consumption. This contribution was expressed by the percentage reduction of odds ratios of the different educational groups [(OR basic model – OR model + stressor) / OR basic model – 1] and the part of the reduction in deviance due to education of the basic model, which was accounted for by inclusion of the selected stressor in the model (due to the inclusion of the selected stressor the deviance related to education will decrease).

Table 2. Statistical procedure followed to explain educational differences in starting excessive alcohol consumption.

Method	Model / what	Criteria
Differential exposure to stressors		
1 Logistic regression	excessive drinking = confounders + stressor [basic model]	<ul style="list-style-type: none"> ▪ Statistically significant likelihood ratio χ^2 test ▪ Increased odds ratios (>1.5) either statistically significant or not statistically significant
2 Cross-tabulation	risk categories of stressor for each educational group	Higher prevalence of risk categories in lower educated groups
3 Logistic regression	excessive drinking = confounders + education + stressor	<ul style="list-style-type: none"> ▪ Decrease in odds ratios of educational groups (>5% and no increase in other ORs) ▪ Reduction in deviance of education due to inclusion of stressor
Differential vulnerability		
4 Logistic regression	excessive drinking = confounders + selected stressor(s) + vulnerability indicator	<ul style="list-style-type: none"> ▪ Statistically significant likelihood ratio χ^2 test ▪ Increased odds ratios (>1.5) either statistically significant or not statistically significant
5 Cross-tabulation	risk categories of vulnerability indicator for each educational group	Higher prevalence of risk categories in lower educated groups
6 Logistic regression	excessive drinking = confounders + selected stressor(s) + education + vulnerability indicator	<ul style="list-style-type: none"> ▪ Decrease in odds ratios of educational groups (>5% and no increase in other ORs) ▪ Reduction in deviance of education due to inclusion of stressor
Moderating effect of vulnerability		
7 Logistic regression	excessive drinking = confounders + selected stressor(s) + education + selected vulnerability indicator(s) + education*selected stressor(s)	Statistically significant interaction education*stressor
8 Logistic regression	excessive drinking = confounders + selected stressor(s) + education + selected vulnerability indicator(s) + stressor*vulnerability indicator	Statistically significant interaction stressor*vulnerability indicator

Further, we studied whether differential vulnerability to stress could explain educational differences in starting excessive alcohol consumption (Figure 1;b). In this second procedure (Table 2), we adjusted for differential exposure to stress by adding stressors selected in the first procedure to the logistic model. We carried out the same three steps described above to identify which vulnerability indicators were related to the start of excessive alcohol consumption (step 4), their relationship with educational level (step 5), and their contribution to the explanation of the remaining educational differences in starting excessive alcohol consumption (step 6).

In the third procedure (Table 2), we tested the contribution of a moderating effect of vulnerability to stress to the explanation of educational differences in starting excessive

alcohol consumption (Figure 1;c). First, we tested the possibility of a non-specific moderating effect of vulnerability in our sample by testing interaction terms combining education with the stressors selected in the first procedure (step 7). When this non-specific buffering vulnerability reduced the deviance due to education (odds ratios of education can no longer be straightforwardly interpreted, because the interaction term includes education), we tested so-called applied buffering effects using interaction terms combining all vulnerability indicators with stressors selected in procedure 1 (step 8).

Results

Educational differences in excessive alcohol consumption have increased between 1991 and 1997 (Table 3). It is therefore not surprising that the lowest educated group was almost three times more likely to start excessive alcohol consumption during follow-up compared to the group that completed higher vocational schooling or university (Table 3).

Table 3. Educational differences in excessive alcohol consumption in 1991 and 1997 (cross-sectional) and in starting excessive alcohol consumption between 1991 and 1997 (abstainers excluded).

Educational level	1991			1997			Start excessive alcohol consumption 1991-1997		
	# ^a	% ^b excessive drinkers	OR ^c excessive drinking	# ^a	% ^b excessive drinkers	OR ^c excessive drinking	# ^d	% ^b start excessive drinking	OR ^c start excessive drinking
highest	496	8.5	1.00	493	6.5	1.00	446	3.5	1.00
higher	483	10.0	1.54	508	6.4	1.20	426	2.8	1.11
lower	710	10.9	1.98*	732	9.8	2.15*	627	5.2	2.85*
lowest	173	11.6	2.00*	181	13.4	2.26*	149	5.8	2.65*
Total	1862	10.1		1914	8.2		1648	4.2	

* 95% confidence interval does not include 1

a respondents to interview in 1991 and 1997; numbers differ due to different numbers of cases with missing values

b prevalence

c odds ratio

d respondents to interview in 1991 and 1997 who were light or moderate alcohol drinkers and 20-54 years in 1991

Table 4 shows the relation between stressors and starting excessive alcohol consumption during follow-up. The occurrence of 3 or more life events, long lasting difficulties with the health of important others, and one long lasting problem with relationships seemed to induce excessive alcohol consumption (not statistically significant). The occurrence of financial problems and being unemployed in 1991 statistically significantly predicted the start of excessive alcohol consumption. Other groups that showed (not statistically significantly) increased risks to start excessive drinking were the two lowest equivalent income groups, the disabled, and people with housing problems and situational difficulties. Neighbourhood conditions were statistically significantly related to starting excessive drinking, but showed reduced risks to start excessive alcohol consumption.

Table 5 shows the educational distribution of risk categories of variables that were related to the start of excessive alcohol consumption. The occurrence of 3 or more life events was adventitiously lower in the lowest educated group compared to the higher educated. Lower educated groups more often reported multiple long lasting difficulties with the health of others, financial problems, lower equivalent income, work related disability, and housing problems. The level of unemployment was only slightly higher in the lower

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Table 4. Relation between stressors and starting excessive alcohol consumption.

Psychosocial stressors		OR ^a	95%CI ^b	test ^c
Life events	none	1.00		0.7291
	1 event	1.12	0.64-1.96	
	2 events	1.33	0.65-2.73	
	3 or more events	1.81	0.55-5.95	
Long lasting difficulties with health of others	none	1.00		0.1283
	1 difficulty	1.53	0.88-2.64	
	2 or more difficulties	1.91	0.93-3.94	
Long lasting difficulties with relationships	none	1.00		0.1286
	1	1.71	0.96-3.05	
	2	0.80	0.31-2.09	
	3	0.45	0.12-1.72	
Health problems	4 or higher	1.45	0.69-3.06	0.9736
	none	1.00		
Perceived general health	severe chronic condition	1.01	0.53-1.93	0.3383
	(very) good	1.00		
	less than good	1.38	0.73-2.63	
Material stressors				
Financial problems	none	1.00		0.0009
	some	2.36	1.29-4.29	
	large	4.88	1.87-12.75	
Equivalent income (guilders)	>2750 (high)	1.00		0.0978
	2075-2750	0.98	0.44-2.15	
	1525-2075	1.79	0.85-3.77	
	<1525 (low)	2.11	0.97-4.59	
Employment status	employed	1.00		0.0102
	unemployed	6.18	2.54-15.02	
	work related disability	1.71	0.51-5.75	
	housekeeper	1.38	0.44-4.38	
	others	1.44	0.45-4.55	
Neighbourhood conditions	no problem	1.00		0.0443
	1 problem	0.38	0.17-0.84	
	2 problems	1.25	0.57-2.72	
	3 problems	0.93	0.26-3.27	
Housing conditions	no problem	1.00		0.1887
	1 problem	1.66	0.90-3.07	
	2 or more problems	1.60	0.76-3.33	
Long lasting situational difficulties	none	1.00		0.3178
	1	1.20	0.63-2.31	
	2	1.88	0.94-3.77	
	3	1.71	0.65-4.49	
	4 or higher	2.05	0.79-5.36	

a odds ratio

b 95% confidence interval

c p-value of likelihood ratio χ^2 test

educated groups, while long lasting situational difficulties and difficulties with relationships were not consistently related to educational level.

Stressors that increased the odds to start excessive alcohol consumption and were inversely related to educational level, i.e. difficulties with health of others, financial problems, equivalent income, employment status, and housing conditions were studied with regard to their contribution to the explanation of educational differences in starting excessive alcohol consumption. Only educational differences in the occurrence of financial problems reduced the odds ratio of the lowest educated group (one third till 2.03) and the second lowest educated group (10% till 2.66). Financial problems accounted for 15% of the educational variation in starting excessive alcohol consumption. Educational differences in starting excessive drinking were, however, still statistically significant after adjustment for differential exposure to stress (odds ratio of the second lowest educated group was still statistically significantly increased).

Table 5. Prevalence of persons in risk categories of stressors by educational level.

		Educational level			
Psychosocial factors		lowest	lower	higher	highest
Life events	none	45.5	60.6	52.2	48.9
	1 event	30.9	22.0	28.1	32.8
	2 events	12.3	11.7	15.8	15.2
	3 or more events	1.3	5.7	3.9	3.1
Long lasting difficulties with health of others	none	59.4	59.3	67.0	63.0
	1 difficulty	25.2	27.7	25.2	28.1
	2 or more difficulties	15.5	13.0	7.8	8.9
Long lasting difficulties with relationships	none	49.4	53.2	48.8	44.6
	1	20.3	17.5	20.6	20.4
	2	5.7	10.2	12.5	13.3
	3	8.9	8.8	6.6	10.3
	4 or higher	15.8	10.2	11.6	11.4
Material stressors					
Financial problems	none	65.6	79.2	83.7	89.2
	some	23.4	17.7	13.1	9.9
	large	11.0	3.0	3.2	0.8
Equivalent income	>2750 (high)	50.8	33.8	9.2	6.2
	2075-2750	31.8	27.3	27.3	13.6
	1525-2075	31.8	27.3	27.3	13.6
	<1525 (low)	50.8	33.8	9.2	6.2
Employment status	employed	49.0	59.2	75.0	73.6
	unemployed	3.3	3.0	2.5	2.7
	work related disability	10.6	3.4	3.5	0.4
	housekeeper	37.1	34.2	13.2	9.1
Housing conditions	others	0.0	0.2	5.8	14.3
	no problem	67.7	74.1	74.8	73.6
	1 problem	16.8	13.3	17.0	15.3
Long lasting situational difficulties	2 or more problems	15.5	12.7	8.3	11.1
	none	64.3	67.7	54.0	52.5
	1	16.9	16.3	25.6	24.2
	2	7.1	7.3	11.7	12.2
	3	3.2	4.8	3.4	6.6
	4 or higher	8.4	4.0	5.3	4.5

We tested the direct effect of vulnerability indicators (Figure 1;b) in a model including confounders and financial problems (in order to adjust for differential exposure to stressors). We found that respondents who showed moderate levels of neuroticism were significantly more likely to start excessive alcohol consumption (Table 6), while no effect was observed for respondents with higher neuroticism scores. Furthermore, people that reported moderate levels of social support showed (not statistically significantly) increased odds to start excessive alcohol consumption (Table 6). The group with lowest social support, however, experienced lower odds to start excessive drinking compared to respondents in categories with moderate social support.

Not many vulnerability indicators that were related to starting excessive alcohol consumption were inversely related to educational level (Table 7). Only some emotional social support was more prevalent in the lower educated groups.

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Table 6. Relation between vulnerability indicators and starting excessive alcohol consumption

Vulnerability indicators		OR ^a	95%CI ^b	Test ^c
Locus of control	internal	1.00		0.3726
	2	0.97	0.49-1.93	
	3	0.64	0.31-1.35	
Neuroticism	external	1.24	0.62-2.47	0.0139
	low	1.00		
	2	2.24	1.15-4.37	
Palliative coping	3	1.02	0.42-2.45	0.1776
	high	0.93	0.39-2.18	
	low	1.00		
Active coping	2	0.95	0.47-1.90	0.1896
	3	0.64	0.29-1.41	
	high	1.46	0.71-3.00	
Emotional social support	high	1.00		0.2776
	2	1.97	0.89-4.36	
	3	1.83	0.82-4.07	
Instrumental social support	low	1.32	0.57-3.07	0.3088
	high	1.00		
	2	1.61	0.70-3.72	
	3	2.04	0.91-4.57	
	low	1.35	0.58-3.12	

Model includes confounders and financial problems

a odds ratio

b 95% confidence interval

c p-value of likelihood ratio χ^2 test

Low emotional social support was the only vulnerability indicator that was related to the start of excessive drinking and was more prevalent in lower educated groups. In a situation of equal exposure to stress among educational groups, i.e. prior adjustment for financial problems, emotional support explained almost 10 percent of the odds ratio of the lowest educated group (till 1.94), while 8% of the educational differences in starting excessive alcohol consumption was accounted for (not tabulated).

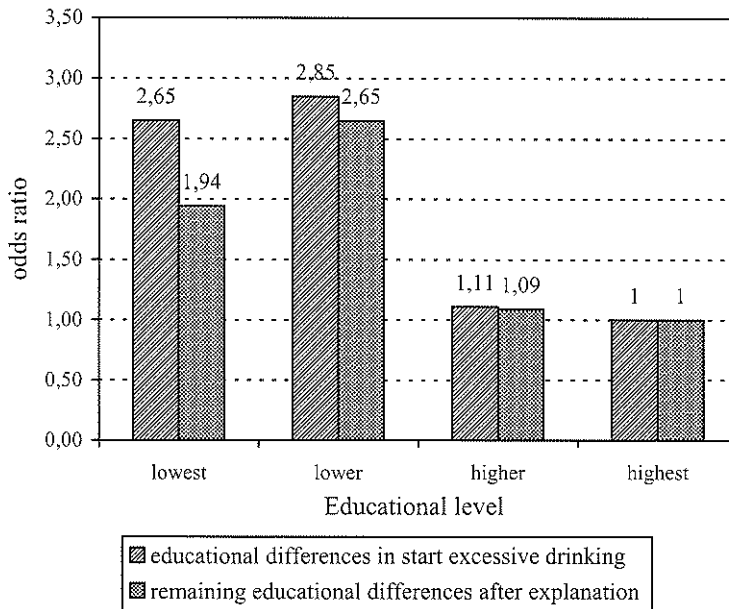
Table 7. Prevalence of risk categories of vulnerability indicators by educational level.

Vulnerability indicators		Educational level			
		lowest	lower	higher	highest
Neuroticism	2	32.1	35.6	35.9	33.6
	3	17.6	22.7	17.6	19.6
	high	32.1	23.6	25.2	20.4
Emotional social support	2	23.9	28.2	27.0	31.0
	3	30.2	25.6	20.1	20.7
	low	22.0	21.3	19.6	19.5
Instrumental social support	2	22.3	31.3	25.7	29.0
	3	21.0	28.8	24.5	25.8
	low	31.8	20.1	26.1	25.6

A possible moderating effect of vulnerability on the relationship between stressors and starting excessive alcohol consumption (Figure 1;c) was first tested by the interaction term education*financial problems in a logistic regression model containing education, financial problems and emotional social support (Table 2). The interaction term was not statistically significant ($p=0.3154$), meaning that moderating effects of vulnerability do not contribute to the explanation of educational differences in starting excessive alcohol

consumption. Tests of applied buffering effects, i.e. successively adding interaction terms combining all vulnerability indicators with financial problems yielded similar results.

Figure 2. Explanation of educational differences in starting excessive alcohol consumption by financial problems and emotional social support



In summary, financial problems and low social support in the lower educated groups explained 11% of the elevated odds to start excessive alcohol consumption of the second lowest educated group (OR became 1.94) and 43% of the increased odds ratio in the lowest educated group (OR became 2.65), while 23% of the educational variation in starting excessive alcohol consumption was explained (Figure 2).

Discussion

Lower educated groups were more prone to start excessive alcohol consumption during the follow-up period. Our finding is in accordance with other studies on this subject.⁷⁻⁹ Both differential exposure to stressors and vulnerability contributed to the educational differences in starting excessive alcohol consumption.

Before elaboration on the results we would like to discuss the limitations of the study that need to be considered in the interpretation of the results. First, respondents of whom no follow-up information was available might differ from respondents who remained in the study. Loss-to-follow-up between 1991 and 1997 and non-response in 1997 was not related to alcohol consumption in 1991, but was higher in lower educated groups. Furthermore, those not involved in the follow-up measurement in 1997 showed a higher prevalence of predictors of starting excessive alcohol consumption in the lower educated

groups, like financial problems and low emotional social support. The group lost-to-follow-up hence can be expected to have started relatively more often with excessive alcohol consumption since 1991. We, therefore, likely have underestimated educational differences in starting excessive alcohol consumption in our study population.

Second, alcohol consumption was self-reported and might be underreported because of socially desirable answering. We tried to minimize this risk through including the questions on alcohol consumption in the postal questionnaire. The rare literature on this subject does not relate underreporting of alcohol consumption to socioeconomic status,^{29,40} so our estimation of educational differences in starting excessive drinking is likely to be correct. Also the stressors and vulnerability indicators were self-reported and these reports reflect a status quo at the moment of the baseline measurement of 1991, while for example the amount of stress experienced might have affected coping styles or social support.

Third, the time frame used in this study might affect the predictive power of variables concerning educational differences in starting excessive alcohol consumption.⁷ Some argue that any effect of stressors occurs quickly and dissipates over time, resulting in stronger associations using shorter time frames,^{8-9, 18} while others advocate a longer time frame⁷ to be able to detect changes in alcohol consumption in an aging adult cohort.³² Interpreting the results described in this paper, one has to bear in mind that these are obtained after six and a half years of follow-up. Furthermore, we do not have any information on interim occurrence of stressors or the alcohol consumption level during this follow-up period.

Financial problems were the only stressor, which predicted educational differences in starting excessive alcohol consumption. Many others, in accordance, have reported that differential exposure to well established determinants of distress only account for a small part of socioeconomic differences in the consequences of stress, like excessive drinking.^{10-11, 22-23} Cross-sectional analyses on educational differences in excessive alcohol consumption, using the baseline data of our study population similarly found only material stressors to be related to educational differences in excessive alcohol consumption.⁴ The cross-sectional analyses revealed that, next to financial problems, employment status and material deprivation (not available for all respondents in the current analyses) contributed to educational differences in excessive drinking. The total contribution of selected material stressors to the explanation of educational differences however was remarkably comparable between both analyses.

