SOCIO-ECONOMIC INEQUALITIES IN HEALTH: INDIVIDUAL CHOICE OR SOCIAL CIRCUMSTANCES?

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SOCIAAL-ECONOMISCHE GEZONDHEIDSVERSCHILLEN: INDIVIDUELE KEUZE OF SOCIALE OMSTANDIGHEDEN?

Proefschrift

TER VERKRIJGING VAN DE GRAAD VAN DOCTOR AAN DE
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door

Karien Stronks

geboren te Aalten

Promotiecommissie

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2.2 Stronks K, Gunning-Schepers LJ. Should equity in health be target number 1? *Eur J Public Health* 1993;3:104-111

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Voorwoord

Het is al weer 10 jaar geleden dat ik voor het eerst met het verschijnsel van sociaal-economische gezondheidsverschillen in aanraking kwam. Ik heb het tot op de dag van vandaag een fascinerend probleem gevonden. Deels omdat het zo complex is, en de inbreng van verschillende disciplines nodig is om het te kunnen begrijpen. En deels omdat het een onderwerp is waarbij feiten en de (morele) beoordeling van die feiten dicht bij elkaar liggen. Zo roept het gegeven dat mensen in lagere sociaal-economische groepen ongezonder zijn dan mensen in meer bevoorrechte posities, onmiddellijk de vraag op of dit een *ongewenste* situatie is. Mijn gedachten daarover gingen destijds twee kanten op. Enerzijds had ik het idee dat het oneerlijk is dat sommige groepen door de sociale omstandigheden waarin ze verkeren, korter leven en vaker ziek zijn dan andere. Anderzijds vroeg ik me af of er wel een probleem was: de verschillen in gezondheid leken deels samen te hangen met het feit dat personen in lagere en hogere sociaal-economische posities een andere leefstijl hebben, en die diversiteit in individuele keuzen leek me nu juist een groot goed.

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1 INTRODUCTION

Being in good health is seen as one of the most valuable goods in life. Therefore it is viewed as unfair that certain groups within society, for example unmarried people or some ethnic groups, do not appear to enjoy an equal share of good health compared to other sections of the population. The perceived injustice is even more emphatic if differences in health correspond with the distribution of other goods (see Schuyt 1987). This is the case with inequalities in health between socio-economic groups which are the focus of this thesis.

Empirical studies in many countries show that people who are worst off as far as their socio-economic position is concerned are also worst off when it comes to health. This thesis addresses the background of these socio-economic inequalities in health as well as the consequences for health policy. This chapter contains a brief introduction to the concept of social stratification and specifies roughly the objectives of this thesis.

1.1 Social stratification

Social stratification is the ranking of individuals in terms of the amount of valued goods such as material resources, knowledge, prestige and power. The position of the individual in the stratification is indicated by the term *social class* or *socio-economic status*. Whereas in the literature on socio-economic inequalities in health, both terms are often used interchangeably, in the sociological literature they have different meanings (Grusky 1994). For Weber 'status group' refers merely to a person's lifestyle and his/her honour or prestige in society. It is based on the work a person does or the educational level attained. Alternatively, 'social class' is assumed to have an economic base and refers to a person's income. Weber therefore argues that social stratification has several dimensions, implying that a person can be high in one dimension and low in other. An example of this is a highly educated person who is unemployed and as a result has a low income.

The multidimensional perspective of Weber contrasts with the unidimensional approach of Marx. He defined classes by their position in the economic system, more specifically the way they are related to the 'means of production'. This classification is therefore based on economic factors only. According to this perspective, society is divided into two clearly distinguished classes, i.e. the proletariat and the bourgeoisie which qualitatively differ from each other. In contrast, the social and class status of Weber represents a quantitative difference between social strata. Socio-economic strata, in this view, are not clearly distinguished entities but rather a ranking of people in terms of number of years of education, occupational prestige and income.

The members of a particular socio-economic group are seen as sharing a certain culture (lifestyle, orientations, values etc.) but these socio-cultural elements in themselves do not constitute the position of an individual in the stratification.

Although the theoretical construct of social stratification is seldom spelled out, most studies on socio-economic inequalities in health seem to be

based on Weber's multidimensional view of social stratification. In these studies, income, educational and occupational level are the most frequently used indicators of socio-economic status (Susser et al. 1985, Liberatos et al. 1988).

In this thesis, the term socio-economic status is used for both the class and status dimension. All three socio-economic indicators have been included. If the effect of material conditions on health is studied, income is used as an indicator of socio-economic status whereas if the focus is on the status component, educational level is mainly used. In the Netherlands, educational level is considered to be an appropriate indicator of socio-economic status. This contrasts for example with the United Kingdom, where occupational level is a more frequently used indicator. The choice to use educational rather than occupational level is based on a practical as well as a theoretical argument. Firstly, educational level as an indicator of socio-economic status has the advantage of being available for both men and women, whether they are in paid employment or not. A more theoretical argument in favour of educational level relates to its growing importance for the relative position of the individual in the distribution of other valuable goods, such as paid labour, occupational status and income (Schuyt 1987, de Vries 1993). This reflects the tendency for individual capacities to become more crucial for the position of the individual in the social stratification which in the extreme might lead to a meritocracy as sketched by Young (1976).

1.2 Consequences of social stratification for health

The socio-economic status of an individual to a certain extent determines the opportunities to survive until old age and to enjoy good physical and mental health. In all Western countries for which data are available, mortality and morbidity increases as one descends the social scale. This is not surprising, as many aspects of life are shaped by the position of an individual in the social stratification. It influences what people eat, in what houses they live, their opportunities for a paid job, the physical environment in which they work, how they spend their money, how they cope with problems, what they do in leisure time etc. Many of these factors influence health, indicating the link between social stratification and health. The socio-economic position, in other words, provides access to many resources that are prerequisites for promoting good health.

Health problems for which the frequency rises with decreasing socio-economic status range from subjective health complaints and perceived health status to specific chronic conditions and mortality. The difference in life expectancy at birth, for example, between Dutch men at the highest and lowest educational level is assessed to be more than 4 years (van de Water et al. 1996). The percentage of people reporting a chronic condition at the lowest educational level is 1.5 times as high as the corresponding percentage at the highest educational level (van der Wulp 1996). Moreover, people in lower socio-economic groups are more than twice as likely to perceive their health as less than "good" (CBS 1992).

1.3 Objectives and structure of this thesis

Whereas in some other Western European countries, in particular the United Kingdom, the consequences of social stratification for health has been the subject of research for several decades, evidence on socio-economic inequalities in health in the Dutch population has accumulated only recently. It is beyond doubt however, that socio-economic inequalities in health in the Netherlands exist. This thesis addresses the explanation of these inequalities. The focus will be on the effect of socio-economic status through more proximate determinants of health, such as adverse working and living conditions and unhealthy behaviour. The underlying rationale of this research question is the wish to identify the causes of inequalities in health which could be addressed through health policy. The implications of these empirical findings for current health policy will also be explored. We will try to establish which inequalities in health should be considered unjust and what policy measures should be initiated to reduce the inequities in health.

In summary, the issues which are addressed in this thesis might be formulated as follows: How do socio-economic inequalities in health arise? Should we be concerned about these inequalities and what should be done about them?

This thesis consists of three parts.

The first part (chapter 2) spells out the conceptual framework on which this thesis is based. Chapter 2.1 provides an overview of the international literature concerning the background to socio-economic inequalities in health. This overview relates to the 'causation mechanism', which is the focus of this thesis, but also to other mechanisms which might explain socio-economic inequalities in health. In addition, this chapter specifies the conceptual model on which the empirical analyses in this thesis are based. In order to further increase the relevance of the empirical analyses for health policy, chapter 2.2 explores some policy issues relating to the moral justification of a policy aimed at the reduction of socio-economic inequalities in health and the possibilities of achieving this goal. Chapter 2 ends with a more detailed description of the research questions that are studied in this thesis, and further specifies the outline of this thesis (2.3).

The second part (chapter 3-5) includes several empirical analyses in which elements of the explanation of socio-economic inequalities in health are explored. All empirical analyses in this thesis are based on data from the Longitudinal Study on Socio-Economic Health Differences (LS-SEHD). The LS-SEHD started as a part of a national research programme on socio-economic inequalities in health, which was launched in 1989 by the Dutch Ministry of Welfare, Public Health and Cultural Affairs (Mackenbach 1994b). As all empirical analyses in this thesis are based on the baseline data collection of the LS-SEHD, which took place in 1991, they are all cross-sectional studies. The design and data collection of the LS-SEHD are described in chapter 3. The empirical analyses are presented in chapter 4 and 5.

The third part of this thesis (chapter 6) summarises and discusses the findings of the empirical analyses. Moreover, it presents some conclusions with respect to the background of socio-economic inequalities in health, and discusses the implications of the findings for health policy.

2 CONCEPTUAL FRAMEWORK

Abstract

This chapter provides an overview of the explanations that have been put forward with regard to the origins of socio-economic inequalities in health. According to current scientific opinion both processes of 'selection' (health influences socio-economic position through health-related social mobility) and of 'causation' (socio-economic position influences health through the differential distribution of specific risk factors) play a role in socio-economic inequalities in health, although there is some evidence that 'causation' is the more important mechanism.

The 'selection' processes are commonly divided between the effects of health in childhood on 'intergenerational' social mobility (change of socio-economic status between parents and children), and the effects of health at adult ages on 'intragenerational' social mobility (change of socio-economic status after entry into the labour market).

Specific risk factors which may be involved in the 'causation' mechanism can be grouped into health-related behavioural factors (e.g. smoking, nutrition), structural/material factors (e.g. material deprivation, occupational exposures) and psychosocial stress-related factors (e.g. life events, lack of social support). The distribution of these risk factors across socio-economic groups in its turn probably is partly determined by childhood environment (e.g. socio-economic position of parents) and attitudes/personality (e.g. neuroticism and locus of control). The latter are not simply 'intermediary' between socio-economic status and health because they may also influence socio-economic status. They are therefore not only part of the 'causation' mechanism but also of a 'selection' mechanism. The latter differs from the 'selection' mechanism described above (in which health is the selection criterion) and is sometimes referred to as 'indirect selection' (in which a determinant of health is the selection criterion).

Finally, (a small) part of socio-economic inequalities in health is probably due to the differential distribution of genetic factors across socio-economic groups.

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2.1 The background to socio-economic inequalities in health: a review of the literature and a conceptual model

2.1.1 Introduction

The explanation of socio-economic inequalities in health is still largely unknown in the Netherlands (as it is in other countries), although the number of studies which not merely describe the inequalities but also investigate the determinants, is increasing. Based on existing (international) literature, this chapter provides an overview of the explanations that have been put forward with regard to the origins of socio-economic inequalities in health.

On the basis of this overview as well as empirical data relating to the socio-economic distribution of specific determinants in The Netherlands, an explanatory model was formulated prior to the Longitudinal Study on Socio-Economic Health Differences (LS-SEHD). The model aimed to integrate the relationships between socio-economic status (SES), determinants of health, and health itself. Existing literature presents other models relating to the background of socio-economic inequalities in health (Power et al. 1986, Mackenbach & van der Maas 1987, Carr-Hill 1987, van den Heuvel 1988). These were considered during the development of the conceptual model. The decision to develop a new model was prompted by the wish to be able to derive specific hypotheses on the basis of this model which could then be tested in the LS-SEHD. This required a specification of the relationship between explanatory factors and mechanisms that went further than the scope of the above-mentioned models.

Because it attempts to integrate the existing explanations, the model has the potential to contribute to the discussion on the background of socio-economic inequalities in health. However, in view of the general validity, it should be borne in mind that the model reflects a number of choices that were made in the LS-SEHD. These choices concern both the health indicators and the explanatory factors which were considered.

Firstly, the model was restricted to the explanation of differences in *somatic* health. Although however, the model is partly applicable to the explanation of differences in mental health problems, this was not its primary aim. The model focuses on the incidence of chronic conditions, disabilities, self-perceived health problems and mortality. Other aspects of health, such as medical consumption and prognosis, require other models of explanation, and were therefore not considered here. In addition, the model is concerned with the explanation of inequalities in health *in adulthood*. Factors and mechanisms that occurred in previous stages in life (such as social background) are involved in the explanation of these differences.

Choices have also been made with regard to *explanatory* factors. Indeed, the study pays attention to all explanatory mechanisms discussed in the existing literature, but within these mechanisms it focuses on specific aspects. For example only those factors of which it is known that they are differentially distributed across socio-economic groups have been

included. Moreover, factors that could not be determined by questionnaires in a reliable way have been excluded (e.g. the majority of genetic factors and biological risk factors), together with factors that would require a disproportionately great effort to measure (e.g. intelligence).

The outline of this chapter is as follows. Firstly, the current explanations of socio-inequalities in health are discussed, i.e. artefact, 'selection' mechanism, genetic predisposition, and 'causation'. Empirical data will be used as frequently as possible to examine whether it is likely that these explanations also constitute the background for health inequalities in The Netherlands. As far as these are available, study results regarding the relative importance of each of these explanations will also be discussed. The different explanations are then integrated into one model.

2.1.2 Artefact

The artefact explanation assumes that inequalities in health between socio-economic groups that emerge from previous research are biased by the research methods and the measurements used (Bloor et al. 1987). In reality, it is hypothesized, the differences either do not exist or do so to a lesser degree. For example, the results could be biased if the number of deceased in a particular socio-economic group is calculated, thereby using different methods in the numerator and denominator to indicate the socio-economic status of the deceased. For example, in the British mortality statistics, the occupational level of a deceased person is simply determined by asking the relatives. Data on the number of persons in a specific social class however are taken from the census. Occupational data are therefore derived from two different sources. Consequently, the estimates of inequalities in mortality might be biased.

Although it is possible to point out several sources of bias in empirical studies, it is unlikely that socio-economic inequalities in health are largely or solely an artefact (Fox et al. 1986, Marmot 1986). Socio-economic inequalities in health emerge from a large number of studies which have used many different research methods. In this thesis it is therefore assumed that the differences that are to be explained are primarily true differences.

2.1.3 Selection

The selection explanation assumes that socio-economic inequalities in health can be explained by the effect of health on the socio-economic status (Illsley 1955, Illsley 1980, Stern 1983, Fox et al. 1986, West 1991). Socio-economic health inequalities occur, it is hypothesized, as a result of the fact that selection in relation to health occurs during social mobility. As a consequence, persons who are in poor health less frequently move up or more frequently move down the social ladder than healthy persons.

The 'selection' processes are commonly divided according to the period in people's lives in which selection occurs. Firstly, social mobility may occur during the period of adolescence and early adulthood. Illness during childhood or adolescence may influence a person's future socio-

economic status at the start of adult life. In this case, the social mobility of an individual is determined by comparing his/her attained socio-economic status with the SES of his/her parents. This is called *inter*-generational social mobility (Power et al. 1986, Illsley 1980). Secondly, health may influence social mobility in adulthood. In this case, the individual is not socially mobile compared to his parents, but in comparison to himself earlier on in adult life. This process is indicated by the term *intra*generational social mobility (Fox et al. 1985).

Apart from the period in which selection occurs, the form in which selection emerges can also be further specified. In the literature, a distinction is made between direct and indirect selection (West 1991, Wilkinson 1986). Direct selection implies that social mobility is a direct result of either very good or very poor health. Indirect selection occurs when social mobility is selective according to *determinants* of health and disease. An example of this might be selection according to attitudes that influence one's behaviour. Both selection in adulthood and selection in the period before adulthood can be either direct or indirect. Four forms of selection can therefore be distinguished. These are discussed in more detail below.

An important variable in the case of *direct* selection with *inter*-generational social mobility is an individual's chance of education. A long period of illness during childhood or adolescence could influence a person's educational opportunities, for example as a result of absence from school due to illness. An illness can also limit the number and type of jobs which an individual can choose (West 1991). The results of a British birth cohort study, The National Survey on Health and Development (Wadsworth 1986), provides evidence to suggest how this might occur. From this study, it emerged that boys who had been very ill in childhood have a greater chance of downward social mobility than healthy boys. Here, mobility was measured by comparing the occupational status of father and son.

In the process of *indirect* selection with intergenerational social mobility, both attitudes and behaviour that influence health play a central role (West 1991, Fox et al. 1985). The idea behind this mechanism is that the same behaviour and attitudes that lead to an up- or downward mobility can also influence the long-term state of health. The factor 'orientation towards the future' is an example of this. The extent to which a person orientates himself towards the future might be associated with the inclination to invest in an education. In addition, people with a lack of orientation towards the future are probably less likely to incorporate the long-term effects of certain health-related behaviour in their decision to engage in that behaviour. In this case, the attitude constitutes a common explanation for downward social mobility and illness later on in life, or for upward social mobility and good health. Although several authors assume that indirect selection might be involved in the generation of socio-economic inequalities in health there are no empirical data to support this view. Indirect selection can also occur during *intra*generational social mobility in a similar way as in the case of intergenerational mobility.

Moreover, direct selection can occur during adulthood. This form of selection implies the influence of chronic conditions on *down*ward social mobility. Illness could lead to downward mobility if someone is unable to stay in his previous job or function as a result of that illness. This process is sometimes called 'drift' (Lundberg 1988), and may arise, for example, when people are excluded from the labour market as a result of a long-term work disability. Alternatively, very good health can also influence *up*ward social mobility. People who enjoy very good general health probably have a better chance to move up the social ladder during adulthood than people who are less healthy (Wilkinson 1986).

Although there is some evidence on the way the above-mentioned selection processes operate, we are not aware of studies that *quantify* the effects of selection mechanisms on socio-economic inequalities in health. Yet some authors have tried to obtain an approximate estimate of the contribution of this explanatory mechanism (Fox et al. 1985, Wilkinson 1986). These estimates seem to indicate that the selection mechanism can never provide a comprehensive explanation of existing socio-economic inequalities in health. Proof of this emanates from the British OPCS Longitudinal Study, in which a cohort was followed-up for ten years with respect to mortality. Occupation was established at the start of this period. If direct selection (in the case of intragenerational social mobility) had occurred, then the differences in mortality rates in this cohort would have decreased during the follow-up period as the socio-economic status of people who died in the first part of the follow-up period was registered in the period directly before death. In case of direct selection one might expect this status to be linked more strongly with mortality risks than the occupational level reported at an earlier point in time. However, in the above-mentioned study an increase of socio-economic inequalities in mortality was found. Mortality differences in the first five years after determination of occupation were found to be smaller than the mortality differences that were recorded in this group at the end of the '70s (Fox et al. 1985).

It should be borne in mind that indications from other countries with regard to the contribution of the selection mechanism are not necessarily applicable to the situation in The Netherlands. The extent to which health affects social mobility, either directly or indirectly, not only depends on personal characteristics but is also influenced by the social structure, which varies between countries (West 1991). The social security system and the way in which employees are selected for a job are just two examples of this.

2.1.4 Genetic predisposition

The explanation of inequalities in health in terms of genetic factors is described as follows: because the socio-economic status of the parents is related to that of their child and because parents' health is correlated with socio-economic status, a part of socio-economic health differences in adulthood could possibly be explained by the distribution of genetic factors in a population (Power et al. 1986, Himsworth 1984). This

influence is a genetic disposition that runs from parent to child, i.e. a hereditary transferable predisposition for developing a particular disorder. This explanation is closely related to the selection explanation. When people who are ill gradually move down the social ladder, this will eventually result in a differential distribution of genetic material among the population with respect to illnesses that carry a genetic component. This is at the lower socio-economic groups' disadvantage (Mackenbach & van der Maas 1987).

Although it cannot be excluded that genetic predisposition partially explains the existing socio-economic inequalities in health, this mechanism is expected to be less important than the causation and selection mechanism. In support of this view it should be mentioned that there is no clear indication of a differential distribution of genetic characteristics across socio-economic groups (Mascie-Taylor & McManus 1984, Golding et al. 1984, Cliquet 1963).

2.1.5 Causation

The 'causation' mechanism assumes that a person's socio-economic status affects his health (Towsend et al. 1987, Marmot et al. 1987, Davey Smith et al. 1994). This is not a direct effect however. Socio-economic status influences health through more specific determinants of health and illness. Because these determinants are in between socio-economic status and health, they are called intermediary factors. According to this explanation, socio-economic inequalities in health exist because lower socio-economic groups live in less favourable circumstances and more frequently engage in health-damaging behaviour and less frequently in health-promoting behaviour than higher socio-economic groups. Traditionally, intermediary factors are divided into material or structural factors and behavioural factors (Townsend et al. 1988).

Behavioural factors

Habits such as smoking and drinking, dietary habits, physical exercise/leisure activities and use of preventive and curative health care are all examples of behavioural factors. We expect that these factors will explain part of the socio-economic inequalities in The Netherlands because on the one hand they influence health, and on the other they are differentially distributed across socio-economic groups. Table 2.1.1 shows for example, that the percentage of current smokers is higher in the lower socio-economic strata both among men and women. Another example of a behavioural factor that is differentially distributed across socio-economic groups is fat intake. The data in Table 2.1.1 show that among men and women in lower socio-economic strata, the fat intake is slightly higher than among people in higher strata. The ratio however, between polyunsaturated and saturated fatty accids seems to be higher in lower socio-economic groups. Finally, excessive drinking seems to be more common among women in higher socio-economic groups, whereas the association is irregular for men.

Table 2.1.1 Distribution of some intermediary factors across socio-economic groups

intermediary factor	socio-economic group						
	1 high	2	3	4	5	6	7 low
% current smokers[a]							
men	27.9	29.6	35.2	34.9	43.5	44.4	51.5
women	27.7	29.7	30.9	31.9	38.2	42.4	49.5
fat intake (% energy)[b]	40.0			40.1		41.5	
ratio polyunsaturated and saturated fatty accids[b]	0.39			0.44		0.45	
% excessive drinkers[a]							
men	10.1	8.9	11.1	8.9	10.8	10.9	9.3
women	6.5	4.5	4.5	2.4	2.8	1.6	1.8
% persons reporting physically demanding work[c]	10		12		12	37	
% persons living beyond social minimum[d]	2.5	3.5		6.7	10.6		17.5
average number of life-events in the previous year per 100 persons[e]	13.0	20.1	16.1	17.6	14.4	18.6	24.0
% of persons reporting opportunities to discuss personal problems with relatives/friends[e]	77	66		61	48		39

a Peilstationsproject Hart- en Vaatziekten (Hoeymans et al. 1993). Socio-economic indicator: educational level

b Voedingspeilingsonderzoek 1987-1988 (Hulshof et al. 1990). Socio-economic indicator: compound index (occupation and education)

c CBS, Leefsituatie-onderzoek 1983 (CBS 1984). Socio-economic indicator: occupational level

d CBS, Sociaal Economisch Panel-onderzoek, 1985 (Berghman et al. 1988). Socio-economic indicator: educational level

e Sociaal en Cultureel Planbureau. Culturele veranderingen in Nederland 1988/89 (Mackenbach 1992). Socio-economic indicator: educational level

Material factors

Material aspects of living conditions that are important for the explanation of socio-economic inequalities in health are, among others, the circumstances in which a person lives and works, and his medical insurance. It is likely that inequalities in health partly originate because people from lower socio-economic groups, more often than people in a higher socio-economic position, live and work in circumstances that have a detrimental effect on health. Table 2.1.1 includes one of these factors, namely physically demanding labour.

The influence of medical insurance is linked to the use of medical care. In this respect, the financial accessibility of services for example might be important (for example compensation/no compensation for a GP visit), as well as the rules that are imposed on the insured party (for example periodic dental check-ups).

This shows that the explanations of socio-economic inequalities in health in terms of behavioural and material factors are not separate issues (Blane 1985, Whitehead 1988, Macintyre 1986). Behavioural factors are partly embedded in a number of material or structural living conditions. Poor dietary habits for example, or a lack of leisure facilities are to some extent determined by a person's financial position.

If someone as a result of limited financial resources, lacks *several* basic necessities for health, then there is a situation of multiple deprivation (Townsend 1987). A study which is concerned with the explanation of socio-economic inequalities in health should include such clusters of material determinants. Table 2.1.1 includes data which show differences in deprivation between socio-economic groups in The Netherlands. It reflects the percentage of persons in particular socio-economic groups who have to live on an income that is below the social minimum.