Although emotional social support was not statistically significantly related to starting excessive drinking, educational differences in emotional support explained part of the relation between education and starting excessive alcohol consumption. Many other studies have reported a direct effect of support.^{13, 21-23, 42} This effect of low social support can be understood in the light of poor behavioural regulation¹⁴ through poor social embeddedness in society or even social isolation. Additionally, absence of social support or social isolation may be a stressor in itself, resulting in loneliness or lack of identity for which excessive drinking is a reaction or coping mechanism.¹⁴

We did not find a moderating effect of vulnerability on the relation between stressors and starting excessive alcohol consumption, in spite of other studies that indicate such a moderating effect with regard to several outcomes.^{12-14, 17, 20} The moderating role of vulnerability in stressful circumstances is, however, intensely debated as well, because a

growing number of studies report only main effects and no moderating effects of social support or other vulnerability indicators on several different outcomes.^{14, 18, 21-22}

Even after adjustment for differential exposure to stressors and vulnerability, statistically significant educational differences in starting excessive alcohol consumption remain. Since the GLOBE study includes the major groups of stressors distinguished in literature, i.e. life events and chronic difficulties,^{8, 14, 20} we feel confident that the low explanatory power of differential exposure to stress is not due to inaccurate operationalisation of exposure to stress. And as stated earlier, others also have reported an equally small contribution of well-established stressors to the explanation of socioeconomic differences in the consequences of stress. It also seems unlikely that additional vulnerability indicators account for the remaining educational differences, since we amply included indicators identified in other studies.^{11, 14, 18-20}

The results described in this paper bear consequences for the prevention of socioeconomic differences in excessive alcohol consumption and health. We identified a need for evidence-based interventions that reduce financial problems and encourage social support in lower socioeconomic groups. For example, income supplementation programs or interventions that address financial management for people who have problems tuning their expenditures to their income could reduce financial problems. There is, however, no reliable indication about the anticipated effect, since evaluation studies of income supplementation generally did not consider health (behaviour) outcomes⁴³ and also programs to improve social support have generally produced weak or equivocal results.^{14, 20} A better understanding of the processes leading to socioeconomic differences in social support and the mechanism involved in the effect of social support on excessive drinking would enhance the effectiveness of social support interventions.

The remaining educational differences in starting excessive drinking might be the result of feelings of chronic stress related to the presence of socioeconomic inequality.⁴⁴⁻⁴⁵ Socioeconomic inequality in a society is known to increase unhealthy behaviour and disease in lower socioeconomic groups^{44, 46-47} possibly through psychological consequences of individual low socioeconomic status (social comparison), and societal effects of inequality (lack of social cohesion and justice).

Both the contribution of financial problems and low social support to the explanation of educational differences in starting excessive alcohol consumption, as well as the hypothesized explanation for the remaining educational differences in starting excessive alcohol consumption corroborate the role of psychosocial mechanisms in the effect of socioeconomic differences. Accordingly, Wilkinson⁴⁵ states in his inequality theory that socioeconomic differences in stress, social resources, and unhealthy behaviour are the result of a psychosocial process initialised by perceived inequality. From a prevention point of view it may therefore be more efficient to deal with structural socioeconomic inequality rather than the psychosocial consequences.

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**[Educational differences in leisure-time physical inactivity:
a descriptive and explanatory study]**

Educational differences in leisure-time physical inactivity: a descriptive and explanatory study

In this study we aim to explain educational differences in leisure-time physical inactivity in terms of psychosocial and material factors.

Cross-sectional data were obtained from the baseline of the Dutch GLOBE study in 1991, including 2,598 men and women, aged 15-74 years. Physical inactivity during leisure time was defined as not participating in any activity, such as sports, gardening, walking or cycling. Psychosocial factors included in the study were coping resources, personality, and stressors. Material factors were financial situation, employment status, and living conditions. Logistic regression models were used to calculate educational differences in physical inactivity.

Physical inactivity was more prevalent in lower educational groups. Psychosocial factors related to physical inactivity were locus of control, parochialism, neuroticism, emotional social support, active problem focussing, optimistic and palliative coping styles. Material factors associated with physical inactivity were income, employment status and financial problems. All correlates of physical inactivity were unequally distributed over educational groups, except optimistic and palliative coping. Personality and coping style were main contributors to the observed educational differences in physical inactivity. That is to say, parochialism, locus of control, neuroticism and active problem focussing explained about half of elevated odds ratios of physical inactivity in the lower educational groups. The material factors, equivalent income and employment status explained about 40% of the elevated odds ratios. Psychosocial and material correlates together reduced the odds ratios of lower educational groups by on average 75%.

These results have practical consequences for the design of more effective interventions to promote physical activity. In particular, personality and coping style of risk groups, such as lower educational groups, should be taken into consideration at the future development of these interventions, as well as inequalities in material restrictions to engage in physical activity. Supplementary interventions focussing on childhood conditions which, partly, influence both personality and physical inactivity may also contribute to a reduction of socioeconomic differences in physical inactivity.

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Introduction

Leisure-time physical activity has been shown to be associated with a wide variety of health outcomes, i.e. people who exercise have better physical health. Many studies demonstrate a clear relationship between exercise and main causes of death such as heart disease or cancer.¹⁻⁴ Evidence on a dose-effect relationship between exercise and poor health or mortality, i.e. a linear relationship, such as the more exercise, the lower the prevalence of disease or mortality is inconclusive.^{1-2, 4} Recently, studies also stress the beneficial effect of exercise on mental health or psychological well-being.⁵⁻⁷ Many of these, mainly cross-sectional, studies concentrate on the effect of physical activity on the occurrence of depression. People who exercise less do have a higher probability of being depressed.^{6, 8-10} Surveys that study the effect of physical activity on mental health or depression in a longitudinal setting, reach a similar conclusion,¹¹⁻¹² except for one study that could not confirm the influence of physical activity on the subsequent occurrence of depression.¹⁰ A study that tried to unravel the relationship between physical activity and mental health in the opposite direction failed to prove that psychological well-being, including depression, did substantially influence the future physical activity pattern.⁸

It has been theorised that the level of physical activity in which an individual engages may be

influenced by factors, such as physical health status, psychological state, or opportunities for physical activity.⁸ Physical activity in leisure time is related to socioeconomic status, i.e. people of lower socioeconomic groups do participate less often and less intensive in physical activity, including not only sports, but also walking, cycling, etc.¹³⁻¹⁵ Little is known about the mechanism which accounts for these differences. Considering the detrimental effect of physical inactivity on health, research on its determinants in different socioeconomic groups may have practical utility for the design of more effective intervention strategies.

Determinants of socioeconomic differences in health-related behaviour in general, mentioned in the international literature, can be broadly classified into two categories: psychosocial and material factors.¹⁶⁻¹⁹ Material factors refer to material (dis)advantages, to which some people in society have no choice but to be exposed.²⁰⁻²¹ Factors mentioned in this context are, for example, employment status or financial situation. The relationship between material factors and physical exercise can best be explained in terms of available opportunities for physical activity during leisure time. Limited opportunities, such as lack of financial resources for membership or outfit, or lack of time because of work related responsibilities, may very well result in low levels of leisure-time physical activity.²²⁻²⁴ Psychosocial factors comprise immaterial factors, such as personality or stress. There are few studies that focus on the effect of personality on physical activity. Studies, however, that do address this relation, all stress the importance of, for example, neuroticism,^{11, 25-26} personal uncertainty,⁸ extraversion,^{25, 27} low perceived control,²⁸ poor coping strategies,²⁹⁻³¹ etc. Some authors even point to the existence of a more general unhealthy personality risk profile, characterizing those who show poor health-related behaviour. Also, the occurrence of stress has been cross-sectionally related to physical activity. Highly physically active persons reported less perceived stress.³²⁻³³ Probably this illustrates the inhibiting effect of stress on physical activity participation.

Both psychosocial and material factors are distributed unequally over socioeconomic groups.^{21, 34} For example, material disadvantages and several 'unhealthy' personality factors occur more often in lower socioeconomic groups, and may therefore give rise to socioeconomic differences in health damaging behaviour, such as physical inactivity. This paper will report on a study that aimed to explain educational differences in physical inactivity in terms of psychosocial and material factors.

Methods

Population

Data were obtained from the baseline survey of the Longitudinal Study on SocioEconomic Health Differences (LS-SEHD) in 1991. The design and objective of this study have been described in detail elsewhere.³⁵ A random sample of the non-institutionalised, general Dutch population, living in the city of Eindhoven and surroundings, aged 15-74 years was drawn from population registers. In this sample, people aged 45-74 years and persons originating from the highest and lowest socioeconomic strata (indicated by the zipcode) were overrepresented. A self-administered postal questionnaire, which inquired about health, life style, socioeconomic status, and other related subjects, was completed by 18,973 persons (70.1% response). Among a randomly selected subsample of respondents to the postal questionnaire, containing 2,802 people (79.4% response), more extensive information on the

background and possible explanations of socioeconomic inequalities was collected during a successive oral interview. After excluding missing values, 2,598 men and women were included in the analyses presented in this paper.

Measures

Physical inactivity during leisure time was defined as not participating in any physical activity such as sports, gardening, walking, or cycling during leisure time. Respondents had to fill in (1) a question about the time they spent on average walking or cycling to work or shops every day, (2) how much time they spent on average on leisure-time gardening, cycling, walking, and, in a separate question (3) on active sports, per week. People who answered 'no time at all' to all three questions were defined as being physically inactive. Information on this variable was missing for 70 respondents (2.5%). The three questions on physical activity were included in the postal questionnaire.

Highest attained educational level indicated socioeconomic status (SES). In the Netherlands, educational level is considered a good indicator of socioeconomic status.³⁶ Educational level has the advantage that it is available for both men and women, whether they are in paid employment or not, it does not change during adult life, it has a high reliability and validity,³⁷ and it is simple to measure and use. Educational level was measured in the postal questionnaire and divided into four categories, i.e. higher vocational schooling and university (1=high), intermediate vocational schooling or intermediate / higher secondary schooling (2), lower secondary or vocational schooling (3), and primary school only (4=low). Fifty-eight respondents (2.0%) did not report their educational level.

Psychosocial factors included in this study were personality factors, coping resources, and stressors. Personality factors included in the analyses were locus of control, neuroticism, parochialism, and orientation towards the future. All variables were asked for during the oral interview. *Locus of control* reflects the belief of a person about control over one's own life. It was measured using the unidimensional twelve item questionnaire of Ormel,³⁸ based on Rotter's locus of control scale. A higher score means that the respondent has a more external locus of control, i.e. beliefs that one can not do much to steer life. A *neurotic* person can be characterized as nervous, emotionally reactive, insecure and unstable. A Dutch twelve-item translation of the Eysenck Personality Questionnaire was used to measure neuroticism.³⁹ The higher the score, the more neurotic the respondent. *Parochialism* is characterized by a traditional, shared, affectual, irrational, and closed attitude. In contrast, cosmopolitans tend to be more progressive, individualistic, instrumental, scientific, and open.⁴⁰ Parochialism was measured with a Dutch five-item scale⁴¹ in which a higher score indicates a more parochial attitude. *Orientation towards the future* was asked for using a four-item scale.⁴¹ A high score indicates a lack of orientation towards the future.

Coping resources, enquired about in the interview, were personal coping style and social support. *Coping style* was questioned using a 41-item, Dutch questionnaire.⁴² The list distinguishes seven different coping styles; four positive styles, i.e. active problem focussing, social support seeking, disclosure of emotions, and optimism, and three negative styles, i.e. depressive reaction pattern, avoidance behaviour, and palliative reaction pattern. A higher score on each coping style means that the respondent is more inclined to react to stressful situations using that specific coping behaviour. An adapted version of a Dutch questionnaire was used to measure two dimensions of *social support*, i.e. emotional and instrumental

support.⁴³ Emotional social support refers to personal contacts, while instrumental support comprehends more material support, such as practical help with activities.

The scores of all personality variables and coping resources were classified into five equally sized categories (quintiles). The upper quintile comprises the 20% of the population with the highest scores on the scales, i.e. the most neurotic people, or persons with the most external locus of control, or greatest lack of social support.

Psychosocial stressors available in our data set were life events and long lasting difficulties. *Life events* were measured in the postal questionnaire, using a nine-item checklist asking about negative events in the preceding year, e.g. serious illness or death of people important to the subjects, substantial drop in income, moving, or being a victim of robbery or theft.⁴⁴ The number of life events experienced was divided into four categories (none, one, two, at least three). *Long lasting difficulties* were measured during the interview with an adapted version of the Dutch Long Lasting Difficulties List.⁴⁵ Using this list, two different types of difficulties were distinguished. Difficulties with health problems of significant others (five items) were classified according to whether respondents reported zero, one, two, or three or more problems during the last year. The subscale problems with relations consisted of eight items. The score on each item ranged from zero (no problem or not applicable) to four (serious problem). The scores of all items were added up, resulting in a total score, which we combined in five groups with score 0, 1, 2, 3, or ≥ 4 .

Material factors measured in the LS-SEHD were financial situation, employment status, and living conditions. Financial situation was indicated by equivalent income, the occurrence of financial problems, and material and social deprivation. All were elicited during the interview, except the question on financial problems, which was included in the postal questionnaire. *Equivalent income* was defined as total net household income divided by the number of persons depending on that income, giving more weight to adults, and was classified into five equally sized groups (quintiles). *Financial problems*, i.e. not being able to pay the rent, electricity or food during the preceding year were precoded into three categories (none, some, and big). *Material deprivation* was considered present when respondents were not able to afford at least one out of six material assets (such as telephone, basic food, etc.). *Social deprivation* meant not being able to participate in three or more, out of six, social activities, because of a lack of money.

Employment status was elicited by inquiring about the main activity of the respondent. We distinguished between paid employment, unemployed, long-term work disability, (early) retired, housekeepers (those engaged in household duties), and other (=students, servicemen, and persons living on private means).

Living conditions were measured, asking about the housing and neighbourhood situation and crowding in the postal questionnaire. *Housing conditions* were examined by asking whether any of three housing problems (draft, cold, and damp) were present (zero, one, two or more problems).⁴⁴ Four items on adverse *neighbourhood conditions* included smell, noise from neighbours, noise from traffic, and criminality (zero, one, two or more problems).⁴⁴ *Crowding* was defined as the number of persons in the household divided by the number of rooms.

Physical health was assessed by the presence of at least one self-reported severe chronic condition at the time of the survey. Severe chronic conditions comprised heart disease, pulmonary disease, kidney disorder, stroke, rheumatism, arthritis or arthrosis, illness of the nervous system, cancer, and back disorder. Chronic conditions were measured by means of a checklist in the postal questionnaire. The occurrence of severe chronic conditions will

hamper the participation in physical activity^{1, 46} and is related to socioeconomic status.⁴⁷⁻⁴⁹ Physical demands at work were questioned only among respondents with a paid job. Respondents stated whether their job was physically demanding (yes or no) in the postal questionnaire. The respondents having no paid job formed a separate category. It may be speculated that people with physically demanding jobs are less physically active in leisure time.¹⁵ People in lower socioeconomic groups do more often have physically demanding jobs.^{13, 15}

Analyses

Logistic regression analyses were used to calculate educational differences in physical inactivity. People with the highest educational level served as the reference group. Analyses were carried out taking men and women together, since the relationship between education and physical inactivity did not differ between the sexes (p -value for interaction=0.426). All logistic regression models were adjusted for confounders, i.e. sex, age (12 five-year categories), marital status (four categories), religious affiliation (three categories), and degree of urbanization (four categories). Furthermore, models considering educational differences in physical inactivity were adjusted for physical health^{5-6, 10, 32} and physical demands at work,^{13, 15} to prevent these factors interfering with the relationships of interest.

To test if psychosocial and material factors could explain educational differences in leisure-time physical inactivity, the following procedure was followed. First, psychosocial and material factors were considered correlates of physical inactivity when the reduction in deviance (RD) (also called the likelihood ratio chi square test) comparing the extended model to a model with confounders only, was statistically significant ($p < 0.05$), or showed a clear relationship with physical inactivity (statistically significantly increased odds ratio). Secondly, the relation between the correlates of physical inactivity and educational level was described, calculating directly age and sex standardized frequencies. Finally, each correlate of physical inactivity, which was related to education, was added to a logistic model containing education, confounders, and physical inactivity, in order to quantify the contribution of a correlate to the explanation of educational differences in physical inactivity. This contribution was expressed by the reduction in odds ratios of the different educational groups and the part of the reduction in deviance, or likelihood chi-square due to education of the basic model, which was accounted for by inclusion of a correlate in the model (see footnote Table 4a).

Results

Educational differences in leisure-time physical inactivity

Physical inactivity was more prevalent in the lower educational groups, expressed by the prevalence as well as the odds ratios (Table 1). Educational differences in physical inactivity at leisure were adjusted for physical demands of the job and physical health, which only slightly changed the odds ratios (Table 1).

Table 1. Physical inactivity in leisure time by educational level

Education	N	Model A ^a		Model A + physical demands of the job	Model A + physical illness	Model A + all
		% ^b	OR (CI) ^c	OR (CI) ^c	OR (CI) ^c	OR (CI) ^c
High	540	2.2	1.00	1.00	1.00	1.00
2	616	4.0	2.12 (1.02-4.40)	2.11 (1.01-4.39)	2.10 (1.01-4.36)	2.09 (1.00-4.35)
3	952	4.9	2.55 (1.28-5.08)	2.58 (1.23-4.91)	2.46 (1.23-4.91)	2.50 (1.25-5.03)
Low	490	5.7	3.89 (1.87-8.10)	4.06 (1.92-8.56)	3.76 (1.81-7.83)	3.95 (1.87-8.33)
Total	2598					

a adjusted for sex, age, marital status, religious affiliation, and degree of urbanization

b directly standardized prevalence

c odds ratio and 95% confidence interval

Correlates of physical inactivity

Table 2 shows the psychosocial and material factors which were related to physical inactivity, i.e. for which the reduction in deviance test was statistically significant or which showed statistically significantly increased odds ratios. Psychosocial variables, which were not related to physical inactivity were orientation towards the future, instrumental social support, social support seeking, disclosure of emotions, depressive reaction, avoidance behaviour, long lasting difficulties, and life events. *Locus of control* was statistically significantly correlated with physical inactivity (Table 2). Only respondents with the most external locus of control were significantly more often physically inactive. Though all categories of locus of control had increased odds ratios of physical inactivity, there was no clear linear relationship. *Parochialism* was statistically significantly related to physical inactivity (Table 2). People with a more parochial attitude showed statistically significantly increased odds ratios of physical inactivity, though there was no clear gradient. *Neuroticism* was not statistically significantly related to physical inactivity, but the most neurotic respondents were significantly more often physically inactive (Table 2). *Emotional social support* was statistically significantly related to physical inactivity, but no clear linear relationship was observed. Only the fourth quintile showed a statistically significantly increased odds ratio of physical inactivity (Table 2). *Active problem focussing* was a statistically significant correlate of physical inactivity, although none of the categories showed significantly elevated odds ratios (Table 2). *Optimistic coping* was also a statistically significant correlate of physical inactivity, but only the fourth quintile showed a statistically significantly raised odds ratio (Table 2). *A palliative way of coping* was statistically significantly related to physical inactivity, but none of the odds ratios was significantly elevated (Table 2).