Psychosocial stress-related factors

Psychosocial stress-related factors are a third group of determinants in the explanation of socio-economic inequalities in health. They include stressors (long-term difficulties, life-events) and factors modifying the impact of stressors on health (social support, coping style, locus of control etc.). Examples of stressors are long-term unemployment, death of a partner and divorce.

It is expected that part of the existing differences in health are due to the fact that lower socio-economic groups are more exposed to stressful conditions or circumstances, or are less well equipped to cope with these stressors. As a result, the effects on their health might be larger in lower groups than in higher ones (Kessler & Cleary 1980, Turner & Noh 1983). The influence of psychosocial stress on health probably operates through a decline in physical defence which results in an increased risk of illness (Maes et al. 1987, Antonovsky 1987). That is why psychosocial stress is seen by some authors as a background to an increased susceptibility to diseases in lower socio-economic groups (Marmot et al. 1984, Syme & Berkman 1976). In support of this mechanism it can be argued that a negative socio-economic gradient has been demonstrated not only for some, but for many disease categories.

Empirical research indicates that psychosocial factors in The Netherlands show a relationship to socio-economic status. Table 2.1.1 shows that the number of life events that were reported during the previous year was lowest among the higher socio-economic groups, although the differences do not seem to be very large (Raats et al. 1987, Mackenbach 1991). Table 2.1.1 also contains the results of a study regarding the relationship between social support and socio-economic status. Here, social support is indicated by the percentage of people who report opportunities for discussing problems with friends or relatives. In this respect too, lower socio-economic groups appear to be at a disadvantage compared to people in the higher strata.

Social background

Over the past few years, various authors have pointed out that it is not only someone's current socio-economic status that influences health. Circumstances in which a person grew up might also affect adult health (Notkola et al. 1985, Barker & Osmond 1987, Carr-Hill 1987, Davey Smith et al. 1990b). Nutrition and housing for example are important, not only as individual determinants but as elements of a complex system of material circumstances in which people grow up. Because the socio-economic status of a person is related to that of his parents, persons in lower socio-economic groups will generally have grown up in worse socio-economic circumstances than persons in higher socio-economic groups. These inequalities in living conditions possibly explain a part of the differences in health later on in life by way of illness in childhood or a higher susceptibility to disease (Marmot 1986, Macintyre 1988).

Because a direct way of measuring these material circumstances is often difficult if not impossible, they are usually measured in an indirect way. A person's height is sometimes used as an indicator (Kuh & Wadsworth 1989, Nyström Peck & Vågerö 1989). The reasoning behind this is as follows: height is established by (among other things) material circumstances during childhood such as nutrition, or by way of periods of illness during childhood. People who grow up in relatively poor circumstances or people who have been frequently ill, will, on average, be shorter. However, it should be remembered that height is determined not by the above-mentioned factors alone. Some of the differences in height can also be explained by genetic factors, such as height of the parents (Kuh & Wadsworth 1989). Moreover, the influence of the social background cannot be described by height alone.

In the Whitehall study among British civil servants, it was estimated to what extent inequalities in health among adults could be traced to differences in socio-economic circumstances during childhood as indicated by height. This study showed that given a certain age and social position, short persons ran a higher risk of dying from ischaemic heart disease than tall persons. This provided indications about the impact of material circumstances during childhood on health later on in life. However, the strength of the relationship between occupational level and mortality from heart disease hardly decreased after adjusting for height (Davey Smith et al. 1990b). This may indicate that the contribution of material circumstances during childhood to the explanation of socio-economic inequalities is rather small.

The overall importance of the causation mechanism for socio-economic inequalities in health is presumably much larger than that of the selection mechanism. A number of behavioural factors have been demonstrated to account for some inequalities in health. For example in the Whitehall study, approximately forty percent of the higher risk of mortality from heart disease in lower civil servants appeared to be accounted for by 'traditional' risk factors such as smoking, being overweight and a lack of physical exercise (Rose & Marmot 1981). This result cannot automatically be generalized to the Dutch situation as it is largely unknown whether

the socio-economic distribution of risk factors in the Netherlands is comparable with the distribution in Great Britain.

2.1.6 Conceptual model

The explanatory mechanisms that were discussed above were integrated into one model. A new aspect of this model and of the LS-SEHD, is the attempt to quantitatively assess the importance of the relevant mechanisms and factors in relation to each other. Insight into the interrelationship is necessary to estimate the relative importance of each of the factors and mechanisms involved. Only then is it possible to see how the influence of a particular factor affects other explanatory factors. It is of course impossible to statistically test each and every relationship in the model. The function of the model lies mainly in the opportunities that it offers to derive hypotheses regarding the explanation of inequalities in health which incorporate the relationship between the various factors and explanations. The hypotheses will then be tested separately by means of the data that have been gathered in the LS-SEHD.

The hypothesized role of mechanisms and factors in the explanation of inequalities in health has schematically been visualized in Figure 2.1.1. Each of the blocks in the figure represent the factors that are measured in the LS-SEHD. The relationship between the factors concerned are represented by arrows. The mechanism in which this relationship is placed is also included in the model. The relationships are clarified in this section by way of examples.

Because the diagram serves as the conceptual model for the LS-SEHD, factors and relationships that are not considered in this study have of course not been included in the model. This applies for example to the use of health care. We included use of preventive services but omitted use of therapeutic and rehabilitative services from the model as the LS-SEHD deals with variation in incidence, not prognosis, of health problems.

Although it may sound paradoxical because of the diagram's complexity, the model is still a much simplified representation of reality. The word model has already indicated this. The relationship between factors has also been simplified considerably. It is only generally indicated which groups of factors will influence each other. Moreover, the relationships that exist between different factors in one and the same group have not been specified. Nor does the diagram express the dynamics that characterize most behaviour and circumstances. In reality, many of the characteristics change during the various stages of human life but the model remains a static representation.

Causation

The 'causation' mechanism in this model is represented by the three groups of risk factors which are 'intermediary' between socio-economic status and health problems, i.e. behaviour, material conditions and psychosocial characteristics. The model assumes that the various groups influence each other. As a result, the influence of an intermediary factor on health can be either direct or indirect. The model shows for example, that long-term difficulties may arise from a number of material condi-

tions, such as housing circumstances (e.g. over-crowding) and working conditions (e.g. noise).

The distribution of behavioural factors across socio-economic groups is also influenced by other groups of determinants. It is assumed that behavioural differences between socio-economic groups do not all reflect free choices because the choices have also been influenced by differences in conditions. Therefore, the presence of stress may lead to behaviour that is harmful to health (Lazarus & Folkman 1984). In this case, stress is the explanation for a higher level of unhealthy behaviour in lower socio-economic groups. Another example of behaviour that is influenced by other factors is the influence of available financial resources on dietary habits. By testing the relationship between behavioural and material factors, as in chapter 5 of this thesis, it is possible to determine which part of the existing socio-economic inequalities can be traced to material or psychosocial factors.

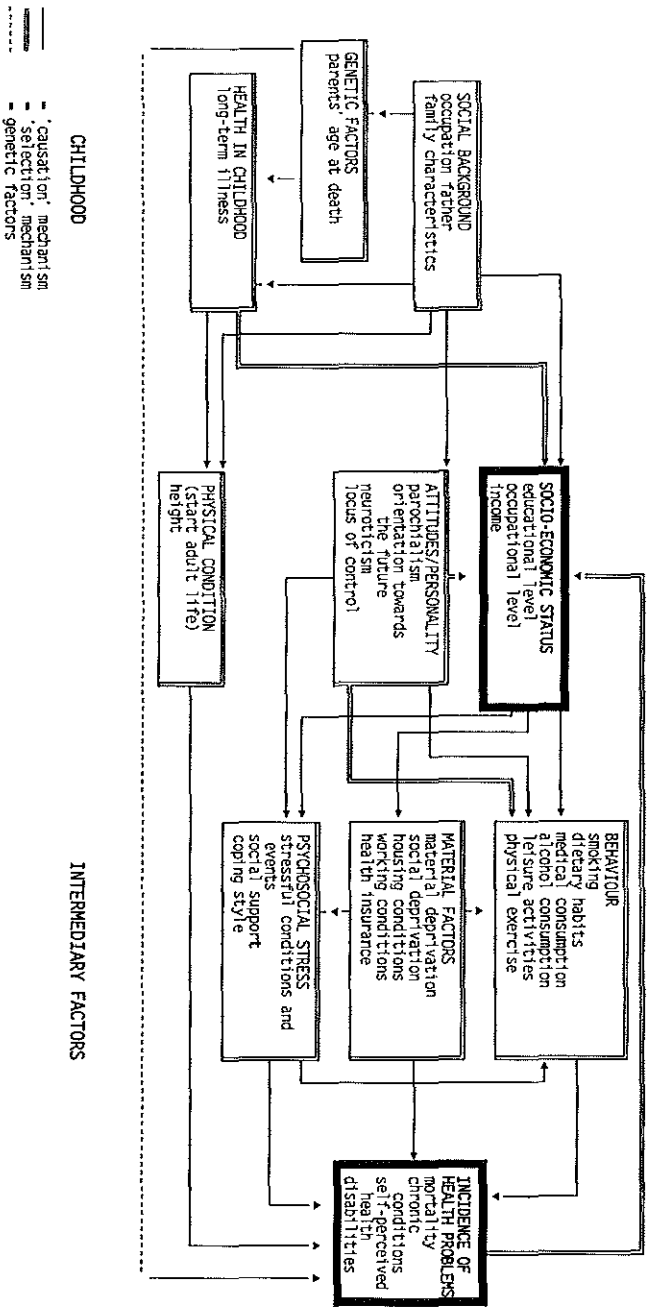
Within the scope of the causation mechanism, the social background is also important. Material circumstances during childhood are supposed to affect health later on in life. Because there is a relationship between a person's social position and the social environment he grew up in, this could explain part of the existing socio-economic inequalities in health. Above, it was indicated that the influence of childhood environment can be indicated using 'height'. In addition, these factors are measured in a more direct manner by means of some approximate indicators of the social status of the family a person grew up in (occupation of the father, some family characteristics).

In the causation mechanism, someone's social background is supposed to be important in other respects as well. It is assumed that it has an influence on the socio-cultural and psychological characteristics of an adult, which, in turn, may influence a number of intermediary factors.

Cultural factors in particular are very closely related to the concept of socio-economic status. Occupation and education as the operationalisation of this concept carry with them a socio-cultural element (Tax et al. 1990). By explicitly including a number of these elements in the model it was indicated that specific attitudes might affect health (behaviour). These could therefore explain part of the existing socio-economic inequalities in health. Naturally, attitudes and personality are not just a result of a person's social background. However, the model does not further discuss the background of these determinants. The inclusion of these factors in the model is primarily an attempt to show that the socio-economic distribution of intermediary factors is determined not only by the current socio-economic status but also by the socio-cultural background.

Attitudes and personality might affect the way in which stressors are dealt with. This applies in particular to neuroticism and locus of control. Moreover, these factors might influence health behaviour such as smoking. Orientation towards the future and 'parochialism' might also influence health behaviour. Higher socio-economic groups presumably show a higher level of future orientation than lower groups (Tax 1982), implying that they might be more inclined to incorporate the long-term consequences of certain behaviour, for example in the decision to smoke.

Figure 2.1.1 A graphical representation of mechanisms and factors hypothesized to be involved in the explanation of socio-economic inequalities in the incidence of health problems at adult ages



Selection
Attitudes and personality might also play a role in the process of indirect selection. The hypothesis is that these constitute a common explanation for a more frequent occurrence of unhealthy behaviour in lower socio-economic groups and for attained socio-economic status. Next to this form of indirect selection, direct selection according to health is also considered in the model. It is represented by the effect of health problems at adult ages on adult socio-economic status ('intragenerational social mobility'), and by the effect of health in childhood on both adult socio-economic status ('intergenerational social mobility') and health problems at adult ages.

Genetic factors
In the model, one aspect of the contribution of genetic factors to the explanation of socio-economic inequalities is considered. It concerns the role of genetic predisposition in the distribution of diseases among socio-economic groups which is indicated here, in a very general way, by the age at which a person's parents died. The link between parents' age of death and that of the individual himself, irrespective of the parents' socio-economic status, might give some indications to the extent to which genetic factors play a role in the development of inequalities in health between socio-economic groups.

2.1.7 Conclusion

This chapter provides an overview of factors and mechanisms that might be involved in the generation of socio-economic inequalities in health. It emerged that the international literature offers sufficient leads to identify these factors and mechanisms.

In order to adequately represent the background of socio-economic inequalities in health, it is necessary to study the various explanatory mechanisms and factors by looking into their mutual relations. For example, it is important to study the contribution of behavioural factors to the explanation of inequalities in health relative to that of living conditions. Moreover, it emerged that it is relevant to study the background to behaviour, as it may arise to some extent from a differential distribution of material or psychosocial factors or socio-cultural differences. It may not be a person's behaviour, but the underlying living conditions or cultural factors which constitute the real explanation of inequalities in health.

Another relevant question is to what extent inequalities in health can be traced to circumstances during childhood. In addition, circumstances during childhood could explain part of the socio-economic inequalities in health in adulthood by way of behaviour later on in life and by way of selection according to behaviour. The hypotheses that are specified here, as well as other hypotheses derived from the conceptual model, will be tested in the LS-SEHD.

Abstract
Policy measures to reduce socio-economic inequalities in health must be preceded by an analysis of the possibilities and desirability of a reduction. This chapter argues that it is necessary to pursue equality in health, conceived as equal opportunities to achieve health. This principle is justified as part of the principle of maximizing individual freedom of choice, and requires that everyone has the opportunity to be as healthy as possible. By means of this principle it is possible to determine which health inequalities should be considered unjust. These are living conditions (physical and social environment and health care) and conditions of choice (e.g. the knowledge of an individual about the health risks of a certain behaviour).

Even if inequalities in health are considered inequities, sometimes conflicting interests will make it difficult to propose a health policy to redress these inequities. These are partly the consequence of the intersectoral character of a policy aimed at equality of opportunities to attain health, in which the importance of health has to be weighed against other goals. Moreover the impact of such a policy on the individual free choice has to be critically weighed. Finally in the context of health care policy, conflicts between the principle of equality and maximizing health can be expected.

2.2 Should equity in health be target number one?

2.2.1 Introduction

There is no doubt that socio-economic inequalities in health exist, even in welfare states. Now that the association between socio-economic position and health seems to be established, a call for a policy response can be observed. Whitehead and Dahlgren (1991), who elaborated policy measures to reduce existing inequalities, summarise this trend as follows: "The debate is no longer about whether inequalities exist but what can be done about them." (p. 1059). In the current debate about the policy measures to be taken to reduce socio-inequalities in health, two important issues have rarely been discussed.

The first concerns the justification of a policy aimed at reducing socio-economic inequalities in health: why is it *necessary* to reduce these inequalities? This question must precede the development of policy measures. Most often the desirability of such measures is simply assumed, even though the justification of policy measures is not necessarily self-evident. We will argue that is necessary to give arguments for the government's responsibility to reduce inequalities in health and to specify the inequalities to which this responsibility applies.

If one can show that (some) socio-economic inequalities should be reduced, the second question to be answered is what *possibilities* exist to achieve this. Given the intersectoral character of such a policy and the fact that these inequalities in health are inextricably related to socio-economic structures, conflicts of interests in developing policy measures can be expected. In order to get a realistic idea of the possibilities of a government to reduce these inequalities, the potentials for policy measures and the inherent constraints should be explored systematically. In this paper we will discuss these two questions.

Two preliminary remarks have to be made. So far equality in health has mostly been discussed in the context of health care services (Mooney 1983, Mooney et al. 1991, Wagstaff et al. 1991, Culyer et al. 1992). Central issues in this debate are the desirability of pursuing equality in health care, and the implications for health care policy in terms of equal effectiveness or equal access. Although the issue of equality in health is related to equality in health care, the discussion about the justification of policy measures to reduce health inequalities must not be limited to the area of health care services. Health care is only one of the determinants of inequalities in health. Therefore the debate on the just distribution of health care is a 'second order' debate, which is of importance only after one has taken a view on the desirability of equality in health.

Furthermore, although the justification of equality has so far hardly been discussed in the context of the distribution of health, political and economic sciences have a long tradition of debate on the justification of equal distribution in general. We can and will draw upon some of the elements from this debate.

2.2.2 Socio-economic inequalities in health and inequities

Socio-economic inequalities in health as observed in the Western European countries are generally assumed to be unjust. They are considered socio-economic *inequities* in health. The underlying logic of most people seems to be that, because of the value of good health for the individual, it is desirable and necessary to pursue equality in health for all (Stronks 1992). Starting from this assumption, one might argue that all differences in health have to be eliminated.

The justification for a policy to pursue equality in health is not as simple as that. In the first place, the question arises whether one should pursue for instance equality in actual health or equality of opportunity to attain health. Because equality is open to so many interpretations, this principle has to be specified before a policy can be formulated (Whitehead 1990, 1992). Secondly, if a policy is simply based on the desirability of equality in health, one will face conflicts with other goals society might have. In the western world equality in health is not automatically seen as the primary goal, to which, for example, economic goals are inevitably subordinate. In this paragraph both the justification and desirable conception of equality in health will be worked out.

We will base the justification of the principle of equality in health on the ideas of Sen. More specifically, we will argue that the responsibility of the government to guarantee equality in health can be subsumed under the responsibility of guaranteeing each individual the opportunities to realize his so-called individual life plan. If the latter has been justified, the obligation to pursue equality in health follows logically from this.

Basic capabilities

Sen argues that each individual has to be guaranteed freedom of choice. The justification of this ideal can be based on the principle of equal concern and respect (Larmore 1987, Dworkin 1987). According to that principle each individual is due equal respect, by virtue of his capacity to work out his own conception of the good life: "To have respect for a person is to view him as capable of elaborating beliefs that we would respect." (Larmore 1987, p. 64).

Therefore each person should have the opportunity to plan his own life. The government is not allowed to favour some groups or persons above others, for example because it believes the ideas of the former are better than those of the latter. As a consequence of the principle of equal concern and respect, individual freedom has to be valued highly. Freedom based on the wish to show every individual equal concern and respect is called *positive freedom* and can be described as follows.

The ideal of the individual who has the freedom to lead the life he considers worthwhile, requires a minimal interference by others. There must be some area in which the individual is free to decide. Neither the government nor any other citizen is allowed to prevent the individual inside this area from doing the things he wants to do. This is called negative freedom. However, being free in the 'negative' sense is not sufficient to work out a lifeplan. This requires more than the absence of interference by others. It shifts the attention from interference by others

to the things an individual can actually do. Firstly, a person must have an opportunity to choose between different ways of living which are all meaningful to him. He must have the freedom to choose from these different life plans the plan which agrees most with his own conception of the good life. Furthermore he must be able to realize his own life plan as much as possible. If these conditions are met, an individual is free in the positive sense (Berlin 1969, Benn & Weinstein 1971).

Positive freedom can therefore be formulated as *freedom of choice*. Justice through the ideal of positive freedom means guaranteeing each individual an equal ability to choose freely. This implies that conditions have to be created that make it possible for each individual to choose the life plan that seems the best to him. Moreover, each individual must have equal prospects of realizing this life plan.

Sen (1985, 1988, 1990) argues that the freedom a person has, is reflected in the different ways of living from which he can choose. These different ways of living can be phrased in terms of alternative combinations of functionings or doings and beings. Examples of these are: being adequately nourished and having the opportunity to follow (qualified) education. These so-called 'capabilities' determine the range and content of the life plans an individual can choose from. Maximizing the individual freedom of choice therefore means guaranteeing each individual as many ways of functionings and beings as possible. The possibility to lead a long and healthy life then becomes just another condition for individual freedom of choice. In other words, good health can be defined as a '*basic capability*'. The absence or presence of this capability determines the life plans from which an individual can choose and a restriction of this capability implies a reduction of the alternatives.

In this view promoting positive freedom therefore means enhancing human capabilities, among others the capability of being in good health. Given these capabilities, individuals might differ in the value they attach to different ways of functioning, for example to being as healthy as possible. In the notion of positive freedom, they are entitled to do so. Each person then has the right not to define his life in terms of a long and healthy life, but to choose for say a 'burgundian' lifestyle. Consequently equality of health is interpreted as equality of *opportunity* to be as healthy as possible. This principle does not require everyone to have the same level of health, but it demands such a distribution of determinants of health, to the extent that they can be controlled, that every individual has the same possibilities to lead a long and healthy life. Given those opportunities, the individual reserves the right to decide whether to use them or not. As a consequence, equality in health justified on the notion of positive freedom, may well coincide with differences in actual health. The definition of equity in health achieved by this argument is the same as the one used by Whitehead (1990, 1992), but here it is based on theories of social justice.

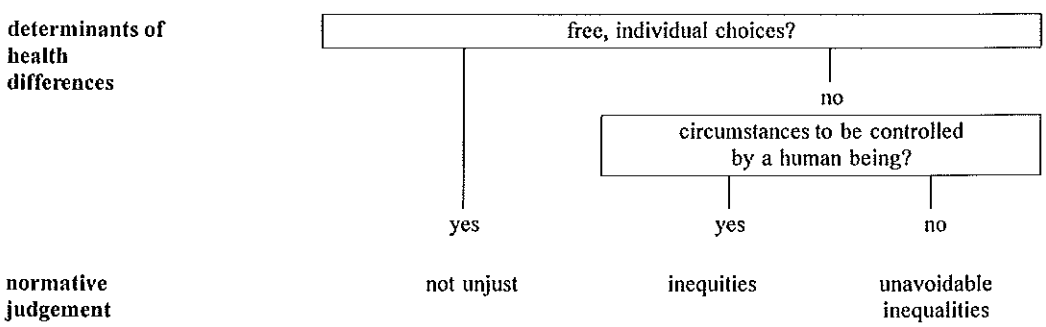
The justification of the desirability to pursue equality in health, perceived as equality of opportunities to attain health, is consistent with the value the Western world attaches to the principle of 'equal concern

and respect', and to positive freedom. Because the government is not supposed to promote a particular conception of the good life, each individual should have the right to determine whether he lives a healthy life or prefers a lifestyle which can be hazardous to his health. The only thing a government is entitled to do is to create conditions that make it possible for the individual to choose the life plan which seems best to him. The capability to be as healthy as possible is such a condition. Health is thus pursued in this argument for its instrumental value, which means that it is primarily considered to be important because it enables the individual to pursue other values. In this argument equality of opportunities to attain health has to compete with other 'basic capabilities' like equal opportunities of education.

Moral judgement

If one accepts the principle of equality of opportunities to attain health, differences in health cannot be considered unjust in advance. Whether they are unjust or not depends on their origins.

Inequalities that are the result of free choices made by an individual are *not* unjust. If the society attaches value to health in order to promote individual freedom of choice, one must, in general, accept the consequence that some people will not choose good health as their primary goal. Differences in health, in our context, are *unjust* if they result from a situation of inequality of opportunities for health. That inequality is reflected in an unequal distribution of determinants of health if these health-influencing factors are beyond the control of the individual. This applies to most health-influencing circumstances in which an individual lives. This is of course conditional. If the distribution of a certain determinant of health is beyond the control of a human being, like the age distribution, it cannot be defined in terms of justice or injustice, if justice is defined as a situation in which equal cases are treated equally and unequal cases unequally. This definition already shows that justice presupposes the acting of a human being. If the distribution of a certain good is determined by nature, like the distribution of genetic factors, one may at most judge it unfair. Such an unequal distribution will be called *unavoidable* in our terminology. This argument can be shown schematically as follows:



In order to determine which *determinants* of inequalities in health result in inequities in health or in unavoidable inequalities, they have to be classified in one of these categories. When the causes of existing inequalities in health have been obtained, it is possible to determine which part of the existing inequalities must be seen as unjust. Furthermore policy measures to reduce unjust inequalities can be elaborated.