Material factors which were not related to physical inactivity and were therefore not included in Table 2, are housing and neighbourhood conditions, deprivation, and crowding. *Equivalent income* was a statistically significant correlate of physical inactivity during leisure time (Table 2), e.g. the lower the income, the higher the odds ratios of physical inactivity. Only the lowest income category, however, was statistically significant more often physically inactive. Also the group with some *financial problems* showed a significantly raised odds ratio of physical inactivity (Table 2). *Employment status* was statistically significantly correlated with physical inactivity. Persons out of labour because of a working disability were more often physically inactive, while other people without regular paid employment, like the unemployed, retired, or 'other' were less physically inactive, compared to the working people (Table 2). Only the category 'other', i.e. the students, servicemen, and people living on private means, showed a statistically significantly decreased odds ratio of physical inactivity.

Table 2. Association between explanatory factors and leisure-time physical inactivity.

	OR ^a	95% CI	p-value ^b	Factors	OR ^a	95% CI	p-value ^b
Psychosocial factors							
Locus of Control			0.0061	Active problem focussing			0.0146
internal	1.00			highly	1.00		
2	1.33	0.70-2.54		2	0.54	0.28-1.06	
3	1.43	0.75-2.74		3	1.19	0.65-2.17	
4	1.35	0.69-2.67		4	1.13	0.59-2.15	
external	2.86	1.54-5.32		hardly	1.53	0.86-2.72	
Parochialism			0.0054	Optimistic reaction			0.0009
hardly	1.00			highly	1.00		
2	2.40	1.16-4.97		2	1.83	1.03-3.23	
3	3.18	1.58-6.39		3	0.90	0.47-1.74	
4	2.33	1.09-5.01		4	2.59	1.49-4.51	
highly	3.26	1.56-6.81		hardly	1.11	0.60-2.07	
Neuroticism			0.0626	Palliative reaction			0.0087
hardly	1.00			highly	1.00		
2	1.15	0.64-2.05		2	0.83	0.43-1.60	
3	1.14	0.61-2.13		3	0.82	0.33-1.20	
4	0.91	0.45-1.84		4	1.26	0.70-2.28	
highly	2.19	1.15-4.14		hardly	1.72	0.93-3.18	
Emotional social support			0.0235				
highly	1.00						
2	0.83	0.42-1.64					
3	1.10	0.56-2.14					
4	1.96	1.07-3.57					
hardly	1.57	0.84-2.95					
Material factors							
Equivalent income (Dutch guilders)			0.0146	Employment status			0.0016
> 2750	1.00			paid employment	1.00		
2087-2750	1.23	0.60-2.52		unemployed	0.26	0.04-1.95	
1601-2086	1.13	0.55-2.32		work disability	1.93	0.96-3.87	
1251-1600	1.59	0.79-3.23		(early) retired	0.48	0.22-1.08	
600-1250	2.67	1.38-5.18		housekeeper	1.04	0.54-2.03	
other				other	0.16	0.04-0.68	
Financial problems			0.0524				
none	1.00						
some	1.70	1.09-2.65					
big	1.71	0.71-4.09					

^a odds ratio adjusted for the confounders sex, age, marital status, religion, and degree of urbanization

^b p-value of likelihood ratio χ^2 test due to inclusion of an explanatory factor, comparing this model to a model with confounders only

Educational distribution of correlates of physical inactivity

Table 3 shows the relationship between psychosocial and material factors which were correlates of leisure-time physical inactivity, and educational level. The risk categories for physical inactivity, i.e. external locus of control, parochialism, neuroticism, a lack of active problem focussing, and a lack of emotional social support were more often observed in lower educational groups (Table 3). Optimistic and palliative copings styles were not related to educational level (Table 3). A low equivalent income, financial problems and work disability were risk categories of material correlates of physical inactivity that occurred more often in lower educational groups (Table 3). The unemployed, though they were less often physically inactive, were also overrepresented in lower educational groups (Table 3). The higher educational groups revealed a higher percentage of (early) retired persons and people in the category 'other' (Table 3).

Table 3. Percentage of persons in high-risk categories of determinants of physical inactivity by educational level, directly age and sex standardized.

Psychosocial factors		Educational level			
		Low	2	3	High
Locus of Control	4	27.0	19.5	17.0	10.7
	external	35.4	18.8	10.4	3.6
Parochialism	4	20.2	20.3	14.8	7.8
	highly	29.6	21.9	10.4	6.0
Neuroticism	4	17.1	18.0	15.3	15.5
	highly	23.0	12.5	8.8	5.8
Coping styles	4	18.2	17.3	16.6	11.4
	active problem focussing	37.4	25.4	16.0	9.7
optimism	4	15.0	13.9	17.4	17.2
	hardly	24.1	21.2	21.6	27.8
palliative reaction pattern	4	21.7	23.6	24.2	22.7
	hardly	15.2	16.3	15.0	11.7
Emotional social support	4	21.8	22.5	18.8	20.3
	hardly	27.6	19.1	20.8	14.4
Material factors					
Equivalent income	1251-1600	23.3	19.7	15.0	7.5
	600-1250	32.0	22.9	13.3	15.9
Employment status	unemployed	5.3	2.6	1.9	2.8
	work disability	9.5	6.2	4.4	3.0
	(early) retired	12.5	13.4	16.5	17.9
	other	9.8	4.4	7.5	12.5
Financial problems	some	30.1	17.0	11.0	11.1
	big	11.6	3.5	2.1	1.2

Explanation of educational differences in physical inactivity

We examined the contribution of psychosocial and material factors which were correlated with physical inactivity, and which were related to educational level, to the explanation of educational differences in physical inactivity. Each of the personality factors locus of control, parochialism, and active problem focussing could explain a substantial part of the educational gradient in physical inactivity (Table 4a). Inclusion of locus of control decreased the odds ratios by an average 20%. Locus of control accounted for the largest decrease in the RD due to education, namely 44%.

Table 4a. Educational differences in physical inactivity, adjusting for psychosocial factors separately

Confounders ^a (Model A)	Model A + locus of control		Model A + parochialism		Model A + neuroticism		Model A + emotional social support		Model A + active problem focussing	
	OR (95% CI)	OR % ^b	OR % ^b	OR % ^b	OR % ^b	OR % ^b	OR % ^b	OR % ^b		
High	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	2.09 (1.00-4.39)	1.94 14	1.84 23	2.08 1	2.03 6	2.39* 7	2.24* 17			
3	2.50 (1.28-5.17)	2.26 16	2.18* 21	2.43* 5	2.39* 7	2.24* 17				
Low	3.95 (1.92-8.56)	3.04* 31	3.16* 27	3.60* 12	3.71* 8	3.16* 27				
RD education ^c	15.021	8.450	9.253	12.568	13.579	9.447				
Δ RD ^d		6.571	5.768	2.453	1.442	5.574				
%explained ^e		44	38	16	10	37				

* 95% confidence interval does not include 1

a confounders: sex, age, marital status, religion, degree of urbanization, physical activity at work, and severe chronic illness

b percentage reduction in odds ratio computed by (OR model A - OR (model A + factor))/(OR model A - 1)

c RD education = reduction in deviance due to inclusion of education in the model

d Δ RD = reduction in deviance due to education of model A - reduction in deviance due to education of model (A + psych. factor)

e percentage explained = (Δ RD / RD education of Model A)*100%

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Adjustment for parochialism accounted for the largest reduction in odds ratios of lower educational levels and explained almost 40% of the reduction in deviance (RD) due to education. Active problem focussing reduced the odds ratios of the lower educational groups with about 20% and accounted for 37% of the RD due to education. Neuroticism also contributed to the elevated odds ratios of physical inactivity in the lower educational groups, albeit to a lesser extent and explained one sixth of the RD due to education (Table 4a). Emotional social support did not contribute much to the explanation of educational differences in physical inactivity, i.e. odds ratios decreased slightly and only 10% of the RD due to education was accounted for (Table 4a).

Both equivalent income and employment status explained part of the educational differences in physical inactivity during leisure time (Table 4b). Educational differences in equivalent income explained about one fifth of the elevated odds ratios of the lower educational levels, while more than half of the RD due to education was accounted for. Employment status also influenced the educational differences in physical inactivity (Table 4b). Inclusion of employment status accounted for about 20% of the odds ratios in lower educational groups and more than one third of the RD due to education. Financial problems could not explain the educational differences in physical inactivity.

Table 4b. Educational differences in physical inactivity, adjusting for material factors separately

Confounders ^a (Model A)	Model A + equivalent income		Model A + employment status		Model A + financial problems	
Education OR (95% CI)	OR	% ^b	OR	% ^b	OR	% ^b
high	1.00	1.00	1.00	1.00	1.00	1.00
2	2.09 (1.00-4.39)	1.86	21	1.97	11	2.22* 0
3	2.50 (1.28-5.17)	2.23*	18	2.25*	17	2.78* 0
low	3.95 (1.92-8.56)	3.10*	29	3.15*	27	4.32* 0
RD education ^c	15.021	7.210		9.633		15.890
Δ RD ^d		7.811		5.388		0
%explained ^e		52%		36%		0

* 95% confidence interval does not include 1

a confounders: sex, age, marital status, religion, degree of urbanization, physical activity at work, and severe chronic illness

b percentage reduction in odds ratio computed by (OR model A - OR (model A + factor))/(OR model A - 1)

c RD education = reduction in deviance due to inclusion of education in the model

d Δ RD = reduction in deviance due to education of model A - reduction in deviance due to education of model (A + mat. factor)

e percentage explained = (Δ RD / RD education of Model A)*100%

Altogether, educational differences in locus of control, parochialism, neuroticism, and active problem focussing accounted for about half of the odds ratios of leisure-time physical inactivity in the lower educational groups and 76% of the RD due to education. When included in the model, all odds ratios decreased to statistically non-significant levels (Table 5). Emotional social support did not further contribute to the explanation of educational differences in physical inactivity. Equivalent income and employment status together accounted for 75% of the RD due to education, while the odds ratios decreased by, on average, 40% (Table 5).

Altogether educational differences in locus of control, parochialism, neuroticism, active problem focussing, equivalent income, and employment status could explain almost three quarters of the elevated odds ratios of physical inactivity of the groups with lower educational levels and 93% of the educational variation in physical inactivity (Table 5).

Table 5. Educational differences in physical inactivity, adjusting for material and psychosocial correlates.

Confounders ^a (Model A)	Model A + psychosocial correlates ^b	Model A + material correlates ^d	Model A + all
Education OR (95% CI)	OR (95% CI)	% ^c	OR (95% CI)
high	1.00	1.00	1.00
2	2.09 (1.00-4.39)	1.63 (0.76-3.49)	42
3	2.50 (1.28-5.17)	1.83 (0.87-3.84)	45
low	3.95 (1.92-8.56)	2.15 (0.93-4.97)	61
RD education ^e	15.021	3.538	3.824
Δ RD ^f		11.483	11.197
%explained ^g		76%	75%
			93%

a confounders: sex, age, marital status, religion, degree of urbanization, physical activity at work, and severe chronic illness

b psychosocial correlates = locus of control, parochialism, neuroticism, and active problem focussing

c percentage reduction in odds ratio computed by $(OR \text{ model A} - OR \text{ (model A + factor)}) / (OR \text{ model A} - 1)$

d material correlates = equivalent income and employment status

e RD education = reduction in deviance due to inclusion of education in the model

f Δ RD = reduction in deviance due to education of model A - reduction in deviance due to education of model (A + correlates)

g percentage explained = $(\Delta \text{ RD} / \text{RD education of Model A}) * 100\%$

Discussion

We report a clear association between educational level and physical inactivity. The lower educational groups report more often that they are completely physically inactive as compared to the highest educational group. Educational differences in parochialism, locus of control, and equivalent income were the main reasons for this association. Active problem focussing, neuroticism, and employment status, however, also contributed substantially to the elevated odds ratios of physical inactivity in the lower educational groups.

Before further elaboration on the results, limitations of the present study should be mentioned. The results presented here might be biased by non-response, but since the non-respondents did not differ substantially from the respondents on several key socioeconomic and demographic key characteristics, such as source of income, presence of financial problems, self-perceived health, and socioeconomic status,³⁵ we assume that non-response is not substantially affecting the results.

Secondly, information on physical activity was self-reported. Participation in active sports may be particularly overestimated, considering the strong Dutch societal attitudes towards the desirability of an active lifestyle. It may be speculated that higher educational groups overestimate their physical activity more than the groups with lower education, since their peers, i.e. people with a relatively high socioeconomic status, do value a healthy life style more than people with lower educational levels.³⁷ The questions on physical activity, however, were posed in the postal questionnaire, which decreases the urge to socially desirable answering. Furthermore, our measure of physical inactivity was also based on daily walking or cycling to work or shops, which seems less sensitive to social norms. We therefore expect that the educational differences reported here largely reflect actual socioeconomic differences in physical inactivity.

Finally, it should be kept in mind that we used cross-sectional data to answer a causal research question. Longitudinal studies show that exercise does not appear to have a significant influence on personality, but that, on the contrary, personality influences participation in exercise.⁵⁰⁻⁵³ This means that the favourable psychological profile of regular exercisers in the population may largely reflect a mechanism of self-selection based on personality. The relationship between personality and coping style and physical inactivity is

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therefore expected to mainly reflect a causal mechanism. Further, it may be argued that material factors, too, influence participation in physical activity, rather than vice versa. More longitudinal research is required to reveal the causal pathway between educational level, psychosocial and material factors and physical (in)activity.

Locus of control contributed substantially to the educational differences in physical inactivity. As expected,²⁸ people with a more external locus of control compared to the reference group turned out to be more often completely physically inactive during leisure time. Persons with an external locus of control believe that what they do, or do not do, has no or little effect on their life course or health. They are therefore less likely to be involved in health promoting behaviour. We found an external locus of control to be more common in the lower educational groups, which replicates findings of other studies.⁵⁴⁻⁵⁶

All groups with a more *parochial attitude* than the reference group showed a statistically significant higher level of complete physical inactivity. Parochial persons are more traditional, affectual, and irrational.⁴⁰ They tend not to believe in the idea of prevention, which corresponds well with a lack of health promoting behaviour. Further, physical exercise is to some extent a modern phenomenon, while parochial people are known to strongly adhere to traditional lifestyles. A high parochial attitude appeared more often in the lower socioeconomic groups in our and other studies,^{57, 40} and was clearly related to physical inactivity. This accounted for the obvious role of parochialism in the explanation of educational differences in physical inactivity.

We found that people with a less *active problem focussing coping style* were more often physical inactive, which is in accordance with prevailing ideas on the subject.³⁰ People applying an active problem focus, are familiar with facing a problem and actively searching for a solution. Such people can be expected to relate physical activity to its beneficial effects, even when these effects are long run. They therefore will take up physical activity more easily and are more likely to continue to be physically active. It thus seems a good idea to emphasize problem solving training, as used in smoking cessation programs, in intervention programs concerning physical activity as well.³⁰ A lack of active problem focussing appeared more often in lower educational groups, which explains part of the higher prevalence of physical inactivity in groups with a lower educational level.

In our and other studies, highly *neurotic* people, i.e. nervous, emotionally reactive, anxious, insecure, and unstable people, reported high levels of physical inactivity.^{11, 25-26} On the other hand, persons with low neuroticism scores, i.e. emotionally well-adjusted, agreeable, and self-confident persons, seemed more attracted to sports and exercise and to maintain that behaviour over the years.⁵⁸ Our finding that neuroticism was more prevalent in the lower educational groups is in accordance with other studies.⁵⁹⁻⁶¹ Since only the most neurotic group showed a statistically significantly increased level of physical inactivity, the contribution of neuroticism to the explanation of educational differences in physical inactivity was small. The contribution of material factors to the explanation of the educational differences in physical inactivity can be considered to reflect opportunities for participation. We report that persons with a lower equivalent income were more often completely physically inactive. This is confirmed by other studies.²²⁻²⁴ These people probably can not afford the necessary equipment, or the costs of a membership of a sports club.

Employment status also explained part of the elevated odds ratios of complete physical inactivity in the lower educated groups. People without time constraints like the retired, unemployed and the category 'other' were less often physically inactive. The absence of time

limitations seems to outweigh the adverse financial situation of unemployed people. On the other hand, people who are unable to participate in paid employment, due to disability, demonstrated a higher level of physical inactivity and were more prevalent in lower educational groups. Although we can not disentangle the contribution of the category 'work disability', which is characterized by limited physical activity, on the one hand and other categories of persons without a regular job, who are more physically active, on the other hand, employment status contributed substantially to the explanation of educational differences in physical inactivity.

Personality and coping style were important contributing factors to the educational differences in physical inactivity. This suggests the existence of the previously mentioned more 'unhealthy' personality risk profile in lower socioeconomic groups. Personality is one of the factors which will turn knowledge about benefits of physical activity into actual participation. Indicating those personality factors that characterise those who engage in unhealthy behaviour may have practical relevance for health promotion and health education. Our results support the importance of considering specific personality factors, like parochialism, locus of control, neuroticism, and coping in tailoring interventions for high risk groups of physical inactivity, like lower socioeconomic groups.

Our results show that another prerequisite for the effective promotion of physical activity in the adult population is to deal successfully with material constraints that are related to physical inactivity in groups with lower educational levels. Only when physical activity is accessible and available for all, can external motivation via promotion campaigns result in the desired behavioural change. Another way is to develop campaigns, that as well as persuading people to start sports, also point out easy, cheap, and less (extra) time consuming ways of physical activity, like walking or cycling.

Next to taking personality and coping style into consideration at the future development of intervention strategies, another possibility may be to attempt to influence the unfavourable personality profile directly. It is reasonable to assume that the basic patterns of personality are formed in early life.⁶² Specific youth programs aimed at affecting personality might, according to our results, have the effect of changing participation in physical activity in adult life, though the impact of such programs will probably be limited.

It may be speculated that the physical activity patterns and personality are both effects of childhood conditions that may last over the life-course. The health behaviour pattern of lower socioeconomic groups may, partly, be the result of growing up in an unfavourable socioeconomic environment.^{14, 63} In addition to the effect on health behaviour, living in adverse socioeconomic circumstances may also have negative psychosocial and personality effects.^{14, 64} However, in our study population, the relative contribution of the selected personality factors to the explanation of educational differences in physical inactivity was highly comparable between analyses with or without prior adjustment for childhood socioeconomic status, measured as occupation of the father and educational level of the mother (results not shown). Consequently, it can be argued that childhood conditions are of minor importance for the explanation of adult educational differences in physical inactivity in terms of psychosocial and material factors. On the other hand, it may be possible that there are other childhood circumstances than socioeconomic status which influence the development of future behavioural patterns and personality, such as cultural aspects or attitudes towards health of parents or peers. Elaborating on the idea that both physical activity and personality are partly expressions of childhood conditions, an additional way to

reduce the public health burden of detrimental behavioural patterns of the lower socioeconomic groups, besides interventions in the adult population, would be to try to improve childhood conditions which, in part, generate them.