2.2.3 Possibilities to reduce socio-economic inequalities in health

In the previous pages we have argued that the causes or determinants of inequalities in health will determine whether we consider these avoidable and unjust, hence inequities. Interventions on these same determinants also offer us the possibility to influence the existence of socio-economic inequalities in health. However also the intervention mode itself needs to be critically weighed and valued to see if it is acceptable to society. Sometimes conflicting interests will make it difficult to propose a health policy to redress inequalities in health even if they are considered an inequity (Gunning-Schepers 1994).

We will explore the possible causes of the existing socio-economic inequalities in health and therefore the possible options for interventions, according to the traditional division in health determinants used in Dutch health policy documents (Tweede Kamer 1986): genetic predisposition, physical environment, lifestyles, social environment and health care. They are supposed to be involved in the so-called causation mechanism and genetic explanation. For each determinant we will try to show to what extent resulting inequalities are inequities and what policy options are available to reduce inequities. Furthermore we will show the inherent dilemmas when an intervention to reduce inequities in health through that determinant is placed in the wider spectrum of just social policy.

Genetic predisposition

Causes

Genetic predisposition as well as biological factors such as ageing, determine much of the variability of health seen in a population. However so far there is no evidence that these health differences are systematic nor that they are unequally distributed over the various socio-economic groups (Mascie-Taylor & McManus 1984). If genetic factors were to be found essential in the explanation of socio-economic health differences, resulting inequalities must be considered unavoidable, because most of these health-influencing factors are beyond the control of a human being.

Policy options

Although their current unavoidability would not warrant interventions in this area, this option is further complicated by the fact that genetic interventions encounter very strong opposition in most societies on ethical grounds.

Policy dilemmas
So if in the near future it would be possible to change genetic configurations, there are ethical choices to be made about the acceptability to society of these technological possibilities, before its use to reduce socio-economic inequalities in health may be envisaged.

Physical environment

Causes
Risk factors in the physical environment are seldom unevenly distributed over socio-economic groups by nature (Whitehead 1988). It usually requires social elements to achieve skewed distributions. These are most notable in the risk factors associated with poor housing, working conditions and such basic requirements for health as clean drinking water and adequate sewers. According to the principle of positive freedom it is the government's responsibility to achieve an equal distribution of these conditions. Differences in health resulting from an unequal distribution are therefore inequities.

Policy options
The physical environment is an essential element in the health protection policies that were so crucial to the first public health revolution. Since infectious diseases were the most dangerous threats to public health in that period, much of the policy tradition is still geared towards achieving herd immunity. That implies aiming at a broad protection in the population, if only out of self interest. Because of that tradition, there is a longstanding political consensus to achieve an equal distribution of these risk factors.

Policy dilemmas
They are often the easiest determinants for which a policy response can be envisaged. However effectuation will often involve intersectoral action, and thus may interfere with other socio-economic goals. Sometimes the health goals and the other interests of society coincide, as in the clean drinking water and sewage systems, which helped increase the productivity of workers by reducing endemic infectious diseases. However more often there are conflicting interests, such as in improving working conditions while maintaining a healthy cost-benefit ratio, or in weighing the health costs and the economic benefits of polluting industries or major transport centres in our current societies. It is when such basic capabilities, each necessary for the individual to be able to choose his preferred life plan conflict that government encounters a major policy dilemma.

Behavioural factors

Causes
In discussions about the reduction of socio-economic inequalities in health, behavioural factors are often considered the most important determinant. Not only is the variation in disease frequency for the most

important causes of death explained to a certain extent by risk factors connected to lifestyles, but we also know that these risk factors and the causes of mortality influenced by these risk factors are unevenly distributed over socio-economic groups (Rose & Marmot 1981, Blaxter 1990).

As shown in chapter 2.1, smoking is more prevalent in the lower socio-economic groups, healthy nutritional habits are not evenly distributed in society and alcohol abuse appears to be more frequently found in lower socio-economic groups (although the evidence is mixed on this risk factor; see chapter 2.1). "If only the lower socio-economic groups would adopt healthier lifestyles", seems to be a recurrent theme in many a political debate on inequalities in health. Of course just the fact that these are avoidable inequalities in health is not sufficient to make them inequities, as we argued earlier. The crucial element is if these are determined by free choice or not.

In the first part of this chapter, it was argued that there is ample reason to believe lifestyles are not determined by free choice. The knowledge about the health risks of certain lifestyles for example appears to be unevenly distributed. In addition, there are structural limitations to the freedom of choice, as for instance in pricing policies of certain foods. Furthermore lifestyles may be partly determined by the social environment, by definition unevenly distributed among socio-economic groups.

Policy options

Health education campaigns aim at influencing peoples individual choices in behaviour, through information. As such they can contribute to the necessary knowledge about the health consequences of such choices. They are often viewed as the back bone of policies to decrease socio-economic inequalities in health. Unfortunately we also know that health education campaigns do not always reach everyone nor is their effectiveness equal in different socio-economic groups (Holme et al. 1985).

Policy measures aimed at more structural changes such as pricing policies, are another option. Because of their economic character, they require intersectoral action. To the extent that lifestyles are determined by social environment, the policy response will be quite different and should concentrate on changing social structures rather than guiding individual preferences. The determinant then is no longer behaviour but the social environment, and will be discussed there.

Policy dilemmas

A policy to change individual behaviour, beyond giving information, very soon interferes with an essential political good, that of the freedom to act. Interference with free choice in our societies is usually unacceptable, unless the health risks involved will affect others. The state has rights to limit the freedom of the individual for the best of society for instance in the case of epidemic disease. Also in some societies the free choice of parents is limited if it threatens the health of dependent children, although interestingly enough in The Netherlands vaccination of children has never been compulsory, for the simple reason that the state was not allowed to interfere with the parents free choice based on religious beliefs.

Furthermore in some cases interference with free choice can be justified on the paternalistic argument: interference for the individual's own good. An example of a paternalistic policy is the obligation to use seat belts. Given the value attached in the Western world to individual freedom, only liberal paternalistic policies seem to be acceptable, for instance pricing policies. For some even pricing measures to make unhealthy lifestyles less attractive, as opposed to pricing policies to give healthy choices a fair chance, are rejected for that reason. Another dilemma concerning pricing policies is the possible conflict between the potential health benefit and other policy goals. The EC subsidies to tobacco farmers are a good example of a choice against health in favour of economic growth.

Social environment

Causes

The health determinants in the social environment are really at the centre of socio-economic inequalities in health (Marmot & Morris 1984). They are essential for the very existence of socio-economic inequalities in health since education, income and occupation are but proxies which identify groups in society with distinct cultures and lifestyles. It is often these distinct cultures and lifestyles which are in themselves determinants of health. The health beliefs and attitudes are the legacy of the social environment of childhood, lifestyles and the ability to change them are clearly elements of social structures. In our view it is the government's responsibility to strive for an equal distribution of these structures. However a large part of them cannot be changed, and resulting inequalities in health must be conceived as unavoidable. As a consequence also inequalities resulting from differences in lifestyle as far as these are embedded in social structures, are partly unavoidable.

Policy options

Social structure is the result of political decisions that have very little to do with health. Social structures may cause health differences but health differences will seldom be the reason for major social reforms. Sometimes however decisions are taken in social and economic policy that may have farreaching effects on health, without taking the health impact into account. Since health has long been viewed as a randomly distributed good rather than a basic capability in society of which the quantity and the distribution can be influenced by policy, policy decisions made to influence other basic capabilities have not been considered in the light of their effect on health. A very real policy option is to make the impact on the distribution of health a point to be considered in the general policy making process.

Policy dilemmas

Some of the socio-economic inequalities in health caused by social environmental factors may be considered unavoidable, any policy to change social structures to reduce these health inequalities will definitely

have to take the competing societal goals into account.

Differences in health are at best weighed against other effects such as economic growth and employment, all factors that influence (the distribution of) basic capabilities. If one wants to incorporate changes in the social environment, other than indirect changes through lifestyles or exposure to physical risk factors, into a policy to reduce socio-economic inequalities in health, the key question to ask would be at what point health differences become so pronounced that they can no longer be ignored in the socio-economic policy making.

Health services

Causes

The provision of health care services is the central element and responsibility of health policy. The equal distribution and access of health services has long been the most important subject for debate on the just distribution of health. Many industrialized countries have found a system whereby at least the essentials of medical care are available to all, regardless of income. The importance attached to equal access to care is easily defended by the notion that health is a basic capability and that everyone should have equal opportunity to attain it. If health care contributes to the attainment of health it should rightly be equally accessible to all.

However even in the countries which have gone much further in their policy of equal access, either through a national health service or through obligatory social insurance, inequalities in health persist. Some of these are the result of unequal use of the available services, others appear to be related to unequal effectiveness of services (Yelin et al. 1983, Leon & Wilkinson 1989, Mackenbach et al. 1989). If the unequal use of services generates from differences in the accessibility of services, they should be considered unjust. Differences in the use of available services which reflect individual preferences would not be a subject for policy measures however. Unequal effectiveness of available services on the other hand, is unlikely to be intended, either by the user or the provider. In fact it reduces the individuals capability of attaining health. As such it would be just to strive for equal effectiveness of care.

The same applies to preventive care. Many preventive programmes are based on the premise that all those at risk are reached by their efforts. The effect estimates on which decisions to invest are often made, assume not only a even distribution of risk factors in the population but certainly an average effectiveness for all population groups. We know, however, that the risk factors are not equally distributed in the population. If we could assume equal effectiveness of preventive interventions on these risk factors we could therefore expect a reduction of socio-economic inequalities in health as a result of any such programme. Reality is different. Women in the lower socio-economic groups are least likely to respond to an invitation for a PAP smear, compliance with anti hypertension medication is not equal in all socio-economic groups, children of migrant families are less likely to attend child clinics and receive total vaccination

(Gunning-Schepers 1981). There are apparently constraints that make that preventive services do not reach the general population as they were intended to. Because of their unequal effectiveness, these very preventive services may be partly the reason for the unequal distribution of risk factors, and thus of socio-economic inequities in health.

Policy options

Although health care is probably not the most important determinant of inequalities in health between socio-economic groups, health care policy will obviously be a major channel to reduce these inequalities. The potentials for reducing inequalities in health through health care policies are in the reduction of the unequal distribution of incidence of ill health, through health promotion and disease prevention or in the reduction of the unequal distribution of the outcome of health care, the prognosis of the patient. To adequately reduce inequities, health services policies will have to look beyond equal distribution and access to equal effectiveness. Of course the same applies to preventive services, which may also influence the lifestyle determinants.

Policy dilemmas

In most cases tailor made preventive programmes will cost more than one uniform campaign. It is a political decision to what extent these extra investments are justified, whereby they will have to take into account what other services are forgone in doing so. In this weighing of cost-effectiveness, the ultimate goal either of maximizing health or of achieving an equal distribution of health, will play a role. Since health is a basic capability necessary to attain other goods such as economic wealth, reducing the overall potential to attain such other goods may limit society more than the existence of health differences will. In that case the obvious justification for the reduction of socio-economic inequalities in health may cease to exist.

As with the preventive services, investments in time and personnel to achieve equal effectiveness of curative services will again have to be weighed against the effect we wish to achieve. However more than with preventive services the ultimate goal will be equal distribution rather than maximizing health, since having made the decision to supply health services, unequal effectiveness can never be considered positively. Once ill many of the elements of free choice are eliminated and the outcome is very much in hands of the health care professionals. They therefore have the first responsibility in seeing that the patient gets adequate care, irrespective of income or education. This becomes especially important in situations were the financial resources are becoming increasingly scarce. When rationing of some sort begins to apply in health care, equal treatment to all patients may no longer be guaranteed. Those are the situations in which socio-economic inequalities in health are most likely to be sustained through health policy.

2.2.4 Conclusions

In the first part of this paper we argued that (socio-economic) inequalities in health are not necessarily inequities. Striving for the reduction and prevention of all inequalities in health would result in an unacceptable interference with individual freedom. Starting from the ideas on freedom which are common in the Western world, the principle of equality in health can only be conceived as a means to guarantee each individual freedom of choice, based on the conception of health as a basic capability. Therefore only inequalities resulting from an unequal distribution of opportunities to be as healthy as possible, to the extent that this distribution can be controlled, must be conceived as inequities.

If a distribution of opportunities for health cannot be controlled, resulting inequalities are unavoidable. At least some determinants lead to unavoidable inequalities. Especially the possibilities to control the social environment, by definition a crucial determinant of socio-economic inequalities in health, should not be overestimated. Because some differences in behaviour are embedded in the social environment, the same doubts apply to behaviour as an option to reduce inequalities in health.

The *possibilities* to achieve equity in health was the second main issue of this chapter. Although there is great potential for improving the distribution of health through intersectoral action, given the determinants of socio-economic inequalities in health discussed earlier, there very often will be a conflict of interest with other societal goals. We identified four dilemmas, which show that equity in health cannot always be target number one.

The major constraint in trying to redress socio-economic inequalities in health results from the fact that interventions on most determinants of health will have to come from Ministries other than the Ministry of Public Health. Whereas the primary goal of health policy is (equality in) health, other policy fields have other primary goals, and health effects and distributional effects on health are side effects: income distribution is not determined by its health effects, educational policies are not primarily aimed at reducing inequalities in health, employment may be considered more important than the reduction of work related risks. In intersectoral action conflicts between the goal of equality in health and goals in other policy fields, especially economic policies, are therefore to be expected.

Although sometimes policy measures in several policy fields will positively influence the distribution of opportunities for health, the difficult choices occur when one basic capability has to be foregone for another one. The theories on social justice are useful in determining what basic capabilities are, but they do not offer much help in creating a hierarchy within these basic capabilities. What should society choose: equal opportunities to achieve health or equal opportunities to achieve gainful employment? The predominance of economic interest will be especially noticeable in differences in health between socio-economic groups, because these inequalities in health are inextricably related to the social structure. Placed in the wider spectrum of social policy, equity in health may therefore not always be given highest priority.

However, what we can aim for is to include the health effects in the decision making process. Given the skewed distribution of the determinants of socio-economic inequalities in health that are influenced by intersectoral action, a concern for the health effects of such decisions will almost always reduce inequalities in health even if the distribution of health effects is not directly addressed.

Conflicts between health policy and other policy goals are absent in the context of health care policy. Because health is the primary goal in the policy of the Ministry of Public Health, we should at any rate strive for the realization of the equality principle in this context, interpreted as equal access and effectiveness. However here the principle of equality in health care has to compete with the principle of maximizing health. If one accepts that health is a basic capability, equality should prevail over efficiency, at least in curative care. In case of preventive health care, giving priority to maximizing health can sometimes be useful, as this may in the long run contribute to a situation with greater freedom of choice for each individual.

A third dilemma we pointed out applies to interventions in behaviour. Before implementing such interventions, their impact on the free choice of an individual has to be assessed. Given the high value we attach to free choice, policy measures aimed at improving health behaviour should in first instance be aimed at the determinants of this behaviour, like knowledge about health risks. Interventions that (strongly) interfere with individual free choice could to some extent be justified on the harm of certain behaviour to others, or to the individual himself, so-called paternalistic interventions. But in general, the individual free choice should be respected in policy measures, and equity in health should be made subordinate to that.

A fourth and last dilemma concerns the conflict between the wish to control the distribution of genetic factors and ethical principles. If genetic factors appear to be important in the explanation of socio-economic inequalities in health, a policy to 'redistribute' these characteristics among socio-economic groups will be constrained by ethical considerations.

If we accept that the principle of equal opportunities to attain health should be the main goal of health policy, one should not expect this goal to be fully realized. Not only will some determinants of inequalities in health, especially social structures hardly be open to intervention, also conflicts between health policy goals and other societal goals can be expected. Because health is not always the primary concern in intersectoral action, we should not be too optimistic towards the possibilities to reduce or prevent socio-economic inequalities in health. Yet, given the high value attached to the principle of freedom of choice, we should take any opportunity to equalize opportunities to attain health.

2.3 Study aims of this thesis and outline

In chapter 2.1 we gave an overview of factors and mechanisms which have been suggested as possible explanations for socio-economic inequalities in health. These explanations were integrated into one model, thereby specifying the way they are related to each other. From this review, it seems implausible that socio-economic inequalities in health as a whole are an *artefact* of the research methods used. Inequalities in health have been observed in many studies based on many different methods of data collection and study designs. Although the artefact explanation may have some relevance for the results of specific studies, as for example for British occupational mortality statistics (discussed in chapter 2.1), in general the consequences of a man's or woman's position within the social stratification on his/her health status cannot be dismissed. In this thesis we will study which proximate risk factors are involved in the effect of socio-economic status on health. Therefore our focus is primarily on the mechanism which was discussed in chapter 2.1 under the heading of the *causation* mechanism. The selection of proximate risk factors is limited to those that are operative in adult life, including behavioural, material and psychosocial factors.

By focusing on the causation explanation we do not wish to deny the relevance of other explanations which were mentioned in the conceptual model, i.e. the *selection* mechanism, indicating an effect of health status on the position an individual achieves in the social stratification and the explanation in terms of *genetic* factors. The empirical evidence presented in chapter 2.1 nevertheless suggests that they are less important when explaining inequalities in health than the causation mechanism.

2.3.1 Study aims of this thesis

The policy framework in chapter 2.2 enables us to further structure the research question of this thesis. That framework aimed to answer the question whether inequalities in health must be seen as unjust. It was argued that it is desirable to pursue equality in health conceived as equal opportunities to achieve health. By applying this principle to socio-economic inequalities in health as observed in the Western world, it appeared that the possible unjustice of these inequalities depends on their origins. We argued that inequalities in health which are the result of free choices are not unjust. On the other hand, inequalities reflecting an unequal distribution of risk factors which are beyond the control of the individual are unjust. If however, the distribution of such risk factors cannot (easily) be changed by human beings, for example the distribution of genetic factors, the resulting inequalities in health are considered to be unavoidable.

The policy framework stresses the importance of studying the role of specific proximate risk factors involved in the causation mechanism. This is the central issue of this thesis. In addition, it suggests a further classification of the risk factors. From a policy perspective, it appears to be crucial to make a distinction between behavioural factors on the one hand, and living conditions, which are not chosen or controlled by the

individual, on the other. The aim of this thesis therefore was, firstly, to assess the relative importance of behavioural factors versus living conditions (material and psychosocial) when explaining inequalities in health.

Moreover, it follows from the policy framework that the background of the uneven distribution of behavioural factors should also be explored. If differences in behaviour do not reflect *free* choices, the resulting inequalities in health should be seen as unjust. Several behavioural constraints are indicated in the conceptual model in chapter 2.1. These at least include the material and psychosocial environment where a person lives. The second issue to be explored in the empirical studies in this thesis therefore is the way behavioural factors are embedded in living conditions.

Finally, the results of the empirical studies will be related to the policy framework as developed in chapter 2.2. This indicates the third and last study aim of this thesis.

In summary, the study aims are the following:

1. To assess the relative importance of socio-economic differences in material and psychosocial *living conditions* for socio-economic inequalities in health. The conditions studied are financial conditions and deprivation, material housing and working conditions, employment status, and psychosocial stressors.
2. To assess the relative importance of socio-economic differences in *behaviour* for socio-economic inequalities in health and to explore the living conditions in which differences in behaviour are embedded. The behavioural factors studied are smoking, alcohol consumption, physical exercise and body mass index (as an outcome of several behaviours).
3. To explore the policy measures which should be taken to reduce socio-economic inequalities in health given the indications for the explanation of inequalities which were offered by the empirical studies.

2.3.2 Outline of this thesis

As indicated in the first chapter, all empirical studies in this thesis are based on the baseline data collection of the Longitudinal Study on Socio-Economic Health Differences (LS-SEHD). These are therefore all cross-sectional studies. The design of the LS-SEHD and the data collection at baseline are described in chapter 3. The empirical analyses in chapter 4 and 5 are related to the study aims as follows.

Chapter 4 begins with a study on the relative contribution of material factors. Studies which actually address the relevance of such factors *directly* are scarce. Instead, the evidence which is frequently cited as supporting the importance of, for example poverty, for the generation of socio-economic inequalities in health, is rather indirect. One example of such indirect evidence is the observation that the association between *income* and health is stronger than that between other indicators of socio-economic status and health. The study in chapter 4.1 critically assesses

this piece of evidence. We will explore whether it is plausible that the association between income and health reflects the effect of material resources as frequently suggested, or whether it might be disturbed by a third factor which is related to both income and health, i.e. employment status.

The other analyses presented in chapter 4 address the issue of the relative contribution of living conditions more directly. Chapter 4.2 deals with the effect of income on health through deprivation. The study examines to what extent differences in health between income groups reflect a higher level of deprivation in lower income groups and which aspects of deprivation in particular account for that effect. The focus of chapter 4.3 is on the relative importance of psychosocial stressors such as life-events and long-term difficulties. Finally, the analysis presented in chapter 4.4 focuses on one specific condition, i.e. employment status, in relation to differences in the size of socio-economic inequalities health between men and and women. The study assesses whether the lower participation of women in the labour market might explain the smaller socio-economic inequalities in health in this sex.

The analysis in chapter 5 focus on the relative contribution of behavioural factors in relation to living conditions. The first study (chapter 5.1) deals with the relative importance of behavioural factors versus material factors and the extent to which differences in behaviour are embedded in these conditions. It explores the independent contribution of behavioural and material factors as well as their overlap. The second study (chapter 5.2) addresses differences in behaviour between socio-economic groups using smoking as an example. It examines to what extent the higher smoking rates in lower socio-economic groups could be explained by a broad range of determinants, including material and psychosocial conditions.

Chapter 6 summarises and discusses the results of the empirical studies. Moreover, the results are related to the conceptual framework as outlined in this chapter. Finally, the consequences for policy are discussed.

3 DATA SOURCE

Abstract

The empirical analyses in this thesis are based on the baseline data collection of the Longitudinal Study on Socio-Economic Health Differences (LS-SEHD). The LS-SEHD aims at making a quantitative assessment of the contribution of different mechanisms and factors to the explanation of socio-economic inequalities in health.

An aselect sample, stratified by age, degree of urbanization and socio-economic status, of appr. 27000 persons was drawn from the population registers in a region in the Southeastern part of the Netherlands. The persons in this sample received a postal questionnaire. An aselect subsample of appr. 3500 persons from the respondents to the postal questionnaire was, in addition, approached for an oral interview. The response rate to the baseline postal questionnaire was 70.1 per cent (n=18973), and that to the baseline oral interview was 80.3 per cent (n=2835).

3.1 Introduction

All empirical analyses in this thesis use data from the baseline data collection of the Longitudinal Study on Socio-Economic Health Differences (LS-SEHD). In this chapter, the objectives, design, data collection procedures and enrollment rates of the LS-SEHD are described.

The preparations for this study started in 1989, a pilot-study was held in 1990, and the baseline data collection took place in 1991. In its practical implementation, the LS-SEHD has been embedded in a larger data collection effort, the GLOBE-study. The GLOBE acronym refers to 'Gezondheid en LevensOmstandigheden Bevolking Eindhoven en omstreken' ('Health and Living conditions of the population of Eindhoven and surroundings'). While the LS-SEHD deals with socio-economic inequalities in (the incidence of) health problems, the other parts of the GLOBE-study, which are not described here, are concerned with:

- socio-economic inequalities in health care utilization (Van der Meer et al. 1996);
- socio-economic inequalities in cancer survival (Schrijvers 1996);
- differences in health by marital status and living arrangement (Joung 1996).

The LS-SEHD aims at making a quantitative assessment of the contribution of the so-called selection and causation mechanism and specific groups of factors within the causation mechanism. The conceptual model of the LS-SEHD, based on a review of the international literature regarding the explanation of socio-economic inequalities in health, has already been described in chapter 2.1. It is used to derive hypotheses about the explanation of socio-economic inequalities in health which will be tested in the LS-SEHD.

Four types (or aspects) of health problems will be studied: impaired perceived health, long-term disability, specific chronic conditions, and mortality. It was thought that this would give a good balance between 'generic' and 'disease-specific', as well as between 'subjective' and 'objective' dimensions of health. We decided to include in the study persons in a rather wide age-range: 15-74 years. Health problems disproportionally affect people in the middle and older age-groups, but health-related social mobility can only be studied by including younger people as well.