Results presented in this paper do suggest where a beginning might be made to try to diminish socioeconomic differences in physical inactivity. The traditional promotion campaigns for adults as they are implemented nowadays seem to overlook several material and psychosocial restrictions people face before they can actually be receptive to an external motivation to engage in physical activity. These restrictions might be dealt with when they appear in adult life, by addressing material living conditions and adapting new information programs to psychosocial restrictions. Furthermore, additional interventions that focus on the childhood conditions which may partly generate these material and psychosocial restrictions, and the physical activity pattern may contribute to the decrease of socioeconomic differences in physical inactivity.

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[Educational level and decreases in leisure-time physical activity: predictors from the longitudinal GLOBE study]

Educational level and decreases in leisure-time physical activity: predictors from the longitudinal GLOBE study

This study describes educational differences in decreases in leisure-time physical activity among an adult, physically active population and additionally attempts to identify predictors of these differences from information on health status and individual and environmental factors.

Prospective population based study in South-eastern part of the Netherlands. Baseline measurement were carried out in 1991 and follow up in 1997. The study included 3,793 subjects who were physically active in 1991 and who participated in the follow up. Potential predictors of decreasing physical activity were measured in 1991. Logistic regression analyses were carried out for two age groups (<45 years; ≥45 years) separately.

Lower educated respondents experienced statistically significant higher odds to decrease physical activity during follow up, compared with respondents with higher vocational schooling or a university degree. Perceived control was the main predictor of educational differences in decreasing physical activity in both age groups. In the older group, material problems and a poor perceived health experienced by lower educated people additionally predicted educational differences in decreases in physical activity during leisure time.

These findings have important implications for health promotion practice and policy to prevent socioeconomic differences in physical inactivity and health. There is a need for evidence-based interventions that improve perceived control and reduce material problems in lower educated groups.

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Introduction

Socioeconomic variation in physical activity has been well documented over the past years. People from lower socioeconomic groups engage in physical activity during leisure time less often than higher socioeconomic groups.¹⁻³ Also unfavourable changes in physical activity, like decreasing exercise or becoming sedentary occur more often in lower socioeconomic groups.⁴⁻⁹ Such decreases are related to premature death¹⁰⁻¹³ and socioeconomic differences in decreasing physical activity could accordingly contribute to socioeconomic health differences.

General health promotion activities to reduce unhealthy behaviour have been relatively unsuccessful in lower socioeconomic groups so far.¹⁴⁻¹⁶ Prevention of unhealthy (changes in) behaviour in these groups therefore might prove to be more effective. This study is the first to combine a description of educational differences in decreasing leisure time physical activity among an adult, initially active population with the identification of specific characteristics of lower educated groups that predict their higher odds to decrease physical activity. Knowledge of the predictors of socioeconomic differences in decreases in physical activity might be a valuable input for more effective health promotion policies and activities that tackle socioeconomic differences in physical activity.

Our study included information on three groups of potential predictors of decreasing physical activity, i.e. health status, individual factors, and environmental factors. Decreases in physical activity are often preceded by poor subjective health,⁵ as well as more objective health indicators such as low functional status,^{6, 17} diabetes mellitus,¹⁸ high cholesterol,¹⁸ and increases in, or a high body mass index.^{6, 8-9, 18}

Furthermore, decreasing physical activity is often embedded in a more general unhealthy lifestyle. People who experience subsequent decreases in physical activity are reported to smoke^{5, 8, 18} and consume alcohol⁸ more often than people with stable activity patterns. They also have specific personality characteristics more often, such as high personal uncertainty,⁵ or low perceived control over life.⁷ Other individual circumstances, such as family or work responsibilities may influence physical activity^{4, 19-20} because of competing time claims.

The environment exerts considerable influence on individual behaviour.^{8, 22-23} Environmental factors, like life events or material problems potentially induce stress that could adversely influence physical activity.⁶ Furthermore, environmental circumstances, like lack of economic resources or facilities can affect opportunities for physical activity.^{9, 19-20}

We know that the predictors described above are distributed unequally over socioeconomic groups.^{3, 23} For example, poor health or material disadvantages occur more often in lower socioeconomic groups and may therefore give rise to socioeconomic differences in decreasing physical activity.

Methods

Population

Data were obtained from the longitudinal study on socioeconomic health differences in the Netherlands (GLOBE study).²⁴ In 1991, a random sample of approximately 27 000 persons, drawn from registers of the general non-institutionalised population aged 15-74 years, received a postal questionnaire (response 70.1%). Two subsamples from respondents to the postal questionnaire were additionally interviewed (response 79.4% and 72.3%). People who reported specific chronic diseases were overrepresented in one subsample. Non-respondents only differed from respondents in the subsample that overrepresented chronically ill persons, regarding age and marital status.²⁴⁻²⁵ In 1997, of the 5,667 subjects participating in the interviews in 1991, 328 (5.8%) had deceased, 39 (0.7%) moved abroad, 316 (5.6%) refused to further participate in the longitudinal study before follow up measurement, while 37 (0.7%) could not be traced. This left 4,947 persons (87.3%) eligible for enrolment in the follow up measurements in 1997, of which 4246 persons returned the postal questionnaire (response 85.8%).

Measures

Physical activity during leisure time was assessed using three questions in the postal questionnaires.²⁶ Respondents filled in (1) the average minutes spent walking or cycling to work or shops every day. They also stated (2) how much time they spent on average on leisure time gardening, cycling, walking, and, separately (3) on active sports, per week (Appendix). Minutes spent on daily walking and cycling were multiplied by 6 to calculate time spent weekly and successively added to the time spent on leisure time gardening, cycling, and walking per week. This categorical information on total time spent on gardening, cycling, and walking was combined with time spent on sports into total leisure time physical activity, giving double weight to time spent on sports. Physical activity was

divided into four categories; completely sedentary, lightly active, moderately active, and highly active (Appendix). Decreased physical activity was defined as being categorised one or more categories lower in 1997 than in 1991. Only respondents who were active in 1991 and at risk of decreasing their activity were included in the analyses (N=3,978). Information on physical activity in 1997 was missing for 122 respondents (3.1%).

Highest attained educational level was measured in the postal questionnaire in 1991 and divided into four categories, i.e. higher vocational schooling and university (1=high), intermediate vocational schooling or intermediate / higher secondary schooling (2), lower secondary or vocational schooling (3), and primary school only (4=low). Sixty-three respondents (1.6%) did not report their educational level. Educational level has the advantage that it is available for both men and women, whether they are in paid employment or not, it does not change during adult life, it has a high reliability and validity²⁷ and it is simple to measure and use.

Health status was indicated by perceived general health, the presence of at least one self-reported severe chronic condition, the Nottingham Health Profile, and obesity. All questions were included in the postal questionnaire of 1991. *Perceived general health* was assessed by asking 'How do you rate your health in general?'²⁸ *Severe chronic conditions* comprised heart disease, pulmonary disease, stroke, peptic ulcer, kidney disorders, diabetes, rheumatism or arthritis, illness of the nervous system, and cancer, which were part of a 24-item checklist.²⁸ The *Nottingham Health Profile* reflects health problems in 6 areas: emotional reaction, energy, sleep, pain, physical mobility, and social isolation.²⁹ *Obesity* was defined as a body mass index (self reported weight (kg)/height²(m)) of at least 30.

Individual factors included alcohol consumption, smoking, family and work responsibilities, neuroticism and perceived control. All were included in the postal questionnaire of 1991, except neuroticism and perceived control, which were questioned during the interview. *Alcohol consumption* was questioned using a quantity-frequency method.³⁰ Three *smoking* categories were distinguished, i.e. current smokers, ex-smokers and those who have never smoked. *Work responsibilities* were indicated by being employed, unemployed, or housekeeper (engaged in household duties). The number of children living at home with the respondent indicated *family responsibilities*. *Locus of control* indicated perceived control, measured with a questionnaire based on Rotter's locus of control scale.³¹ A Dutch translation of the Eysenck Personality Questionnaire measured *neuroticism*.³² The scores of locus of control and neuroticism were classified into five equally sized categories (quintiles).

Environmental factors were life events, longlasting difficulties, equivalent income, the occurrence of financial problems, situational difficulties, and housing and neighbourhood circumstances. All were questioned during the interview in 1991, except for life events and financial problems, which were included in the postal questionnaire. Nine negative *life events* in the preceding year included serious illness or death of important persons, substantial decrease in income, or being a victim of robbery or theft.³³ *Long lasting difficulties* during the preceding year were measured with an adapted version of the Dutch Long Lasting Difficulties List.³⁴ Difficulties with health problems of significant others were added up. The score on items of relational and situational difficulties ranged from 0 (no problem or not applicable) to 3 (serious problem) and were added up to arrive at a total score. *Equivalent income* was defined as total net household income divided by the number

of persons depending on that income, giving more weight to adults than to children and classified into five equally sized groups (quintiles). *Financial problems* were indicated by not being able to pay the rent, electricity or food during the preceding year. *Housing conditions* were examined by asking whether draught, cold, or damp were present.³³ Four items on adverse *neighbourhood conditions* included stench, noise from neighbours, noise from traffic, and criminality.³³

Analyses

After excluding cases with missing values 3,793 people were included in the analyses. Logistic regression models with decreasing physical activity as dependent variable and adjusted for gender, age, and physical activity at baseline, were fitted. Furthermore, we adjusted for the overrepresentation of chronically ill. We therefore proportionately weighed the information of the different subgroups (chronically ill and healthy people) to resemble the composition of the population that responded to the postal questionnaire in 1991.

Educational differences in decreasing physical activity did not differ by gender, but were related to age (education*age $p < 0.001$). Explanatory analyses have therefore been carried out separately for the group younger than 45 years ($N=1,297$) and the group of 45 years and older ($n=2,469$).

To test if variables predicted educational differences in decreasing leisure time physical activity, the following procedure was followed. Firstly, each variable was added successively to a logistic model with confounders only. Variables were considered predictors of decreasing physical activity when they showed a statistically significant likelihood ratio χ^2 test ($p < 0.05$), and a clear relationship with decreasing physical activity (statistically significantly *increased* odds ratio). Secondly, the relation between predictors of decreasing physical activity and educational level was described. Thirdly, each predictor of decreasing physical activity, which was inversely related to education, was added to a logistic model containing education and confounders, in order to quantify the prediction of educational differences in decreasing physical activity. This prediction was expressed by the reduction in odds ratios of the different educational groups (should be more than 5% in at least one of the educational groups and no substantial increase of other odds ratios) and the part of the reduction in deviance due to education, which was accounted for by inclusion of the predictor in the model (see footnote Table 3 and 4).

Results

Almost a quarter of the initially active respondents decreased their physical activity level between 1991 and 1997 (Table 1). Almost one fifth of the persons who reduced their physical activity became sedentary. Most respondents (80%) only decreased one category. Educational differences in decreasing physical activity were much larger among the younger group (Table 1). Persons with primary school only in the younger group experienced an almost five times higher chance to decline in physical activity compared with the reference group. Among persons older than 44 years, the lowest educated group was almost 2.5 times more likely to decrease physical activity during follow up than

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persons who had finished higher vocational schooling or university.

Table 1. Educational differences in decreasing physical activity.

Educational level	younger than 45 years				45 years and older			
	#	%	OR	95%CI	#	%	OR	95%CI
High (1)	348	18.8	1.00		411	17.0	1.00	
2	439	30.1	1.94	1.37-2.74	457	16.5	1.01	0.69-1.47
3	423	31.0	2.57	1.81-3.65	1038	19.6	1.36	0.98-1.89
Low (4)	87	41.3	4.98	2.91-8.53	590	23.6	2.41	1.68-3.46
Total	1297	28.0			2496	20.0		

number of respondents physically active in 1991

% weighed prevalence of decreased physical activity between 1991 and 1997

OR odds ratio of decreasing physical activity, adjusted for gender, age, and physical activity in 1991

95%CI 95% confidence intervals of OR

Predictors of decreasing physical activity in the younger group

Table 2 shows the relationship between potential predictors and decreasing physical activity. Health status was not related to declines in physical activity in the younger group (Table 2a). Several individual factors, however, resulted in decreasing physical activity during follow up, like having one child and reporting lower perceived control or high scores on the neuroticism scale (Table 2b). Low equivalent income was the only environmental factor related to decreasing physical activity (Table 2b and 2c). All these risk factors occurred more frequently in lower educated groups, i.e. they more often reported having one child living at home, low perceived control, and low equivalent income (not tabulated). Neuroticism was ambiguously related to educational level, showing a high prevalence of the highest neuroticism scores in the lower educated groups, but the second highest neuroticism scores occurring more often in the highest educated groups (not tabulated).

Table 2a. Association between health status and decreasing physical activity.

Health status	younger than 45 years			45 years and older		
	OR	95%CI	test	OR	95%CI	test
Severe chronic conditions	none	1.00		1.00		**
	at least one problem	1.22	0.85-1.75	1.38	1.10-1.73	
NHP emotions	no problems	1.00		1.00		*
	at least one problem	1.04	0.76-1.44	1.34	1.04-1.72	
NHP energy	no problems	1.00		1.00		**
	at least one problem	1.18	0.78-1.79	1.51	1.13-2.02	
NHP isolation	no problems	1.00		1.00		**
	at least one problem	1.58	0.98-2.54	1.71	1.21-2.42	
NHP mobility	no problems	1.00		1.00		***
	at least one problem	1.44	0.98-2.13	1.69	1.34-2.14	
NHP pain	no problem	1.00		1.00		***
	at least one problem	1.09	0.72-1.64	1.67	1.32-2.12	
NHP sleep	no problem	1.00		1.00		
	at least one problem	1.21	0.86-1.70	1.46	0.94-2.28	
Self-perceived health	(very) good	1.00		1.00		***
	less than good	1.31	0.92-1.88	1.93	1.52-2.44	
Obesity	BMI < 30	1.00		1.00		
	BMI ≥ 30	1.22	0.63-2.36	1.46	0.94-2.28	

* p<0.05, ** p<0.01, *** p<0.001

OR odds ratio of decreasing physical activity, adjusted for gender, age, and physical activity in 1991

95%CI 95% confidence intervals of OR

test likelihood ratio χ^2 test

Table 2b. Association between individual and material, environmental factors and decreasing physical activity.

		younger than 45 years			45 years and older			
Individual factors		OR	95%CI	test	OR	95%CI	test	
Alcohol consumption	abstainer	1.00		***	1.00		*	
	light drinking	0.79	0.56-1.13		0.70	0.53-0.92		
	moderate drinking	0.49	0.31-0.78		0.83	0.60-1.14		
Smoking	(very) excessive drinking	1.34	0.76-2.34		1.20	0.78-1.07		
	never smoked	1.00			1.00		***	
	ex smoker	1.00	0.71-1.42		0.99	0.75-1.31		
Work responsibilities	smoker	1.26	0.95-1.68		1.56	1.17-2.09		
	not employed	1.00			1.00			
	housekeeper	0.83	0.50-1.39		1.03	0.72-1.48		
Family responsibilities	employed	0.89	0.60-1.32		1.03	0.74-1.42		
	no children	1.00		**	1.00			
	0 living at home	1.19	0.50-2.84		0.71	0.50-1.00		
	1 living at home	1.87	1.26-2.83		0.82	0.56-1.21		
Locus of control	2 living at home	1.10	0.74-1.63		0.79	0.52-1.20		
	3 or more living at home	0.66	0.38-1.17		0.58	0.29-1.13		
	internal	1.00		**	1.00		***	
	2	1.43	1.04-1.96		1.58	1.06-2.37		
	3	1.34	0.92-1.95		1.79	1.18-2.72		
Neuroticism	4	1.98	1.35-2.92		2.17	1.47-3.20		
	external	1.79	1.10-2.90		2.26	1.53-3.33		
	hardly	1.00		*	1.00			
	2	1.23	0.81-1.87		0.81	0.57-1.14		
	3	1.49	0.98-2.28		1.19	0.84-1.67		
Material environmental factors	4	1.28	0.86-1.92		0.80	0.57-1.13		
	highly	1.87	1.28-2.73		1.13	0.83-1.55		
	Equivalent income	high	1.00		**	1.00		***
	4	1.38	0.56-3.39		1.14	0.60-2.18		
	3	1.95	0.79-4.78		1.06	0.55-2.03		
	2	2.27	0.93-5.59		1.44	0.75-2.76		
	low	2.91	1.17-7.26		2.23	1.16-4.28		
	Financial problems	none	1.00			1.00		***
	some	1.11	0.78-1.59		1.53	1.14-2.05		
	big	1.56	0.75-3.24		3.32	1.97-5.60		
Situational difficulties	none	1.00			1.00			
	1	0.67	0.49-0.92		1.04	0.77-1.42		
	2	0.94	0.63-1.41		1.61	1.07-2.41		
	3	1.06	0.62-1.82		0.90	0.51-1.57		
	4 or higher	0.91	0.52-1.58		1.18	0.65-2.13		
Neighbourhood circumstances	no problems	1.00			1.00			
	1 problem	1.04	0.77-1.40		1.11	0.86-1.45		
	2 problems	1.56	1.01-2.40		1.35	0.91-2.00		
	3 or 4 problems	1.01	0.56-1.81		2.04	1.11-3.75		
Housing conditions	no problems	1.00			1.00		***	
	1	1.28	0.91-1.79		1.10	0.81-1.51		
	2	0.93	0.60-1.46		1.93	1.26-2.94		
	3 problems	1.13	0.58-2.17		2.84	1.56-5.17		

* p<0.05, ** p<0.01, *** p<0.001

OR odds ratio of decreasing physical activity, adjusted for gender, age, and physical activity in 1991

95%CI 95% confidence intervals of OR

test likelihood ratio χ^2 test

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Table 2c. Association between psychosocial environmental factors and decreasing physical activity.

Psychosocial environmental factors		younger than 45 years			45 years and older		
		OR	95%CI	test	OR	95%CI	test
Life events	none	1.00			1.00		
	2	0.90	0.68-1.20		1.18	0.93-1.51	
	3	0.91	0.63-1.32		1.01	0.72-1.42	
	≥ 4 events	1.43	0.80-2.56		1.60	0.95-2.69	
Long lasting difficulties with health of others	none	1.00			1.00		
	1	1.07	0.80-1.43		0.90	0.71-1.14	
	2	1.63	1.03-2.58		1.27	0.90-1.80	
Long lasting difficulties with relationships	≥ 3 difficulties	1.38	0.54-3.50		0.79	0.37-1.68	
	none	1.00			1.00		
	1	1.12	0.82-1.54		1.28	0.96-1.72	
	2	1.21	0.83-1.77		1.09	0.73-1.64	
	3	1.23	0.78-1.94		1.32	0.90-1.95	
	high	1.40	0.93-2.11		1.08	0.74-1.59	

* p<0.05, ** p<0.01, *** p<0.001

OR odds ratio of decreasing physical activity, adjusted for gender, age, and physical activity in 1991

95%CI 95% confidence intervals of OR

test likelihood ratio χ^2 test

Predictors of decreasing physical activity in the older group

Table 2a shows that in the older group all self reported health problems, except the Nottingham sleep profile and obesity, predicted decreasing physical activity during follow up. People who smoked or reported lower perceived control experienced decreases in physical activity during follow up more frequently (Table 2b). Also people with lower equivalent incomes, financial problems, or detrimental housing conditions experienced declines in physical activity more often (Table 2b).

All risk factors for decreasing activity among this older group occurred more often in lower educated groups (not tabulated). This was particularly true for perceived general health.

Prediction of educational differences in decreasing physical activity

Variables that predicted decreases in physical activity (Table 2) were all related to educational level and therefore selected into analyses of the contribution of each variable to the prediction of educational differences in decreasing physical activity.

Educational differences in decreasing physical activity in the younger group were predicted partly by perceived control and family responsibilities (Table 3). Both predictors together decreased the odds ratios with about 20%, and explained more than one third of the educational variation in decreasing physical activity (%RD). Neuroticism and equivalent income did not predict the educational differences in decreasing activity. The remaining educational differences were however still statistically significant. The lowest educated group was still almost four times more likely to experience decreases in activity compared to the highest educational group.

Educational differences in decreasing physical activity in the older group were predicted by the low perceived control in lower educated groups as well (Table 4). Furthermore, less than good perceived health, financial problems and detrimental housing conditions contributed to educational differences in decreasing physical activity (Table 4). Equivalent income and the Nottingham Health Profile did not predict educational differences. The

four predictors together accounted for more than half of the increased odds of decreasing physical activity in the lower educated groups, while the educational variation was reduced with almost 60% and educational differences were no longer statistically significant.

Discussion

We report results from a longitudinal study, showing that adverse changes in physical activity during leisure time were more frequent in lower educated groups. Low perceived control in the lower educated groups was the most important predictor of educational differences in decreasing physical activity. Educational differences in the younger group were further predicted by family responsibilities. In the older group, poor perceived health and problems with finances and housing predicted more decreasing leisure-time activity in lower educated groups.

Limitations of the study need to be considered in the interpretation of the results. Firstly, people lost-to-follow up were less active in 1991. Less active persons do decrease their physical activity less often ($p < 0.0001$) and are more prevalent in lower educated groups. This might have resulted in an overestimation of educational differences in decreasing activity. Furthermore, loss-to-follow up was higher in lower educated groups and those lost-to-follow up showed higher prevalence of predictors of decreasing physical activity, like lower perceived control and poor perceived health. Those lost-to-follow up therefore can be expected to relatively more often have decreased physical activity. This suggests that the presented educational differences in decreasing physical activity might have been underestimated because of selective loss-to-follow up.

Secondly, physical activity was self reported. We, however, assume reporting bias to have the same impact in both years, not influencing analyses of changes in physical activity.

Thirdly, the study was not specifically designed to predict long-term physical activity change. Therefore, we could not include well-known predictors of behavioural change, such as self-efficacy,²¹ cognitive and motivational factors,^{22, 35} and stages of change assessments.³⁶

Fourthly, the six and a half year span between data collection periods is rather long. It is impossible to know when the observed changes occurred and what other temporary changes in physical activity and predictors may have occurred in the mean time.

Perceived control was the main predictor of educational differences in decreasing physical activity in both age groups. Many authors have emphasised self-control to be a powerful predictor of behavioural change.^{21, 37-39} People with low perceived control lack confidence about the relation between behaviour and outcomes, and have lower perceived abilities to produce desired outcomes or prevent undesired outcomes themselves, leading to passivity.³⁸⁻³⁹ Furthermore, it has been acknowledged that low perceived control is more common among lower educated persons.³⁹⁻⁴¹ We think that health promotion could benefit from finding ways to stimulate control beliefs in lower social classes. In any case, interventions targeting physical activity should anticipate the low control beliefs of lower socioeconomic groups to increase their effectiveness.

Table 3. Explanation of educational differences in decreasing physical activity in the group younger than 45 years.

Educational level	Model A	Model A + locus of control		Model A + family responsibility		Model A + both	
	OR ^a	OR ^a	% ^b	OR ^a	% ^b	OR ^a	% ^b
High (1)	1.00	1.00		1.00		1.00	
2	1.94 *	1.82 *	13	1.89 *	12	1.76 *	19
3	2.57 *	2.41 *	10	2.46 *	7	2.28 *	18
Low (4)	4.98 *	4.44 *	14	4.49 *	5	3.94 *	26
RD education ^c	45.576	40.910		38.658		28.320	
p-value RD education	0.0000	0.0000		0.0000		0.0000	
ΔRD education ^d		4.666		6.918		17.256	
% ΔRD ^e		10.2		15.2		37.9	

Table 4. Explanation of educational differences in decreasing physical activity in the group of 45 years and older.

Educational level	Model A	Model A + perceived general health		Model A + locus of control		Model A + housing conditions		Model A + financial problems		Model A + all	
	OR ^a	OR ^a	% ^b	OR ^a	% ^b	OR ^a	% ^b	OR ^a	% ^b	OR ^a	% ^b
High (1)	1.00	1.00		1.00		1.00		1.00		1.00	
2	1.01	0.94		0.90		0.98		0.96		0.85	
3	1.36	1.23	36	1.19	47	1.30	17	1.30	17	1.09	75
Low (4)	2.41 *	2.01 *	28	1.99 *	30	2.21 *	14	2.20 *	15	1.68	52
RD education ^c	33.037	21.459		22.742		27.502		26.781		14.001	
p-value RD education	0.0000	0.0001		0.0000		0.0000		0.0000		0.0029	
ΔRD education ^d		11.578		10.295		5.535		6.256		19.036	
% ΔRD ^e		35.0		31.2		16.8		18.9		57.6	

Note: Model A includes confounders and educational level

c reduction in deviance due to inclusion of education in the model

* 95% confidence interval does not include 1

d ΔRD = [reduction in deviance due to education of model A] - [reduction in deviance due to education of model A+predictor]

a odds ratio, adjusted for gender, age, and physical activity in 1991

e percentage explained of reduction in deviance due to education in model A = $[\Delta RD / RD \text{ education of model A}] * 100\%$

b % reduction in odds ratio = $[OR \text{ model A} - OR \text{ model A} + \text{predictor}] / [OR \text{ model A} - 1]$

Family responsibilities, i.e. having one child living at home, adversely changed physical activity in the younger group and occurred more frequently in lower educated respondents. On the other hand, having two or more children at home was related to a stable activity pattern and was more prevalent among higher educated persons. Respondents with one child may be more likely to have another child during follow up and increase their time limitations for activity, compared to respondents having more children already at baseline. On the other hand, the number of children might also be a marker of socioeconomic status, i.e. the more children, the higher the socioeconomic status, the lower the chance to decrease physical activity.

Perceived general health was as important a predictor of decreasing physical activity as low perceived control in the older group. Physical unfitnes or disease is often proposed an important predictor of unfavourable changes in physical activity.^{9-10, 17, 19} Other, more 'objective' health measures, however, failed to contribute to the explanation of educational differences in decreasing activity. Poor perceived physical condition of lower educated people above their mid-40s could be overcome by emphasising convenient, less strenuous activities in health information.

Material factors, in particular poor housing conditions and financial problems (but not income) predicted educational differences in decreasing physical activity in the older group. These findings suggest that not the low status aspect of a disadvantaged material position is important, but the problems (barriers) people may experience as a consequence of this position. A wide range of policies could potentially influence physical activity, such as financial redistribution systems, financial management courses, collective renovation of houses in low socioeconomic neighbourhoods, or decisions to increase the number of accessible and inexpensive facilities for physical activity.

The predictors of educational differences in decreasing physical activity identified in this paper imply several possibilities for health promotion programs and policies to reduce socioeconomic differences in physical inactivity. Low perceived control, poor health and material hardship need to be dealt with in health education, health promotion programs and policies that may affect health behaviour.

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Appendix: Measurement of physical activity

How much time do you spend on average walking or cycling to work or shops per day?

.. minutes.

How much time do you spend on average gardening, leisure cycling or walking per week?

- no time
- less than 1 hour
- 1 to 2 hours
- more than 2 hours

How much time do you spend on average on active sports per week?

- no time
- less than 1 hour
- 1 to 2 hours
- more than 2 hours

Appendix: Categories of physical activity

		Physical activity categories			
		none	<1 hour	Sports 1-2 hours	≥2 hours
Leisure activity	none	no	light	moderate	high
	<1 hour	light	light	moderate	high
	1-2 hours	light	moderate	moderate	high
	≥2 hours	light	moderate	high	high

Part IV

[Discussion]

Chapter 10

[Discussion]

Summary of results

In this thesis, socioeconomic differences in health related behaviour during different phases of the life course are described. Substantial socioeconomic differences in health related behaviour are already observed during adolescence. We report a clear relation between occupational level of the father and daily smoking during adolescence, equalling the magnitude of socioeconomic differences among adults. These occupational differences in smoking were present and stable right from the onset of daily smoking during adolescence. Furthermore, adolescents from lower occupational backgrounds drank large amounts of alcohol significantly more often than their peers from higher occupational backgrounds. These occupational differences in high alcohol consumption developed only later during the adolescent period. Also during adulthood, substantial educational differences in both health related behaviour and unhealthy behavioural choices are observed. Less educated adults report inactivity more often than those with higher vocational schooling or university training. Among those physically active at the start of the study, decreases in leisure-time physical activity are more common in less educated groups. Less educated men drink alcohol excessively twice as often as the highest educated men, while no educational differences in alcohol consumption are found among women. Among those drinking in a light or moderate manner at the start of the study, less educated persons are more prone to start excessive alcohol consumption. Less educated groups more often smoke and continue to smoke, even though smokers from all educational groups are equally willing to quit smoking.

In this thesis, we further studied the role of several individual and environmental factors in the explanation of socioeconomic differences in health related behaviour and unhealthy behavioural changes. Socioeconomic differences in individual factors bring about socioeconomic differences in health related behaviour. Adolescents from lower occupational backgrounds experience higher odds of smoking daily and drinking large amounts of alcohol compared with peers whose fathers had a higher occupational status, due to their lower intelligence scores (Table 1). Less educated adults more often report low perceived control and neuroticism, which increases their susceptibility to (continued) smoking, being or becoming physically inactive, and excessive drinking (Table 2). Less educated adults are less confident about their ability to quit smoking, which results in a higher propensity to continue smoking.

Material environmental factors, like living with financial problems, material deprivation, or lower incomes encourage smoking, excessive drinking and physical inactivity in less educated groups (Table 2). Psychosocial environmental factors also contribute to socioeconomic differences in health related behaviour. Higher exposure to favourable social attitudes with regard to alcohol consumption provokes drinking by adolescents from lower occupational backgrounds (Table 1). Modelling behaviour of fathers and friends encourages both daily smoking and high alcohol consumption in adolescents whose fathers had a lower occupational status (Table 1). Low social support or low attachment to parents explains why lower socioeconomic groups are physically inactive, (start to) drink large amounts of alcohol and continue to smoke more often (Table 1 and 2).

Table 1. Explanation of the relationship between occupational level of the father and health related behaviour of adolescents

Predictors	Smoking ^a	Alcohol ^b
Individual factors		
Self-esteem		
Neuroticism		
Health locus of control		
Behavioural problems		
Personal general attitude towards behaviour		
Attitude towards smoking friends		
Attitude towards smoking adults		
Belief smoking is as bad for your health as people say		
Belief smoking will affect health when you are older		
Number of reasons to smoke		
Performance at school		
Intelligence	X	X
Psychosocial environmental factors		
Behaviour mother		
Behaviour father	X	
Smoking behaviour of family at home		
Alcohol problems in family noticeable to adolescent		X
Behaviour of friends	X	
Attitude towards alcohol consumption in general of parent		
Mother's attitude towards alcohol consumption adolescent		
Father's attitude towards alcohol consumption adolescent		
Friends' attitude towards alcohol consumption adolescent		X
Have your parents told you anything about alcohol		
Has school told you anything about alcohol		
I belong to organised groups, clubs or activities		
Family relationships		
Attachment to parents		X
Relationship with parents		
Attachment to friends		
Recalled number of pro-alcohol messages in media		
Material environmental factors		
Child receives pocket money		
Number of children in family		
Unemployment of father in last 2 years		

White cells mean that that specific factor was not tested for its contribution to explanation of occupational differences

^a daily smoking vs. not smoking daily

^b 25% of adolescents consuming the highest amount of alcohol vs. 75% of adolescents drinking less or no alcohol

Methodological issues

Self-reported information

The use of self-reported data on health related behaviour and determinants of behaviour might have introduced a potential source of bias. Both adults and adolescents are likely to adjust their report of health related behaviours towards socially acceptable levels. Since people with a higher socioeconomic status value health and a healthy life style more than people from lower socioeconomic groups,¹⁻² they might be more inclined to underestimate their excessive alcohol consumption or smoking, while overestimating their physical activity level. Such reporting bias would augment socioeconomic differences in unhealthy behaviour in the study population. However, the rare literature on underreporting of alcohol consumption in relation to socioeconomic status in adults shows no differences between socioeconomic groups in the extent of underreporting.³⁻⁴

Table 2. Explanation of educational differences in (changes in) health related behaviour

Predictors	Inactivity ^a	Decreased inactivity ^b		Smoking ^c	Continued smoking ^d	Intention to quit smoking ^e	Excessive alcohol consumption ^f		Start excessive drinking ^g
		< 45	≥ 45				men	women	
Individual factors									
Neuroticism	X			X	X		X	X	
Locus of control	X	X	X		X				
Parochialism	X								
Coping styles:									
active problem focussing	X								
optimistic reaction								X	
palliative reaction								X	
Perceived general health			X		X				
Chronic illness					X				
Nottingham Health Profile									
Attitude smoking cessation									
Self-efficacy smoking cessation									
Psychosocial environmental factors									
Life events									
Chronic difficulties health of significant others				X					
Chronic difficulties relationships									
Number of children		X							
Lack of emotional support					X				X
Lack of instrumental support									
Social norms smoking cessation									
Material environmental factors									
Financial problems			X	X			X	X	X
Equivalent income	X			X				X	
Social deprivation				X				X	
Material deprivation				X			X	X	
Chronic situational difficulties									
Employment status	X						X		
Housing problems			X						
Neighbourhood problems									
Crowding									

White cells mean that that specific factor was not tested for its contribution to explanation of educational differences in (changes in) behaviour

^a Physical inactivity during leisure time vs. physically active

^e Intention to quit smoking vs. no intention to quit smoking among smokers in 1997

^b Decreased physical activity vs. stable physical activity among physically active in 1991

^f Excessive alcohol consumption vs. light and moderate consumption

^c Smoking vs. never smoked (Stronks et al., 1997)

^g Start excessive alcohol consumption vs. light and moderate drinking among light and moderate drinkers in 1991

^d Continued smoking vs. have stopped smoking among smokers in 1991

The self-report of leisure-time physical activity in the GLOBE study combines information on sports and daily walking or cycling. The classification of people as inactive or active is, however, mostly the result of differences in time spent on walking and cycling, while time spent on sports is most distinctive between light, moderate, and high activity. We assume that social acceptability and social health norms mainly apply sports and that reporting bias, hence, has not affected the classification of people as inactive. We therefore believe that educational differences in inactivity were estimated correctly. Self-administered questionnaires have proven to be an accurate source of information on smoking habits,⁵⁻⁶ with no significant differences between social classes in the misclassification of smokers as non-smokers.⁷ The Dunedin Multidisciplinary Health and Development Study verified the self-report of smoking status of adolescents with saliva cotinine concentrations showing high sensitivity (96%) and specificity (82%).⁸ Reporting bias in determinants of health related behaviour might have occurred specifically with regard to sensitive information, such as income or deprivation. Psychosocial environmental and individual factors seem less sensitive to social norms and perceptions of social desirability and, hence, to underreporting. The occurrence of material restrictions, however, might be perceived as more embarrassing and therefore underreported in self-administered questionnaires as used in the GLOBE study and the Dunedin study. It might be argued that higher socioeconomic groups would be more embarrassed by material deprivation because it defers from the living standards and norms of their social environment. In case of an equally strong association between material factors and behaviour in all socioeconomic groups, this would result in an overestimation of socioeconomic differences in adverse material environmental circumstances and hence of their contribution to the explanation of socioeconomic differences in unhealthy behaviour.

Cross-sectional analyses

Cross-sectional data are used to answer a causal research question concerning the explanation of educational differences in health related behaviour. Cross-sectional analyses capture the result of a combination of processes, i.e. determinants have influenced behaviour, behaviour has influenced certain determinants, etc. This combination of selection and causation processes leads to an overestimation of the contribution of determinants to the causal explanation of socioeconomic differences in health related behaviour.

Particularly material environmental factors might be subject to selection processes related to unhealthy behaviour. Smoking or drinking, for example, might contribute to financial problems, because of the money spent on tobacco or alcohol. By analogy, material factors should be stronger determinants of behaviour in cross-sectional analyses compared with longitudinal analyses. This, however, only applies to smoking behaviour in the GLOBE data. This could mean either that selection processes do not play a major role in the relation between material factors and behaviour and that there is another explanation for the described discrepancies between cross-sectional and longitudinal smoking analyses or that selection only occurs with regard to smoking.

Psychosocial environmental factors, such as chronic difficulties or social support are unlikely to be affected by unhealthy behaviour, except in the case of excessive alcohol

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consumption. Excessive drinking is associated with major social and health related problems⁹⁻¹⁰ and can be considered socially unacceptable behaviour, giving rise to stress and social isolation. Our and others' longitudinal analyses, however, show that stress and poor social relations predict excessive alcohol consumption as well.¹¹⁻¹³

It is not expected that individual factors, such as personality or intelligence, are affected by health related behaviour, since they are known to be relatively stable over time.¹⁴⁻¹⁷

Longitudinal analyses

A special methodological problem in longitudinal research concerns changes that may occur to the composition of a sample over time due to drop out of study participants. The GLOBE study twice measured health related behaviours within 6,5 years. Attrition between these waves was significantly higher among less educated groups. Selective attrition might affect the estimation of educational differences in behavioural change. We checked a possible attrition effect, using available baseline information, by comparing the relation between educational level and predictors of continued smoking, decreasing physical activity, and starting excessive drinking between the group that participated in both waves and the group which only participated the first time. We find educational differences in some predictors, i.e. neuroticism, poor perceived health, and financial problems to be greater in the group that responded twice. Assuming that predictors would have had the same effect on behavioural change in both groups, this might have led to an overestimation of educational differences in behavioural change. Educational differences in social support, income and chronic diseases, however, are smaller in the group included in the follow-up, which might have led to an underestimation of educational differences in changes in behaviour. We believe that attrition had no substantial effect on educational differences in continued smoking and decreased physical activity, since these behaviours are explained by multiple predictors which cancels out the hypothesised effects. Educational differences in starting excessive alcohol consumption are mainly explained by financial problems, so attrition might have led to a slight overestimation of educational differences in starting excessive alcohol consumption.