3.2 Design

The design of the LS-SEHD is that of a prospective cohort study. At baseline data were collected among almost 19000 respondents. Assuming a duration of follow-up of 10 years, power calculations showed that this number of respondents was necessary to detect socio-economic inequalities in the incidence of the rarer outcome measures (specific conditions, cause-specific mortality) (Mackenbach et al. 1994). In order to increase the statistical power of the study we decided to increase the

number of 45-74 year olds at the expense of the 15-44 year olds.
Given this large sample size budgetary constraints necessitated a choice for cost-effective ways of data collection. The core of the LS-SEHD therefore consists of a baseline measurement in the form of a postal questionnaire, and follow-up procedures using both registration data (hospital admissions, cancer incidence, mortality) and a postal questionnaire after 5 and 10 years respectively (to measure changes in self-reported health and socio-economic position). The information on factors involved in the 'causation' mechanism which is available in this part of the study, is relatively limited because postal questionnaires impose certain limits on the number and nature of questions that can be asked.

A subsample of those who responded to the postal questionnaire were therefore approached for a more extensive oral interview (at baseline). This interview permitted a more complete measurement of factors involved in the 'causation' mechanism. The follow-up of this subsample includes a oral questionnaire after 5 and 10 years respectively.

As the follow-up procedures heavily rely on the availability of administrative data from public and health care authorities we decided to perform the study in a geographically restricted area. Eindhoven, the fifth largest city of the Netherlands, and a number of surrounding municipalities, ranging from small and rural to medium-sized and urban in character, were chosen for practical reasons.

The population registers of these municipalities were used as a sampling frame. After a pilot study in the same area had shown a response rate to our postal questionnaire of 75 per cent, an aselect sample of approximately 27000 persons was drawn, stratified by age (35 per cent 15-44 years old; 65 per cent 45-74 years old), municipality (60 per cent Eindhoven, the other 40 per cent balanced according to degree of urbanization), and within municipality by postcode (in order to over-represent the lowest and highest socio-economic groups, and thus to increase the socio-economic contrast within the study population). Persons with a non-Dutch nationality were excluded from the sample in order to avoid language problems.

For the oral interview an aselect sample was drawn from the respondents to the postal questionnaire. This sample was again stratified by postcode, in order to further increase the socio-economic contrast.

In order to be able to evaluate the effects of non-response on the study results, we decided to incorporate the following two elements in the study design. Firstly, the total sample (including non-responders) will be followed-up for hospital admissions, cancer incidence and mortality. This will help to determine whether non-responders differ from responders in the frequency of a number of health problems. Secondly, a small subsample of the non-responders to the postal questionnaire was approached for a brief oral interview, the contents of which were practically identical to the postal questionnaire. Responders and non-responders can therefore also be compared with regard to socio-economic position, self-reported health, and a number of factors involved in the explanation of socio-economic inequalities in health.

3.3 Data collection procedures

The data collected during the baseline measurement are summarised in Table 3.1. In addition to the postal questionnaire and the oral interview, the population registers were used as a source of information, mainly on socio-demographic background variables.

Table 3.1 The baseline measurement

	Population register	Postal questionnaire	Oral interview
Background variables	Date of birth	Religious affiliation	Social desirability scale
	Sex	Marital status/living arrangements	
	Marital status		
	Place of birth	Children	
	Country of birth of the mother		
	Place of residence		
Socio-economic position	Postcode	Educational level	Educational level of partner
		Occupation (also of partner)	Family income
		Source of income	
		Car access	
		Housing	
Health indicators	-	Perceived general health	Perceived general health
		Subjective health complaints	Nottingham Health Profile
		Chronic conditions	Long-term disabilities
Factors involved in explanation	-	Smoking habits	Use of preventive services
		Alcohol consumption	Food habits (extensive)
		Food habits	Material and social deprivation
		Physical activity	Social support
		Leisure-time activities	Long-term difficulties
		Body-mass index	Coping style
		Working conditions	Parochialism
		Housing conditions	Orientation towards the future
		Transport	Locus of control
		Health insurance	Neuroticism
		Life events	Socio-economic circumstances in childhood
		Occupation of father	
		Height	
		Long-term disease in childhood	

Extensive measurements of socio-economic position were made, following the recommendations of a Dutch Committee on the measurement of socio-economic status in epidemiological and socio-medical research (van Berkel-van Schaik & Tax 1990). Three dimensions of socio-economic status (educational level, occupational level, income) were measured, both for the respondent and his partner. Following the example of a number of British studies, we also measured car access and housing

tenure. For the health measurements we mainly used instruments as developed and validated for the Netherlands Health Interview Survey (CBS 1988). 'Perceived health' was operationalized in three instruments: a single question regarding perceived general health ('how do you rate your health, generally speaking?' answers ranging from 'very good' to 'poor') (CBS 1988); a list of subjective health complaints (Dirken 1967); and the Dutch version of the Nottingham Health Profile (Hunt et al. 1986, Essink-Bot et al. 1992). Long-term disabilities were measured with a list of Activities of Daily Living and with the OECD indicator of long-term disabilities (McWhinnie 1979). The prevalence of specific chronic conditions was measured by administering a checklist of 23 frequent disorders (CBS 1988). Although the postal questionnaire did not permit a complete survey of all factors possibly involved in the explanation of socio-economic inequalities in health, the factors included (partially) cover health-related behaviour, material conditions, psychosocial stress-related factors, childhood environment, and health in childhood. The oral interview supplements this with, among other things, some relevant attitudes and personality factors. In addition, an extensive food questionnaire was included, measuring fat intake.

During follow-up, the population registers of the municipalities involved in the study (and other municipalities if cohort members move from the study area) will be used to track the study population with respect to place (and address) of residence, marital status, and vital status. In case of death, the medical cause of death will be retreived by linkage to the national cause-of-death register. The incidence of specific chronic conditions will be measured using data on hospital admissions, by diagnosis at discharge and counting first admissions for each condition only. Hospital admission data will be obtained by linkage to the national hospital admission registry. A regional cancer registry will enable us to measure the incidence of cancer in the study population.

After 5 and 10 years, respectively, the postal and oral questionnaires will be repeated (with some modifications). Socio-economic position will be measured again, as will be health status.

3.4 Enrollment rates

The data collection for the baseline measurement started in March 1991, following a publicity campaign in the local newspapers and other media. The postal questionnaire was mailed in a personally addressed envelope, accompanied by an introductory letter signed by the project leader and the director of the municipal public health service. A stamped envelope was added to facilitate an easy response. Three reminders were sent: after 1 week (a simple postcard), after 3 weeks (a letter with another copy of the postal questionnaire), and after 6 weeks (a very urgent letter). The design of this procedure was guided by Dillman's recommendations (Dillman 1978).

The response rates were quite satisfactory (Table 3.2). The overall response rate was 70.1 per cent, slightly lower than the expected 75 per cent but still rather high for a postal questionnaire. Differences in re-

sponse rates between different subgroups of the sample were modest in size: women, elderly people, the better-off, and country-dwellers responded a little more frequently than did their respective counterparts.

Table 3.2 Response rates baseline: postal questionnaire

	Numbers approached[a]	Numbers responding (abs)[b]	% responding
gender			
men	13583	9207	67.8
women	13487	9766	72.4
age			
15-34 years	7083	4762	67.2
35-54 years	10088	6977	69.2
55-74 years	9899	7234	73.1
postcode group[c]			
1 (well-to-do)	6805	4960	72.9
2	3829	2727	71.2
3	4537	3232	71.2
4	4163	2853	68.5
5 (deprived)	7615	5134	67.4
degree of urbanization			
1 (rural)	213	160	75.1
2	2681	1969	73.4
3	4462	3268	73.2
4	3639	2521	69.3
5 (big city)	16075	11055	68.8
Total	27070	18973	70.1

[a] net sample, i.e total sample (n=27278) minus: questionnaires which were returned because the address was wrong (n=124); persons who had died (n=30); persons who were absent for a long time (n=18); nursing home residents (n=7); mentally handicapped (n=29).

[b] i.e. those who returned a completed questionnaire

[c] classification based on commercial postcode segmentation data; unknown for 121 persons in the net sample and for 67 responders respectively.

The data collection for the oral interview started in April 1991, and lasted until the end of June. A personal letter was sent to announce the interviewer, who visited the address a maximum of three times. The overall response rate was 80.3 per cent (Table 3.3), with even smaller differences between subgroups of the sample than in the case of the postal questionnaire. This implies that this study population closely resembles the original sample as far as the distribution of socio-demographic factors is concerned.

239 non-responders to the postal questionnaire were approached for a brief oral interview. Of these, 64 (26.8 per cent) completed this interview.

Table 3.3 Response rates baseline: oral interview

	Numbers approached[a]	Numbers responding[b]	% responding
gender			
men	1718	1388	80.8
women	1811	1447	79.9
age			
15-34 years	912	739	81.0
35-54 years	1295	1041	80.4
55-74 years	1322	1055	79.8
postcode group[c]			
1 (well-to-do)	981	800	81.5
2	507	417	82.2
3	591	473	80.0
4	452	352	77.9
5 (deprived)	981	779	79.4
degree of urbanization			
1 (rural)	27	22	81.5
2	335	282	84.2
3	597	486	81.4
4	476	399	83.8
5 (big city)	2094	1646	78.6
Total	3529	2835	80.3

a net sample, i.e total sample (n=3637) minus: persons whose addresses were wrong (n=18); persons who had moved (n=50); persons who were absent for a long time (n=40). Persons who had not sent back their postal questionnaire, but were selected accidently for the interview, are excluded from the sample.

b i.e. those who returned a complete questionnaire

c classification based on commercial postcode segmentation data; unknown for 17 persons in the net sample and for 14 responders respectively.

3.5 Discussion

The LS-SEHD represents a conscious attempt to translate recent insights and hypotheses on the possible causes of socio-economic inequalities in health into an appropriate and cost-effective research design. The conceptual framework of the study reflects the complexities of the phenomenon: causality is probably bidirectional, multiple factors are involved in the 'causation' mechanism, and the distribution of these factors across socio-economic groups is partly determined by circumstances and experiences in early life. The use of postal questionnaires and administrative data from public and health care administrations, in addition to the more conventional oral interviews, enabled us to combine a large sample size with an adequate data collection effort.

The response rate of the postal questionnaire used for the baseline measurement actually is higher than that obtained in large-scale oral interview procedures in the Netherlands: surveys of the Netherlands Central Bureau of Statistics, including the Health Interview Survey, currently have response rates of around 55 per cent (CBS 1992). As there

is no reason to suppose that the validity of responses to postal questionnaires is lower than that of responses to oral questionnaires (O'Toole et al. 1986), we believe that the data collection procedure adopted for the LS-SEHD will prove to be a good choice.

A comparison of the design of the LS-SEHD with that of other studies investigating the explanation of socio-economic inequalities in health suggests some interesting similarities *and* differences (van de Mheen & Mackenbach 1990). Table 3.4 summarises the design of the LS-SEHD on the one hand, and that of a number of frequently cited British studies on the other hand.

The 'OPCS Longitudinal Study' is rightly famous for its tremendous contributions to the debate on socio-economic inequalities in health, especially mortality, both in the United Kingdom and internationally. Of the four British studies mentioned in Table 3.4, it is by far the largest in terms of sample size, and it is also much larger than the LS-SEHD. Its advantage in statistical power is, however, counterbalanced by the relatively limited number of variables on which information was collected in the baseline measurement (i.e. the 1971 census). Its stronghold therefore is description, not explanation.

The other three British studies mentioned in Table 3.4 clearly offer many more opportunities for explanatory analyses. The 'National Survey of Health and Development' exemplifies the three birth cohort studies which are currently underway in the United Kingdom, and which permit extremely interesting analyses of life histories. This is important for the explanation of socio-economic inequalities in health, because the distribution of risk factors across socio-economic groups is mediated by factors which find their origin in early life (childhood environment, cultural factors, psychological factors). Birth cohort studies enable researchers to disentangle the time-order of events in these areas, and thereby provide insight into the causality of associations. In addition, the effect of health in childhood on 'intergenerational social mobility' can be studied in a prospective way. The LS-SEHD was not constructed to permit such analyses: we start with a cross-section of age-groups in the range 15-74 years.