The Dunedin Multidisciplinary Health and Development Study accomplished very high follow-up rates.¹⁸ Several comparisons of those who were in the sample at a certain measurement wave with those who were not, have usually shown that the missing data have not significantly affected results.¹⁸ Attrition effects are further minimised by the use of longitudinal logistic GEE analyses to study the association between father's occupation and adolescent behaviour during the whole adolescent period. These GEE analyses utilise information from all available measurement waves of one person, irrespective of missing information during other waves.

Longitudinal analyses assess causal relationships, since determinants are measured before the behaviour occurs. The 6,5 years span between the two measurement waves of the GLOBE study is rather long. It is impossible to know when the observed changes in health related behaviour occurred and what other temporary changes in behaviour and predictors may have occurred in the mean time. It could be hypothesised that the contribution of determinants with great variability over time, such as material conditions, or with relative short impact timeframes, like life events, has been underestimated, although, in our longitudinal analyses, the association between these factors and health

related behaviour was in most cases not weaker than in cross-sectional analyses.

Discussion of results described in this thesis

The contribution of several individual and environmental factors to the explanation of socioeconomic differences in health related behaviour and unhealthy behavioural changes is explored.

We report that material environmental factors contribute more to cross-sectional educational differences in unhealthy behaviour than to socioeconomic differences in behavioural changes. This is only logical, taking into consideration that material factors act as barriers or have their impact through the stress mechanism. Smoking or excessive alcohol consumption are, for example, common and known mechanisms to alleviate (material) stress.¹⁹⁻²¹ Material barriers to behave healthily apply consummately to physical activity. Persons with a lower equivalent income are more often physically inactive, because they cannot afford necessary equipment or membership of a sports club.²²⁻²⁴

Psychosocial environmental factors that contribute to socioeconomic differences in health related behaviour, i.e. social support during adulthood and parental attachment, social attitudes and modelling behaviour during adolescence, all reflect the impact of social networks. Within such a network, certain forms of behaviour are supported by existing social norms and modelling behaviour.²⁵⁻²⁷ Furthermore, social support and adequate attachment help people to cope with stress, pressure and variant social norms, reducing the need for palliative coping through smoking or alcohol consumption.²⁷⁻³² On the other hand, does poor social embeddedness in society, or even social isolation, result in poor behavioural regulation and control and hence more unhealthy behaviour.³⁰⁻³³

Psychosocial stressors hardly affect educational differences in health related behaviour, because they were not predictive of health related behaviour. Others similarly reported that differential exposure to stressors only account for a small part of socioeconomic differences in the consequences of stress.^{32, 34-35} The Dunedin study also includes information on the occurrence of life events, problems and stress, but these were all measured later during adolescence and therefore excluded from the analyses of causal determinants of adolescents' smoking and alcohol consumption.

We report that individual factors play a considerable role in the explanation of socioeconomic differences in health related behaviour and to a lesser extent to socioeconomic differences in unhealthy behavioural changes. The contribution of individual characteristics to socioeconomic differences in behaviour very likely reflects a causal effect, because they are relatively stable over time¹⁴⁻¹⁷ and hence are not likely affected by behaviour. Selection effects are nevertheless plausible for perceived control or self-efficacy³⁸ and health status,³⁶⁻³⁷ although the latter was only studied longitudinally, excluding selection effects.

Many authors have already emphasised self-control to be a powerful predictor of behavioural change.³⁹⁻⁴² This thesis describes that less educated people continue to smoke and are physically inactive or decrease their activity, because they lack confidence about their ability to control their personal life and health by means of their own behaviour. We further identify low self-efficacy as a disadvantage to lower socioeconomic people who want to stop smoking. Locus of control and fearfulness or neuroticism do, however, not

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contribute to the explanation of occupational differences in health related behaviour during adolescence. Personality needs time to develop and the measurement of locus of control and neuroticism at age 11 or 13 might therefore have been too early. A study in the same birth cohort points towards personality continuity between age 18 and 26, but at the same time concludes that many adolescents became more controlled and confident during the same period.¹⁷ On the other hand, it might just be true that personality does not play an important role in behavioural choices during adolescence, which may be more determined by environmental factors such as modelling behaviour and social norms.

Intelligence, however, is an important individual determinant of socioeconomic differences in both adolescent smoking and alcohol consumption. Adolescents with lower intelligence (IQ) scores might use smoking and alcohol consumption to counterbalance their lower academic success⁴³ or alternatively, because lower intelligence in itself decreases the opportunity to achieve higher education and occupational status, adolescents with lower IQ scores may be ready to assume adult roles and behaviour earlier. Further, they may be less amenable to the messages on the negative health consequences of anti-smoking and alcohol programs. The rare studies that analysed explanations for socioeconomic differences in health related behaviour during adolescence also report academic competence or achievement to be one of the main explanatory tracks.²⁶⁻²⁷

The effect of health status on health related behaviour was studied only using longitudinal information to exclude the anticipated effect of behaviour on health. We find no relation between adolescents' health at baseline and smoking or alcohol consumption (not shown). Poor health, however, is an important predictor of educational differences in decreasing physical activity and continued smoking among adults. Physical unfitnes or disease is often proposed to be an important predictor of unfavourable changes in physical activity,⁴⁴⁻⁴⁶ due to the physical constraints entailed. Smoking is believed to be the coping mechanism, with which the stressful feelings of discomfort and poor health that are more often reported by less educated groups are dealt with. Such a paradoxical mechanism has been brought up previously to explain similar findings.^{20, 47}

There are many models and theories that attempt to explain behaviour and behavioural changes, such as the theory of Planned Behaviour,³⁹ the Social Learning theory,⁴⁰ or the Transactional theory.⁴⁸ In this thesis, we identify determinants that play an important role in the explanation of socioeconomic differences in health related behaviour and, hence, could play a prominent role in interventions to reduce unhealthy behaviour in lower socioeconomic groups. Part of the identified determinants, such as perceived control, social attitudes, and modelling behaviour are important components of these theories. Many of these determinants, such as financial situation, personality, or social support are, however, categorised as distal, predisposing factors having their (assumed small) effect on behaviour through other main components of the models. Our findings justify a more explicit role of these factors in theories and models explaining behaviour, for example, as has been proposed in the Theory of Triadic Influence.⁴⁹

Future directions

The studies described in this thesis are among the first that combine the description of socioeconomic differences in (changes in) health related behaviour with explanatory analyses. Future studies should now explore the processes leading to socioeconomic differences in identified determinants of unhealthy behaviour, such as socioeconomic differences in intelligence, social norms, or perceived control. Furthermore, we need a clearer understanding of the way by which determinants, such as social support or intelligence, have their impact on health related behaviour.

Additional studies are needed to fill the gaps in the current knowledge about the background of (the development of) socioeconomic differences in health related behaviour, addressing issues such as social cohesion,⁵⁰ social comparison,^{21, 51} or possibly the genetic determination of health related behaviours.⁵²⁻⁵⁴

The relationship between socioeconomic status and behaviour during different phases of the life-course needs to be clarified, incorporating models of both early and later life influences.⁵⁵⁻⁵⁷ Studies which follow individuals from birth through to adult life will be invaluable in this task.⁵⁵

The GLOBE study was initially not specifically designed to predict (long-term changes in) health related behaviour and the determinants studied derived from general ideas and theories concerning the explanation of socioeconomic health differences.⁵⁸⁻⁵⁹ Therefore, well-known predictors of behaviour, such as self-efficacy,⁴⁰ cognitive and motivational factors^{39, 60} or stages of change assessments⁶¹ were not included. Part of this drawback of the original design of the GLOBE study was compensated for with the cross-sectional inclusion of components of the Theory of Planned Behaviour regarding smoking cessation in the second measurement wave. Future studies should extend the analyses of the contribution of the Theory of Planned Behaviour and other prevailing psychosocial behavioural theories to socioeconomic differences in various health related behaviours. Notwithstanding, we identified important determinants of socioeconomic differences in health related behaviour, with great value for the design of more effective interventions regarding behaviour.

How to reduce socioeconomic differences in health related behaviour

The description and explanation of socioeconomic differences in health related behaviour in this thesis make clear that behaviours occur in a socioeconomic context and that they are a response to individual factors as well as environmental circumstances. Our result provoked us to think about and formulate some possible recommendations for interventions, i.e. policies and programs to reduce socioeconomic differences in health related behaviour.

Strategies to reduce socioeconomic differences in behaviour

Interventions to reduce socioeconomic differences in behaviour effectively, should employ both universalist and high-risk strategies. The universalist or structural approach

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addresses the whole society, like for example in the case of changing the socioeconomic stratification or removing general barriers, while the high-risk strategy implies identifying those in special need and controlling their level of exposure or providing protection against the effects of exposure.⁶²

It is still believed that universal welfare services are needed to address the structural sources of inequality to tackle the overall burden of inequalities and relative disadvantage.^{51, 63-64} Universalist interventions that remove barriers for healthy behaviour have been effective in the reduction of socioeconomic differences, in contrast to what is often believed.⁶⁵⁻⁶⁶ As many different policy fields potentially affect health and related behaviour, all policies, like for example geographical planning, need to be assessed for their potential impact on socioeconomic differences in health and related behaviour.⁶³

In addition, policies and programs that specifically target those from lower socioeconomic backgrounds, matching their needs and norms, are needed to accomplish an appreciable decrease in socioeconomic differences in unhealthy behaviour and consequently health.⁶⁴⁻⁶⁷ Most selective strategies targeting lower socioeconomic strata, however, tended to be unsuccessful⁶⁶ and to contribute to stigmatisation.^{65, 68} Community-based interventions in lower socioeconomic groups that target commitment and participation, however, seem very promising^{66, 69} and are now promoted as one of the key strategies for behavioural change.^{66, 69-71} Intersectoral cooperation, nationally as well as locally, is furthermore one of the most important prerequisites for successful interventions on health related behaviour in lower socioeconomic groups.⁶⁹

Interventions to reduce socioeconomic differences in behaviour

The basic cause of socioeconomic differences remains socioeconomic inequality, which, as such, is a proper target for intervention.^{62, 68, 72} Universal welfare services such as publicly funded education, employment and income could reduce the overall burden of inequalities and relative disadvantage.^{51, 63-64}

In this thesis we report that socioeconomic differences in smoking and alcohol consumption already develop at very young ages and that smoking initiation at young age predicts educational differences in smoking cessation in adulthood. Programs should therefore start to promote healthy behaviour at an early age. School based programs have been particularly effective in delaying the onset of unhealthy behaviour in the USA⁷³ and can relatively easily reach children of poorer socioeconomic backgrounds.⁶⁶ Programs targeted at adolescents are more likely to succeed when combined with a supportive environment, consonant with the culture and norms of lower socioeconomic strata,^{69, 74} including, for example, social pressure in favour of abstinence or role models who do not smoke or drink.⁷⁵ Furthermore, programs that strongly emphasise the acquirement of resistance skills or protective attitudes in adolescents have effectively reduced smoking in adolescents.⁷⁶⁻⁷⁸ Restrictions in the access to tobacco or alcohol decrease over-all smoking and alcohol consumption levels and could potentially contribute to a reduction of socioeconomic differences in unhealthy behaviour. There is, however, little evidence for any effect of restrictions on youth access to tobacco on smoking prevalence.⁷⁹

In this thesis we identified determinants of socioeconomic differences in health related behaviour that would contribute greatly to effective programs that reduce unhealthy behaviour or behavioural choices among lower socioeconomic groups, like for example material circumstances, modelling behaviour or personality. Individual barriers for healthy

behaviour, like low perceived control and self-efficacy among adults, or low intelligence scores among adolescents should be alleviated. Intelligence is known to be subject to environmental influences.^{58, 80-82} Reviews on long-term effects of early childhood education and day-care found persistent positive effects on achievement and academic success,⁸³⁻⁸⁴ future socioeconomic status,⁸⁴ as well as on IQ.^{81-82, 84}

Feelings of low control and self-efficacy could be ameliorated through programs with a so-called empowerment focus⁸⁵⁻⁸⁷ that emphasise the development of personal competence and a sense of mastery and control and cultivate resources and skills for action.⁸⁵ For example, the training of skills such as problem solving and coping are among the most efficacious interventions concerning smoking cessation.⁷⁹ Individual empowerment is, however, not optimally successful as long as the cultural, social, and political context in which people live is not recognized.^{43, 85, 87} Programs need therefore to include community empowerment to collectively provide the social support and control necessary to achieve equity in skills, resources and behaviour.^{85, 87-89} Such programs could best employ a community-based participatory approach,^{66, 69, 85, 88-89} since other programs to improve social support until now have generally produced weak or equivocal results.^{33, 90}

We need evidence-based programs that reduce material barriers for healthy behaviour in lower socioeconomic groups. Financial problems could, for example, be reduced by income supplementation programs or financial management courses that help people tuning their expenditures to their income. There is, however, no reliable indication about the anticipated effect, since evaluation studies of income supplementation generally did not consider health (behaviour) outcomes.⁹¹ Tobacco or alcohol taxation, despite their overall positive effect, would only penalise continuing smokers and drinkers within the poorer groups of society, who are least able to find a way out of addiction.⁷⁹ Material barriers for participation in physical activity are diminished by emphasising cheap forms of exercise that do not depend on attendance at a facility and that can be easily integrated into an existing lifestyle.⁹²⁻⁹³ Further is the provision of appropriate, safe, and accessible environment for physical activity one of the potentially most effective interventions to promote activity.⁹⁴

Although we do not yet fully understand the determinants of socioeconomic differences in behaviour and we particularly lack knowledge on the effectiveness of behavioural interventions in lower socioeconomic groups, delaying the active alleviation of socioeconomic differences in our society is unacceptable. In line with our conclusion, the second Dutch Program Committee on SocioEconomic Health Differences and the Great Britain Independent Inquiry into Inequalities in Health recommended comprehensive approaches to reduce socioeconomic differences in health related behaviour.^{65, 66} Prompt implementation of promising interventions on the one hand would actively address unhealthy behaviour in lower socioeconomic groups. On the other hand evaluation of such interventions would provide important information to improve our knowledge on behavioural determinants and the effectiveness of interventions.

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[Summary]

Health related behaviours are an important determinant of health and part of the causal explanation for socioeconomic differences in morbidity and mortality. The fact is that a lower socioeconomic status is generally associated with higher rates of health damaging behaviour, such as smoking or poor diet and lower rates of health promoting activities, like physical activity. Socioeconomic differences in unhealthy lifestyles already appear during adolescence and also tend to grow during adulthood, because people from lower socioeconomic groups more often make unhealthy behavioural choices.

Until today we are still in need of an explanation for the fact that those in the most socially disadvantaged positions seem least able to adopt healthier lifestyles. In the absence of a clear and unambiguous explanatory model for socioeconomic differences in health related behaviour, explanations derive from more general explanations for the health related behaviour of people. Predictors of health related behaviours could be broadly divided into individual influences and environmental circumstances.

Critical to the explanation of socioeconomic differences in health related behaviour are the individual characteristics of persons, whether innate or acquired, i.e. their intelligence, their skills or self-efficacy, their physical and mental qualities, and their personality and personal dispositions and attitudes.

Also the environment exerts considerable influence on individual behaviour by producing stress, by providing environmental opportunities to engage in certain behaviours and by social cohesion that enforces patterns of social norms, control and support. Environmental factors can derive from material or psychosocial sources. Psychosocial factors are social support, social norms, and psychosocial stress. Material factors relate to poor quality housing, air pollution and other neighbourhood aspects, and material deprivation.

Socioeconomic differences in health related behaviour during adolescence

Lifestyle patterns are largely developed and perpetuated during adolescence. Not much is known about the development of socioeconomic differences in unhealthy lifestyles during adolescence and even less about the determinants of this process. The Dunedin Multidisciplinary Health and Development Study is a longitudinal investigation of the health, development and behaviour of a cohort of New-Zealand children from birth until adulthood. This study collected extensive information on many predictors of adolescent behaviour, which provides a unique opportunity to describe and study explanations for the association between occupational level of the father and smoking and alcohol consumption during adolescence.

Using data from this study, we report a clear relation between occupational level of the father and daily smoking during adolescence. These occupational differences in smoking were present and stable right from the onset of daily smoking at the age of 13 years. Furthermore, adolescents from lower occupational backgrounds drank large amounts of alcohol significantly more often than their peers from higher occupational backgrounds. These occupational differences in high alcohol consumption increased during adolescence and started at age 15. There was no relation between father's occupational level and frequency of alcohol consumption among adolescents.

An important explanation for the relation between occupation of the father and

adolescents' daily smoking and high alcohol consumption is the lower intelligence scores among children from fathers with a lower occupational level. This might reflect the mechanism by which socioeconomic differences in behaviour among adults are effectuated. Adolescents with lower intelligence levels will be less likely to achieve higher education or occupational status and hence will become adults with lower socioeconomic status, while lifestyle patterns are largely perpetuated during adolescence and likely to continue into adulthood. Adolescents with lower intelligence scores may use smoking and alcohol consumption to counterbalance their lower academic success. On the other hand, because they have less favourable future perspectives, they may be ready to adopt adult roles and behaviour earlier in life. They may also be less amenable to the public health campaigns on the negative health consequences of smoking and alcohol consumption. Modelling is an indispensable aspect of learning and establishing new patterns of behaviour and we report that it explains the early establishment of socioeconomic differences in health related behaviour during adolescence. This was highlighted by the contribution of the smoking or drinking of parents and friends to the explanation of differences in daily smoking and high alcohol consumption.

Socioeconomic differences in health related behaviour among adults

We used data from the Dutch longitudinal GLOBE study to describe and explain educational differences in smoking, alcohol consumption and physical activity during leisure time. In 1991, a postal questionnaire on socioeconomic status, health and health related behaviour was returned by almost 19,000 non-institutionalised respondents aged 15-74 years. More extensive information on possibly explanatory factors involved in socioeconomic differences was collected during successive interviews among about 5,600 respondents to the postal questionnaire. In 1997, follow-up data on health and health related behaviour were collected among this same group, using a postal questionnaire.

Socioeconomic differences in smoking behaviour among adults

We report that lower educated Dutch smokers were significantly more likely to continue smoking during 6.5 years of follow-up. Poor perceived general health and early smoking initiation were major predictors of educational differences in smoking maintenance. Also the higher prevalence of chronic conditions in lower educated groups contributed to educational differences in continued smoking. We believe that the contribution of poor health and chronic conditions can be interpreted as indicative of smoking being used as a coping mechanism more often among lower socioeconomic groups. The stressful feelings of discomfort and poor health that are reported more often by lower educated groups seem to be dealt with by continued smoking, one of the few coping styles lower socioeconomic groups have at their disposal. Furthermore, educational differences in low perceived control, neuroticism, and low emotional support also contributed to the explanation of educational differences in continued smoking.

We hypothesised that components of the Theory of Planned Behavior might be unequally

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distributed over socioeconomic groups and therefore possibly contribute to the explanation of socioeconomic differences in health related behaviour. We tested this hypothesis with a focus on educational differences in the intention to quit smoking and attempted to understand these in the light of educational differences in attitude towards smoking cessation, perceived subjective norm concerning quitting smoking, and behavioural control.

We failed to find educational differences in the intention to quit smoking, despite earlier reports from the GLOBE study stating that higher educated people quit smoking significantly more often and the fact that intentions and behaviour in general are held to be strongly related. We report that persons with a more positive attitude towards smoking cessation and who perceived higher subjective norms to quit intended to quit smoking significantly more often. However, positive attitude and high subjective norms were not more prevalent in the higher educated groups, which explains the lack of educational differences in the intention to quit smoking.

According to the Theory of Planned Behavior, educational differences in behaviour might also result directly from educational differences in self-efficacy. We reported clear educational differences in self-efficacy. This, in combination with the lack of educational differences in intention, implies that the direct effect of self-efficacy on behaviour is the only component of the Theory of Planned Behavior that may potentially contribute to educational differences in smoking cessation. We were, however, not able to test this, because we did not follow-up smoking behaviour.

Socioeconomic differences in alcohol consumption among adults

We applied the Tension Reduction Theory to the subject of educational differences in excessive alcohol consumption. According to this theory, socioeconomic differences in excessive alcohol consumption can result from socioeconomic differences in exposure to stress or from socioeconomic differences in the effectiveness of coping with stress.

In this study, excessive alcohol consumption was observed more often in lower educated men. We also found that excessive alcohol consumption occurred more often in lower educated women, although this relationship was not statistically significant. The higher prevalence of excessive alcohol consumption in the lower educated groups was related partly to higher stress experienced by lower educated men, resulting from material limitations, such as financial problems, material deprivation and unemployment. None of the studied psychosocial stressors in this study was related to the educational gradient in excessive alcohol consumption. We found no evidence to support the hypothesis that lower educational groups drink more alcohol, because they cope with stressful situations in a less effective way.

We report that lower educated Dutch people were more prone to start excessive alcohol consumption during the follow-up period. This explains why socioeconomic differences in excessive drinking tend to grow during adulthood. Both differential exposure to stressors and differences in coping resources contributed to the educational differences in starting excessive alcohol consumption.

Financial problems were the only stressor, which predicted educational differences in

starting excessive alcohol consumption. Also educational differences in emotional support explained part of the relation between education and starting excessive alcohol consumption. This effect of low social support can be understood in the light of poor behavioural regulation through poor social embeddedness in society or even social isolation. Additionally, absence of social support or social isolation may be a stressor in itself, resulting in loneliness or lack of identity for which excessive drinking is a reaction or coping mechanism. We did not find a moderating effect of vulnerability on the relation between stressors and starting excessive alcohol consumption.

Both the contribution of financial problems and low social support to the explanation of educational differences in starting excessive alcohol consumption corroborate the role of psychosocial mechanisms in the effect of socioeconomic differences.

Socioeconomic differences in leisure-time physical activity among adults

We report a clear association between educational level and physical inactivity among adults. Lower educated groups are completely physically inactive more often compared with the highest educated group. The higher prevalence of parochialism, low perceived control, and low equivalent income in the lower educated groups were the main reasons for this association. Non-active problem focussing, neuroticism, and working disability, however, also contributed substantially to the higher odds to be physically inactive among lower educated groups.

Lower educated people are inactive more often, because of their more parochial attitudes, meaning that they are more traditional and irrational and they tend not to believe in the idea of prevention. Further, physical exercise is a rather modern phenomenon, while parochial people are known to strongly adhere to traditional lifestyles. Lower educated people also reported physical inactivity more often, due to their lower perceived control. They assume that their actions have little or no effect on their life or health. The contribution of low income to the explanation of the educational differences in physical inactivity can be considered to reflect opportunities to participate in physical activity during leisure time. Probably lower educated people cannot afford equipment or the costs of a sports club membership.

We report that adverse changes in leisure-time physical activity during follow-up were more frequent in lower educated groups. Lower perceived control of lower educated groups was the most important predictor of educational differences in decreasing physical activity. This implies that lower educated groups lack confidence about the relation between behaviour and outcomes, and have lower perceived abilities to produce desired outcomes or prevent undesired outcomes themselves, leading to passivity. Educational differences among people younger than 45 years were further predicted by family responsibilities. In the older group, poor perceived health and problems with finances and housing predicted more decreasing leisure-time activity in lower educated groups.

Future directions

The studies described in this thesis are among the first that combine the description of socioeconomic differences in (changes in) health related behaviour with explanatory analyses.

Additional studies are needed to fill the gaps in the current knowledge about the background of (the development of) socioeconomic differences in health related behaviour, addressing issues such as social cohesion, social comparison, or possibly the genetic determination of health related behaviours. The relationship between socioeconomic status and behaviour during different phases of the life course needs to be clarified, incorporating models of both early and later life influences.

Future studies should explore the processes leading to socioeconomic differences in identified determinants of unhealthy behaviour, such as attachment or perceived control. Furthermore, we need a clearer understanding of the way in which determinants, such as intelligence or social support, affect behaviour. Future studies should further extend the analyses of the contribution of the Theory of Planned Behaviour and other prevailing psychosocial behavioural theories to socioeconomic differences in various health related behaviours.

In this thesis, we identify determinants that play an important role in the explanation of socioeconomic differences in health related behaviour and, hence, could play a prominent role in interventions to reduce unhealthy behaviour in lower socioeconomic groups. Part of the identified determinants, such as perceived control, social norms, and modelling behaviour are important components of well-known models and theories that attempt to explain behaviour and behavioural changes. Many of these determinants, such as financial situation, personality, or social support are, however, categorised as distal, predisposing factors having their (assumed small) effect on behaviour through main components of the models. Our findings justify a more explicit role of these factors in theories and models explaining behaviour.

How to reduce socioeconomic differences in behaviour

Interventions to reduce socioeconomic differences in health related behaviour effectively should employ both universalist and high-risk strategies. The universalist or structural approach addresses the whole society and is needed to change the socioeconomic stratification or remove general barriers for healthy behaviour. The high-risk strategy identifies those in special need, i.e. the lower socioeconomic groups, and controls their level of exposure to risk for unhealthy behaviour or provides protection against the effects of such exposure.

In this thesis we report that socioeconomic differences in smoking and alcohol consumption have already developed at very young ages and that smoking initiation at young age predicts educational differences in smoking cessation in adulthood. Programs should therefore start to promote healthy behaviour at an early age.

In this thesis we further identified determinants of socioeconomic differences in health related behaviour that should be the focus of effective interventions designed to reduce

unhealthy behaviour or behavioural choices in lower socioeconomic strata, like material circumstances, modelling behaviour or individual characteristics. Individual barriers for healthy behaviour, like low perceived control and self-efficacy among adults, or low intelligence levels among adolescents should be alleviated. Reviews on long-term effects of early childhood education and day-care found persistent positive effects on achievement and academic success, future socioeconomic status, as well as on intelligence scores. Feelings of low control and self-efficacy could be ameliorated through programs with a so-called empowerment focus. Individual empowerment is, however, not optimally successful as long as the cultural, social, and political context in which people live is not recognised. Programs therefore need to include community empowerment as well and employ a community-based participatory approach. There is a need for evidence-based programs that reduce material barriers for healthy behaviour in lower socioeconomic groups, addressing financial problems and emphasising cheap forms of exercise. Although we do not yet fully understand the determinants of socioeconomic differences in health related behaviour and we particularly lack knowledge on the effectiveness of behavioural interventions in lower socioeconomic groups, delaying the active alleviation of socioeconomic differences in our society is unacceptable. In line with our conclusion, the second Dutch Program Committee on SocioEconomic Health Differences and the Great Britain Independent Inquiry into Inequalities in Health recommended comprehensive approaches to reduce socioeconomic differences in health related behaviour. Prompt implementation of promising interventions on the one hand would actively address unhealthy behaviour in lower socioeconomic groups. On the other hand evaluation of such interventions would provide important information to improve our knowledge on behavioural determinants and the effectiveness of interventions.

[Samenvatting]

Het is al langer bekend dat de gezondheid van mensen wordt bepaald door hun positie op de sociaal-economische ladder. Over het algemeen geldt dat mensen met een hogere sociaal-economische status gezonder zijn dan mensen met een lagere sociaal-economische status. Dit gaat op voor de meeste maten voor gezondheid of ziekte en voor verschillende indicatoren voor sociaal-economische status, zoals opleiding, inkomen of beroepsniveau. In Nederland worden al sinds het begin van de 19^{de} eeuw verschillen in gezondheid tussen sociaal-economische groepen gerapporteerd.

Het Black rapport, dat in 1980 verscheen in Engeland, levert twee traditionele verklaringen voor sociaal-economische verschillen in gezondheid. Het rapport beschrijft het selectie mechanisme waarbij de (on)gezondheid het te bereiken sociaal-economisch niveau bepaalt. Gezonde mensen zullen waarschijnlijk stijgen op de sociaal-economische ladder, terwijl ongezonde mensen dalen. Het sociale causatie mechanisme veronderstelt een indirecte invloed van sociaal-economische status op de gezondheid van mensen, door een ongelijke verdeling van oorzaken voor ongezondheid over verschillende sociaal-economische groepen. Deze oorzaken zijn te verdelen in materiële of structurele verklaringen en gedrags- of culturele verklaringen.

Voortbordurend op het Black rapport, leidde de aanhoudende discussie over sociaal-economische gezondheidsverschillen tot andere mogelijke verklaringen. Zo richt het psychosociaal perspectief zich bijvoorbeeld op het psychosociale effect van stress die voortvloeit uit ongelijkheid. Het levensloop perspectief veronderstelt dat sociaal-economische verschillen in gezondheid gedurende het hele leven worden opgebouwd. De risico's voor ongezondheid hopen zich op tijdens opeenvolgende periodes van leven met nadelige sociaal-economische omstandigheden, ongezond gedrag en ziekte.

Gezondheidsgerelateerd gedrag is een belangrijke determinant van gezondheid en onderdeel van de causale verklaring voor sociaal-economische verschillen in ziekte en sterfte. Over het algemeen gedragen lagere sociaal-economische groepen zich namelijk ongezonder. Ze roken bijvoorbeeld vaker of hebben verkeerde eetgewoontes. Daarnaast zijn ze minder vaak bezig met gezondheidsbevorderend gedrag, zoals lichaamsbeweging. Sociaal-economische verschillen in ongezond gedrag treden reeds op tijdens de puberteit en worden gedurende het leven steeds groter, omdat mensen met een lagere sociaal-economische status vaker ongezonde keuzes maken.

Waarom mensen ervoor kiezen zich op een bepaalde manier te gedragen is een complex vraagstuk. Nog raadselachtiger is de vraag waarom lagere sociaal-economische groepen zich ongezonder gedragen dan mensen met een hogere sociaal-economische achtergrond. Tot op de dag van vandaag is er geen verklaring voor het feit dat mensen in de meest ongunstige sociaal-economische omstandigheden het minst goed in staat zijn gezond te leven.

Bij gebrek aan een duidelijk en eenduidig verklarend model voor sociaal-economische verschillen in gedrag, zijn we aangewezen op meer algemene verklaringen voor gezondheidsgerelateerd gedrag. Determinanten voor gedrag zijn grofweg in te delen in individuele factoren en omgevingskenmerken. Individuele factoren, zowel aangeboren als aangeleerd, zijn cruciaal in de verklaring voor sociaal-economische verschillen in gedrag. Voorbeelden hiervan zijn vaardigheden of eigen-effectiviteit, intelligentie, fysieke en mentale kwaliteiten, persoonlijkheid en karakter, en opvattingen. Ook de omgeving speelt een belangrijke rol bij gezondheidsgerelateerd gedrag, bijvoorbeeld via de aanwezigheid van stress, barrières voor bepaald gedrag, of sociale cohesie. Dit laatste resulteert weer in bepaalde sociale normen, controle en steun. Omgevingskenmerken kunnen worden

onderverdeeld in psychosociale en materiële factoren. Psychosociale factoren zijn bijvoorbeeld sociale steun, sociale normen en psychosociale stress. Materiële factoren refereren aan slechte behuizing, luchtverontreiniging of materiële deprivatie.

Sociaal-economische verschillen in gedrag tijdens de adolescentie

Sociaal-economische verschillen in gezondheidsgelateerd gedrag op volwassen leeftijd worden beschouwd als een van de belangrijkste verklaringen voor sociaal-economische gezondheidsverschillen en zijn dus vaak het onderwerp van onderzoek. Leefgewoontes en gedrag worden echter voor een groot gedeelte ontwikkeld en bepaald tijdens de adolescentie. Er is weinig bekend over het ontstaan van sociaal-economische verschillen in ongezond gedrag tijdens de adolescentie en zelfs nog minder over de determinanten van dit proces.

Een longitudinale studie in Nieuw-Zeeland volgt een groep van ongeveer 1,000 personen al sinds hun geboorte in 1972. Deze Dunedin Multidisciplinary Health and Development Study verzamelde uitgebreide informatie over vele oorzaken voor gedrag en bood daarom de unieke mogelijkheid om de relatie tussen sociaal-economische status van de vader en rookgedrag en alcoholconsumptie onder jongeren te beschrijven en te verklaren.

Gebruik makend van informatie uit bovengenoemde studie, rapporteren wij een duidelijke relatie tussen beroepsstatus van de vader en dagelijks roken tijdens de adolescentie (de periode tussen de 10 en 20 jaar). Deze verschillen waren aanwezig en stabiel vanaf het eerste moment dat jongeren dagelijks begonnen te roken op 13-jarige leeftijd. Verder dronken jongeren van lagere sociaal-economische afkomst vaker veel alcohol dan leeftijdsgenoten met vaders met een hoger beroepsniveau. Deze verschillen in alcohol consumptie ontwikkelden zich echter pas later tijdens de adolescentie, op 15-jarige leeftijd, en groeiden tijdens deze periode. We vonden geen relatie tussen het beroep van de vader en de frequentie van alcohol consumptie.

Een belangrijke verklaring voor de relatie tussen het beroep van de vader en het rook- en drinkgedrag van hun kinderen is de lagere intelligentiescore van jongeren wiens vader een lager beroepsniveau heeft. Deze bevinding geeft mogelijk de manier weer waarop sociaal-economische verschillen in gedrag op volwassen leeftijd ontstaan. Jongeren met lagere intelligentiescores zullen namelijk minder vaak een hoger opleidings- of beroepsniveau bereiken en daarom volwassenen met een lagere sociaal-economische status worden, terwijl eenmaal aangewende leefgewoontes en gedrag vaak voortduren tot op volwassen leeftijd. Op deze manier blijven sociaal-economische verschillen in gedrag onder jongeren bestaan terwijl ze ouder en volwassen worden. Jongeren met lagere intelligentiescores roken en drinken misschien ter compensatie van hun mindere schoolprestaties. Aan de andere kant is het mogelijk dat zij door hun minder gunstige toekomstperspectieven eerder toe zijn aan volwassen rolpatronen en gedrag, zoals roken en drinken. Het is ook nog mogelijk dat jongeren met lagere intelligentiescores minder ontvankelijk zijn voor campagnes over de negatieve gezondheidseffecten van roken en alcohol.

Gezondheidsgelateerd gedrag van rolmodellen speelt een belangrijke rol bij het aanleren en bevestigen van gedrag. Wij rapporteren dat het rook- en drinkgedrag van ouders en vrienden bijdraagt aan sociaal-economische verschillen in roken en alcohol consumptie onder jongeren.

Sociaal-economische verschillen in gedrag bij volwassenen

We gebruiken data van de GLOBE studie (Gezondheid en Leef-Omstandigheden Bevolking Eindhoven en omgeving) om sociaal-economische verschillen in gezondheidsgerelateerd gedrag bij volwassenen te bestuderen. Deze longitudinale studie richt zich op de beschrijving en verklaring van sociaal-economische verschillen in Nederland. In 1991 hebben bijna 19,000 mensen tussen de 15 en 74 jaar oud een vragenlijst ingevuld met vragen over hun sociaal-economische status, gezondheid, gedrag en mogelijke verklarende factoren. Van deze groep zijn daarna ongeveer 5,600 mensen geïnterviewd om meer uitgebreide informatie te verzamelen. In 1997 is een deel van deze laatste groep mensen opnieuw geïnterviewd, waarbij onder andere is gevraagd naar hun gezondheid en gedrag.

Sociaal-economische verschillen in rookgedrag bij volwassenen

In de afgelopen decennia, tot het begin van de jaren negentig, zijn sociaal-economische verschillen in rookgedrag alleen maar toegenomen. Dit komt voor een deel doordat lager sociaal-economische groepen vaker beginnen met roken, maar met name doordat ze over het algemeen minder succesvol zijn in het stoppen met roken. Dit betekent dat mensen in ongunstige sociaal-economische omstandigheden niet alleen vaker roken, maar dat zij ook vaker blijven roken, ondanks anti-roken campagnes en andere trends, zoals verminderde sociale acceptatie en beperkingen voor roken in openbare ruimtes en op het werk.

Dit proefschrift laat zien dat lager opgeleide Nederlandse rokers significant vaker blijven roken gedurende 6.5 jaar follow-up. Een slechte ervaren gezondheid en het op jonge leeftijd beginnen met roken zijn belangrijke verklaringen voor de gevonden verschillen. Verder worden de sociaal-economische verschillen in het doorgaan met roken verklaard door verschillen in chronische aandoeningen, controlebesef, neuroticisme en sociale steun. Men zou verwachten dat ongezonde mensen juist omwille van hun gezondheid zouden stoppen met roken. Het lijkt er echter op dat lagere sociaal-economische groepen omgaan met de stress die voortvloeit uit ongezondheid en ongemak door te (blijven) roken. Roken is voor hen een van de weinige beschikbare manieren is om met moeilijkheden om te gaan.

Nog steeds begrijpen we niet helemaal hoe sociaal-economische verschillen in rookgedrag ontstaan. Wij verwachten dat verschillende factoren uit de Theory of Planned Behavior ongelijk zijn verdeeld over sociaal-economische groepen en dus mogelijk bijdragen aan sociaal-economische verschillen in gedrag. We hebben deze veronderstelling getoetst op verschillen in de intentie om met roken te stoppen tussen groepen met verschillende opleidingsniveaus. Deze verschillen trachten we te verklaren vanuit attitude ten aanzien van stoppen met roken, ervaren subjectieve norm of druk om te stoppen en controle over gedrag.

We rapporteren dat er geen verschillen zijn in de intentie met roken te stoppen tussen groepen met een verschillend opleidingsniveau. Dit ondanks dat eerder uit het GLOBE onderzoek bleek dat hoger opgeleide mensen uiteindelijk wel vaker stoppen met roken en het feit dat in de literatuur een nauwe correlatie tussen intentie en feitelijk gedrag wordt

gerapporteerd. De afwezigheid van verschillen in de intentie om met roken te stoppen is beter te begrijpen als we kijken naar de verdeling van determinanten van die intentie over verschillende opleidingsniveaus, namelijk een positieve attitude en subjectieve norm. We vinden wel significante verschillen in positieve attitude tussen groepen met verschillende opleidingsniveaus, maar een positieve houding kwam juist onverwacht vaker voor bij lager opgeleiden. Verder vinden we geen relatie tussen opleiding en ervaren subjectieve norm. Volgens de Theory of Planned Behavior kunnen verschillen in de intentie om met roken te stoppen ook het resultaat zijn van verschillen in eigen-effectiviteit, oftewel controle over gedrag. Wij vinden duidelijke verschillen in eigen-effectiviteit. Lager opgeleiden hebben minder vertrouwen in hun eigen vermogen te stoppen met roken dan hoger opgeleiden. Dit resultaat, gecombineerd met het gebrek aan verschillen in de intentie om met roken te stoppen, wijst erop dat het directe effect van eigen-effectiviteit op gezondheidsgerelateerd gedrag het enige onderdeel van de Theory of Planned Behavior is dat potentieel bijdraagt. We waren echter niet in staat dit te onderzoeken, omdat we niet hebben nagevraagd of mensen ook echt hun voornemen om binnen 1 maand te stoppen hebben uitgevoerd.

Sociaal-economische verschillen in alcohol consumptie bij volwassenen

Om verschillen in excessief alcohol gebruik tussen groepen met een verschillend opleidingsniveau te kunnen verklaren hebben we de Tension Reduction Theory toegepast. Volgens deze theorie kunnen sociaal-economische verschillen in overmatig alcohol gebruik worden veroorzaakt door verschillen in de blootstelling aan stress of door verschillen in de effectiviteit van het omgaan met stress.

Lager opgeleide mannen drinken vaker veel alcohol dan hoger opgeleide mannen. We zien ook dat lager opgeleide vrouwen vaker overmatig alcohol drinken, maar deze verschillen waren niet statistisch significant. Het vaker voorkomen van excessief alcohol gebruik in lager opgeleide groepen wordt gedeeltelijk veroorzaakt doordat ze meer stress ervaren die voortvloeit uit materiële beperkingen. Financiële problemen dragen het meest bij aan verschillen in excessief alcohol gebruik onder mannen. Maar ook het vaker voorkomen van materiële deprivatie en werkeloosheid bij lager opgeleide mannen leidt tot verschillen in overmatig alcohol gebruik. Geen van de psychosociale stressoren is gerelateerd aan de verschillen in excessieve alcohol consumptie tussen groepen met verschillende opleidingsniveaus. We vinden ook geen bewijs voor de veronderstelling dat lager opgeleiden vaker veel drinken omdat ze minder effectief met stressvolle situaties omgaan dan hoger opgeleiden.

Sociaal-economische verschillen in excessieve alcohol consumptie worden groter tijdens het leven, omdat mensen met een lagere sociaal-economische status vaker beginnen met overmatig alcohol gebruik gedurende hun volwassen leven dan hogere sociaal-economische groepen. Wij rapporteren dat lager opgeleide Nederlanders vaker beginnen met excessief alcohol gebruik tijdens de 6.5 jaar waarin hun gedrag is bestudeerd. Zowel verschillen in de blootstelling aan stress als verschillen in het omgaan met (of de gevoeligheid voor) stress spelen hierbij een rol.

Financiële problemen is de enige bron van stress die bijdraagt aan de verklaring van de bevinding dat lager opgeleiden vaker starten met excessief alcohol gebruik dan hoger

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opgeleiden. Ook verschillen in emotionele steun verklaren een deel van de verschillen in het beginnen met excessief drinken. Dit proces verloopt waarschijnlijk via verminderde controle door gebrekkige inbedding in de maatschappij of zelfs sociale isolatie. Verder is het mogelijk dat de afwezigheid van sociale steun, sociale isolatie of eenzaamheid in zichzelf stressvol zijn en dat mensen hiermee omgaan door overmatig alcohol gebruik. We vinden geen bewijs voor een verhoogde gevoeligheid voor stress onder lager opgeleiden als verklaring voor het feit dat ze vaker beginnen met excessieve alcohol consumptie.

Zowel de bijdrage van financiële problemen als sociale steun aan de verklaring van verschillen in het beginnen met excessief alcohol gebruik bekrachtigen de rol van psychosociale mechanismen in het ontstaan van sociaal-economische verschillen.

Sociaal-economische verschillen in lichaamsbeweging bij volwassenen

De mate van lichaamsbeweging in de vrije tijd, zoals sporten, wandelen of fietsen, is gerelateerd aan sociaal-economische status. Mensen met een lagere sociaal-economische status bewegen minder vaak en minder intensief dan de hogere sociaal-economische groepen. We weten echter tot op de dag van vandaag niet veel over de redenen waarom lagere sociaal-economische groepen vaker inactief zijn.

Wij rapporteren een duidelijke relatie tussen het opleidingsniveau en gebrek aan lichaamsbeweging. Lager opgeleiden zijn vaker inactief in hun vrije tijd in vergelijking tot hoger opgeleiden. Het vaker voorkomen van een parochiale levenshouding, een gebrekkig controlebesef en lage inkomens in de lager opgeleide groepen zijn de belangrijkste oorzaken voor deze verschillen in inactiviteit. Ook neuroticisme, niet actief omgaan met problemen en arbeidsongeschiktheid dragen bij aan het feit dat lager opgeleiden vaker rapporteren inactief te zijn in hun vrije tijd.

Lager opgeleiden zijn vaker inactief door hun meer parochiale levenshouding, wat betekent dat zij meer traditioneel en irrationeel denken en dus over het algemeen niet veel heil zien in preventie. Verder zijn lichamelijke activiteit en sport een nog redelijk modern fenomeen, terwijl mensen met een parochiale levenshouding vaak sterk aan traditionele leefgewoontes hechten. Lager opgeleiden zijn ook vaker inactief doordat zij minder controle over hun leven denken te hebben. Ze geloven dus niet dat wat ze doen of denken veel effect heeft op het verloop hun leven en gezondheid. Het vaker voorkomen van lage inkomens in lager opgeleide groepen draagt waarschijnlijk bij aan verschillen in inactiviteit doordat het de mogelijkheden om aan sport en lichaamsbeweging deel te nemen, beperkt. Waarschijnlijk kunnen lager opgeleiden de uitrusting of een lidmaatschap van een sportclub niet betalen.

De resultaten laten ook een relatie zien tussen het opleidingsniveau van mensen en de afname van lichamelijke activiteit. Tijdens de periode van 6.5 jaar waarin het gedrag van GLOBE deelnemers is bestudeerd, rapporteren de lager opgeleide groepen vaker een afname van hun lichaamsbeweging dan de hoger opgeleide groepen. De belangrijkste verklaring hiervoor is het verminderd controlebesef onder lager opgeleiden. Zij hebben minder vertrouwen in het effect van hun eigen gedrag op hun gezondheid en in hun eigen vermogen hun leven of gezondheid op enige wijze te beïnvloeden, wat leidt tot passiviteit. Verder verklaart de relatie tussen opleiding en gezinssamenstelling de verschillen in

afname van lichaamsbeweging bij mensen jonger dan 45 jaar. Voor lager opgeleide oudere mensen waren een slechte gezondheid en problemen met financiën en behuizing redenen om vaker hun lichamelijke activiteit te verminderen.

Discussie

In dit proefschrift worden sociaal-economische verschillen in gezondheidsgerelateerd gedrag, zoals roken, alcohol consumptie en lichaamsbeweging beschreven tijdens verschillende fasen in het leven. Sociaal-economische verschillen in rookgedrag en alcohol consumptie ontstaan reeds tijdens de adolescentie. Maar ook tijdens het volwassen leven vinden we sociaal-economische verschillen in zowel gedrag als ongezonde veranderingen in gedrag.

Verder verkennen we de bijdrage van verschillende individuele en omgevingsfactoren aan de verklaring van sociaal-economische verschillen in gezondheidsgerelateerd gedrag en ongezonde veranderingen in gedrag. Individuele factoren die bijdragen aan sociaal-economische verschillen in gedrag op volwassen leeftijd zijn, bijvoorbeeld, het vaker voorkomen van neuroticisme of een verminderd controlebesef in lager opgeleide groepen. Een van de belangrijkste verklaringen voor het vaker voorkomen van roken en alcohol consumptie onder jongeren met een lagere sociaal-economische achtergrond is hun lagere intelligentiescore.

Ook sociaal-economische verschillen in materiële omgevingsfactoren, zoals financiële problemen of deprivatie leiden tot het vaker voorkomen van roken, excessief alcohol gebruik en inactiviteit onder lager opgeleide volwassenen. Psychosociale omgevingsfactoren, zoals sociale steun of emotionele banden dragen ook bij aan het vaker voorkomen van ongezond gedrag in lagere sociaal-economische groepen. Jongeren met een lagere sociaal-economische achtergrond ervaren in hun omgeving vaker een positieve houding ten opzichte van alcohol en hebben vaker ouders of vrienden die drinken en roken, waardoor ook zij vaker roken en drinken.

In dit proefschrift identificeren we belangrijke oorzaken van sociaal-economische verschillen in gezondheidsgerelateerd gedrag. Deze oorzaken zouden een prominente rol moeten krijgen in interventies gericht op het verminderen van ongezond gedrag in lagere sociaal-economische groepen. Een deel van de door ons geïdentificeerde determinanten, zoals controlebesef, sociale norm en gedrag van anderen zijn onderdeel van bekende theorieën en modellen gericht op het verklaren van (veranderingen in) gedrag. Veel van de verklaringen voor sociaal-economische verschillen voor gedrag die worden beschreven in dit proefschrift, zoals financiële situatie, persoonlijkheid of sociale steun, worden in deze theorieën en modellen echter gecategoriseerd als distale, predisponerende factoren die hun (verwacht kleine) effect op gedrag uitoefenen via andere verklarende factoren. Onze resultaten rechtvaardigen een meer expliciete rol voor deze factoren in verklarende theorieën en modellen voor gezondheidsgerelateerd gedrag.

Aanbevelingen voor onderzoek in de toekomst

De studies die in dit proefschrift beschreven worden, zijn een van de eersten die de beschrijving van sociaal-economische verschillen in (veranderingen in) gezondheids-

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gerelateerd gedrag combineren met verklarende analyses.

De lacunes die nog bestaan in de huidige kennis over de achtergrond en ontwikkeling van sociaal-economische verschillen in gedrag vragen om aanvullende studies die ingaan op andere mogelijke verklaringen zoals sociale cohesie, sociale vergelijking, of mogelijke genetische invloeden op gezondheidsgerelateerd gedrag. De relatie tussen sociaal-economische status en gedrag gedurende verschillende fases van het leven verdient verdere aandacht. Hierbij zou gebruik moeten worden gemaakt van modellen die zowel vroege als latere invloeden op sociaal-economische status en gezondheidsgerelateerd gedrag combineren (het levensloop perspectief).

Toekomstige studies kunnen meer duidelijkheid scheppen in de processen die leiden tot sociaal-economische verschillen in de hier geïdentificeerde determinanten van ongezond gedrag, zoals controlebesef en emotionele hechting of banden. Verder bestaat er behoefte aan een beter inzicht in de manier waarop sommige verklaringen, zoals sociale steun of intelligentiescores, gedrag beïnvloeden. In dit kader past ook een uitbreiding van de toepassing van de Theory of Planned Behavior en andere gangbare psychosociale verklarende theorieën op de verklaring van sociaal-economische verschillen in diverse gezondheidsgerelateerde gedragingen.

Hoe kunnen we sociaal-economische verschillen in gedrag verkleinen?

Interventies gericht op het verkleinen van sociaal-economische verschillen in gedrag zouden zowel de universele als de risicogroepen strategie moeten hanteren. De universele of structurele benadering richt zich op de hele maatschappij en is bijvoorbeeld noodzakelijk voor veranderingen in de sociaal-economische stratificatie en het verwijderen van algemene barrières voor gezond gedrag. Bij het volgen van een risicogroepen strategie wordt eerst bepaald welke groepen in een maatschappij speciale behoeftes hebben, zoals de lagere sociaal-economische groepen. Vervolgens richten dit soort interventies zich op de controle van hun blootstelling aan risico's voor ongezond gedrag of op bescherming tegen de gevolgen van risico's.

In dit proefschrift rapporteren we dat sociaal-economische verschillen in rookgedrag en alcohol consumptie zich reeds ontwikkelen op zeer jonge leeftijd en dat het op jonge leeftijd beginnen met roken bijdraagt aan sociaal-economische verschillen in het stoppen met roken. Interventies ter promotie van gezonde leefgewoontes kunnen daarom maar beter op zeer jonge leeftijd aanvangen.

Verder identificeren we in dit proefschrift verschillende verklarende factoren voor sociaal-economische verschillen in gedrag. Inbedding van deze oorzaken van ongezond gedrag in interventies ter vermindering van sociaal-economische verschillen in gedrag zou de effectiviteit zeker ten goede komen. Dit soort interventies zouden zich bijvoorbeeld kunnen richten op individuele barrières voor gezond gedrag, zoals een verminderd controlebesef en eigen-effectiviteit onder volwassenen of lagere intelligentiescores onder jongeren. Andere studies hebben aangetoond dat vroege bijscholing en dagopvang voor (jonge) kinderen blijvende, positieve effecten heeft op (school)prestaties, toekomstige sociaal-economische status en intelligentiescores. Een verminderd controle besef en lage eigen-effectiviteit zouden kunnen worden verbeterd met behulp van zogenaamde empowerment (het leren opkomen voor jezelf) programma's. Individueel empowerment is echter nooit optimaal succesvol zo lang de sociale, culturele en politieke context waarin

mensen leven niet wordt erkend. Interventies zullen zich daarom ook op maatschappelijke empowerment moeten richten met behulp van een 'groeps participatie' aanpak. Verder blijkt er grote behoefte aan effectieve interventies die materiële barrières voor gezond gedrag in lager sociaal-economische groepen wegnemen en zich richten op bijvoorbeeld omgaan met financiële problemen of de nadruk leggen op goedkope vormen van lichaamsbeweging.

Alhoewel we de oorzaken van sociaal-economische verschillen in gedrag nog niet allemaal kennen of begrijpen en we met name weinig weten over de effectiviteit van gedragsinterventies in lagere sociaal-economische groepen, lijkt ons het uitstellen van een actieve aanpak van sociaal-economische verschillen in onze maatschappij onacceptabel. Overeenkomstig met deze conclusie, bevelen de Nederlandse programmacommissie voor sociaal-economische gezondheidsverschillen en de Engelse independent inquiry into inequalities in health een uitgebreide aanpak van sociaal-economische verschillen in, onder andere, gedrag aan. Onmiddellijke uitvoering van veelbelovende interventies betekent aan de ene kant een actieve aanpak van ongezond gedrag in lagere sociaal-economische groepen, terwijl aan de andere kant, evaluaties van deze interventies zullen leiden tot belangrijke informatie ter verbetering van onze kennis over oorzaken van gedrag en de effectiviteit van interventies.

[Dankwoord]

DANKWOORD

‘Wat doe jij het allerliefste op de hele wereld, Poeh?’

‘Het allerliefste – ’ zei Poeh en toen moest hij eerst eens even nadenken. Want al was Honing Eten iets vreselijk prettigs, er was toch één ogenblikje, vlak voor je begon, dat nog prettiger was, maar hij wist niet hoe dat heette.
(Tao van Poeh)

Volgens de Tao van Poeh is de weg ernaar toe belangrijker dan het doel, maar ik moet toch toegeven dat ik blij ben dat dit boekje nu voor u ligt! Maar, Poeh heeft toch ook wel een beetje gelijk, want op weg naar dit resultaat heb ik toch een aantal bijzondere, waardevolle jaren achter de rug. De samenwerking met mijn promotor Johan Mackenbach betekende voor mij een gedegen wetenschappelijke vorming op het gebied van de public health en de sociale epidemiologie. Carola Schrijvers, mijn co-promoter, is het grootste deel van de tijd mijn steun en toeverlaat geweest en heeft me de ‘fijne kneepjes van het vak’ bijgebracht. Ter compensatie van de weinig inspirerende fysieke werkomgeving op het instituut Maatschappelijke GezondheidsZorg waren er gelukkig altijd wel enkele collega’s die zorgden voor een goede sociale werkomgeving.

Karen Witten and Philippa Howden-Chapman provided me the opportunity to come to New Zealand to study socioeconomic differences in behaviour during adolescence. I spend some unforgettable and inspiring months in New Zealand, not in the least because of my colleagues at the Alcohol and Public Health Research Unit and other warm and friendly people I met at the other side of the globe.

Ter afsluiting nog meer wijsheid van Poeh.

‘Geleerden kunnen heel nuttig en nodig zijn, op hun eigen vermakelijke wijze. Ze leveren namelijk een hele hoop informatie. Alleen, er is nog Iets Meer en dat Iets Meer is nu juist hetgeen waar het leven werkelijk om draait.’
(Tao van Poeh)

Beste familie en vrienden, Raymund m’n liefjie, fijn dat jullie mijn Iets Meer willen zijn.

[About the author]

ABOUT THE AUTHOR

Mariël Droomers was born on 16 March 1970 in Heesch. After finishing secondary school in 1988, she studied Health Sciences at the Catholic University in Nijmegen, specialising in epidemiology. During the final year, she worked as a trainee for ORSTOM in Yaoundé, Cameroon and at the Nijmegen Institute for International Health. She graduated in 1992, after which she pursued additional training in public health and development studies. From September 1993, she worked as a consultant for several GTZ (Gesellschaft für Technische Zusammenarbeit) assisted development projects in Indonesia. She was involved in the development and implementation of an indicator that captures the public health effects of poverty for use in evaluations of the health impact of development projects. In the beginning of 1996 she returned to the Netherlands and started working at the Department of Public Health at the Erasmus University in Rotterdam. She participated in the GLOBE team that studied socioeconomic differences in health and health related behaviour in the Netherlands (since 1998 as a PhD student). Mariël was particularly engaged in the description and explanation of educational differences in health related behaviour, with this thesis being the result. During her PhD period she obtained her Masters of Science degree in Health Services Research at the Netherlands Institute for Health Sciences of the Erasmus University Rotterdam and she attended the Public Health training for PhD students at the Netherlands School for Public Health. At the end of the year 2000, she went to New Zealand for four months to study the development of socioeconomic differences in health related behaviour during adolescence at the Alcohol and Public Health Research Unit of the Auckland University. In March 2002 she started working at the centre of Health Services Research of the National Institute of Public Health and the Environment in Bilthoven, the Netherlands. She currently works on socioeconomic differences in the accessibility and quality of health care.