The objectives of the LS-SEHD are more closely comparable to that of the 'Whitehall (I)-study' and the 'West of Scotland 20-07-study' (Table 3.4). Data collection at the baseline measurement has been quite extensive in both studies, with an emphasis on biomedical measurements in the Whitehall-study and on social factors in the 20-07-study. The Whitehall-study's sample size is much larger than that of the 20-07-study, but it is restricted to men in the age-range 40-64 years. The 20-07-study intends to document health effects of social factors in three distinct age-cohorts: those 15, 35 and 55 years at baseline respectively. The comparison in Table 3.4 shows that the LS-SEHD has the sample size of the Whitehall-study, but the emphasis on social factors of the 20-07-study. A large sample size is necessary to detect socio-economic inequalities in the incidence of e.g. specific conditions or mortality from the largest causes.

Table 3.4 A comparison between the Longitudinal Study of Socio-Economic Health Differences (LS-SEHD) and selected other longitudinal studies of socio-economic inequalities in health

	NSHD[a]	Whitehall-I Study[b]	OPCS-LS[c]	20-07 Study[d]	LS-SEHD
Starting year (t=0)	1946	1967-1969	1971	1987	1991
Size study population (t=0)	5362 (national)	17530 (London)	± 513000 (national)	4800 (Glasgow)	18973(1) 2835(2) (Eindhoven)
Socio-economic data	occupation education income occup. father & mother educ. father & mother occupation partner education partner	occupation	occupation education occup. partner car access housing tenure	occupation education income occup. father & mother educ. father & mother occup. partner car access housing tenure	occupation(1) education(1) income(2) occup. father(1) educ. mother(2) occup. partner(1) car access(1) housing tenure(1)
Health indicators	mortality self-reported health morbidity[e] chronic conditions[f] mental health injuries	mortality	mortality morbidity[g]	perceived general health chronic conditions[f] mental health disability subjective health complaints injuries	mortality(1) morbidity[g] (1) chronic conditions[f] (1) perceived general health(1) subjective health complaints(1) long-term disabilities (2)
Explanatory variables	genetic health factors housing conditions personality attitudes educational development height & weight family background	behavioural factors (smoking and leisure time activities) height & weight risk factors CHD[e] medical history	family background regional characteristics life-events	height & weight behavioural factors (smoking, use of alcohol, diet, leisure time) family background housing conditions neighbourhood characteristics biological risk factors[e] psychological factors working conditions medical history values/attitudes/beliefs	see Table 3.1

Sample composition	all children born in one week in 1946 in follow-up overrepresentation of lower occupational groups	male civil servants age 40-64	1 % of total population all ages	3 age-cohorts (15, 35, 55 years old) overrepresentation lowest and highest SES-group	15-74 years old, overrepresentation of 45-74 years old and lowest and highest SES-group
Data collection procedures (t=0)	oral interview parents medical examination	written questionnaire medical examination	census (written questionnaire)	written questionnaire oral interview oral interview parents (15 yr.) physical examination by nurse	postal questionnaire [1] oral interview [2]
Data collection procedures follow-up	oral interview (parents and respondent) medical examination school information written questionnaire cause of death registry	cause of death registry	hospital admissions registry cancer incidence registry cause of death registry census	written questionnaire oral interview oral interview parents (15 yr.) physical examination by nurse	hospital admissions registry cancer incidence registry cause of death registry postal questionnaire oral interview

[a] National Survey of Health and Development (Blaxter 1986, Douglas 1951, Atkins et al. 1981, Wadsworth 1987, Kuh & Wadsworth 1989)
[b] Reid et al. 1974, Rose et al. 1977, Marmot et al. 1978, Rose & Marmot 1981, Marmot et al. 1984
[c] OPCS Longitudinal Study (Blaxter 1986, Fox & Goldblatt 1982, Moser et al. 1986, Moser et al. 1987, Barker & Roberts 1987)
[d] West of Scotland 20-07 study (West 1986, Ecob 1987, Macintyre 1987, Annandale 1987, Macintyre et al. 1989, West et al. 1990, Macintyre & Sooman 1991)
[e] measured by medical examination
[f] selfreported
[g] measured by use of registries

We did not focus on specific age-groups: perhaps the explanations of socio-economic inequalities in health differ between generations, but if they do, the sample sizes of the generations in the study would have to be quite large to detect such differences. On the other hand, a comprehensive analysis of the mechanisms and factors involved in the explanation of socio-economic inequalities in health requires an emphasis on social factors, as is also evident from the data collected in the 'Whitehall II-study' (Marmot et al. 1991). Which does not imply that we would not have liked to include biomedical measurements, both to validate some of the self-reports in the LS-SEHD (e.g. on body mass index, on the prevalence of chronic conditions) and to provide information which is impossible to obtain with questionnaires (e.g. on serum cholesterol and blood pressure). The absence of such measurements is probably the main weakness of our study.

Although there are many differences between the LS-SEHD and the other studies mentioned in Table 3.4, as well as longitudinal studies carried out in other countries (van de Mheen & Mackenbach 1990), a comparison of the results of studies performed in different countries may still be worthwhile. International comparisons of socio-economic inequalities in health have shown that the size of these inequalities differs between countries (Leclerc et al. 1990, Lahelma & Valkonen 1990, Kunst & Mackenbach 1992, Kunst et al. 1995). Actually, as these societies differ in many respects, the contribution of different mechanisms and factors to inequalities in health is probably also different. A comparison of the results of different longitudinal studies offers interesting opportunities for an exploration of this issue.

4 THE ROLE OF MATERIAL AND PSYCHO-SOCIAL LIVING CIRCUMSTANCES

Abstract

Objective: The aim of this chapter was to test the hypothesis that the relatively strong association between income and health, compared to that between education/occupation and health, can be interpreted in terms of an association between employment status and health.

Methods: Health indicators used were the prevalence of one or more chronic conditions, and perceived general health. The study population consisted of 6506 men and 6885 women, aged 25-64, who responded to the postal questionnaire in 1991.

Results: After controlling for differences in other socio-economic indicators, the association between the income proxy and health was found to be stronger than that between occupation or education and health. Most of the difference in strength was found to be due to employment status, especially among men. Controlling for employment status, and controlling for the distribution of those with a long-term work disability in particular, reduced the risks of lower income groups, whereas the risks of lower educational or occupational groups hardly changed.

Conclusions: These results suggest that the stronger association between income and health, compared to that between education or occupation and health, can for a large part be interpreted in terms of an interrelationship between employment status, income and health. More specifically, this relatively strong association is largely due to the concentration of the long-term disabled in lower income groups. This indicates the importance of the selection mechanism, as these groups are excluded from paid employment because of their health status, leading to a lowering of income. However, income was still found to be related to perceived general health after controlling for employment status, especially among women. This suggests that an explanation of the association of income and health in terms of an effect of material factors on health may also be important.

4.1 The interrelationship between income, health and employment status

4.1.1 Introduction

It is now well recognized that people in lower socio-economic status groups on average are less healthy than people in higher socio-economic groups (Fox 1989, Illsley & Svensson 1990). Socio-economic status represents the position of an individual or household in the social stratification. It is generally assumed that social stratification comprises several components. Following Weber, a class and a status component may be distinguished. The class component reflects the material resources an individual controls, e.g. spending power and physical living conditions. The status component reflects differences in lifestyles, attitudes, knowledge etc. (Susser et al. 1985, Liberatos et al. 1988). Level of income is considered to be the most appropriate indicator of the material or class component, while occupational and educational level are more closely related to the status component.

Socio-economic inequalities in health have frequently been described but an *explanation* of these inequalities has received less attention in empirical studies.

The largest part of these inequalities seems to be caused by the effect of socio-economic status on health, through more specific determinants of health, such as material factors (e.g. working and housing conditions), and lifestyle factors (e.g. smoking and alcohol consumption). To determine the relative importance of these explanations, socio-economic status, health and possible determinants of health inequalities have to be studied simultaneously. There are, however, other strategies which give an indication as to their relative importance. One strategy is to compare the strength of the association between different indicators of socio-economic status and health (Goldblatt 1990, Dahl 1994).

The association between health and *income* - either measured directly or via indicators of material well-being - seems to be stronger than the association between health and the more frequently used indicator of occupational class. For example Goldblatt (1990) showed that the rather simple variable 'household access to a car', was a more powerful (single) discriminator of mortality than occupational class. Blaxter (1990), in an analysis on Health and Lifestyle Survey data, reported higher risks of health problems for low income groups than for low occupational groups while controlling for differences in the other socio-economic indicator. She concluded that "the apparently strong association of social class and health is primarily an association of income and health" (p. 72). Given the connection between income and material factors, these results may indicate that material factors are more important in the explanation of inequalities in health than e.g. lifestyle. There may, however, be another possible explanation for the relatively strong association between income and health. This concerns an explanation in terms of an effect of health on income, through *employment status*. That alternative explanation is explored in this chapter.

The associations between socio-economic status, health and employment status are complex. Firstly, employment status is associated with health. For example, housewives and the unemployed are less healthy than those in paid employment (Bartley et al. 1992, Moser et al. 1990). In addition, employment status is related to socio-economic status. People from lower socio-economic groups have a higher risk of losing their job (Arber 1987, Bartley 1988, Klein Hesselink & Spruit 1992, Bloemhoff & de Winter 1991). We hypothesized that employment status is more strongly associated with income than with occupation and education, because job loss often implies a lowering of income (Hay 1988). The effect of employment status on education and occupation is presumed to be less likely. Although unemployed people might have a higher risk of experiencing downward social class mobility (Fox & Shewry 1988), in most cases a person's educational and occupational level will have been achieved before the current employment status is attained. If this assumption is correct, the association between income and health is more likely to be based on the relationship between employment status and health than that between occupation or education and health.

We tested the hypothesis that the relatively strong association between income and health, compared to that between education/occupation and health, can be interpreted in terms of an association between employment status and health. Moreover, the implications of these findings for the interpretation of the relationship between income and health will be discussed.

4.1.2 Data and methods

Population
The analyses were based on respondents aged 25-64 who answered the postal questionnaire in 1991. People younger than 25 (mainly students, conscripts etc.) as well as conscripts/students of 25 and older were excluded because of classification problems with regard to socio-economic status. People over 64 were excluded because little variation in employment status exists within this group. People for whom information on employment status was missing (1.8 per cent) were also excluded. This resulted in a study population of 13,391 persons (6506 men, 6885 women).

Indicators of socio-economic position
Household income was requested only in an interview among a subsample. In order to estimate the level of household income for the total sample, we used proxies for income level, namely health insurance, housing tenure and car ownership. Most people in the Netherlands with an income above a certain level are privately insured, while lower income groups receive public insurance. Housing tenure and car ownership, which are considered to be indicators of material well-being, have been shown to be powerful discriminators of mortality (Goldblatt 1990). By combining these proxies, we created five categories (from lowest to highest):

publicly insured, rented house, no car; publicly insured, rented house, car; publicly insured, house owner; privately insured, rented house; privately insured, house owner. The correlation (Somer's D, dependent variable income) between this proxy and income level as measured among the subsample is .54. The corresponding average net household income per month is 1900, 2633, 3010, 3427, 4402 Dutch guilders respectively. Other classifications, for example one where the most advantaged group was divided into car owners and those with no car, did not further increase the correlation between the proxy and the measurement of income level.

The second socio-economic indicator is the educational level of the respondent, divided into four categories: primary school only; lower general and vocational education; intermediate vocational and intermediate/higher general education; higher vocational college and university.

Thirdly, the occupational level of the main breadwinner was determined on the basis of the current occupation, if in paid employment, or if not, the last paid employment. The occupations were classified according to five levels outlined in the Erikson, Goldthorpe and Portocarero (EGP) scheme, i.e. higher grade professionals; lower grade professionals and routine non-manual employees; self-employed; high and low skilled manual workers; unskilled manual workers (Erikson et al. 1983). People who had never been in paid employment formed the sixth category. If the respondent did not live with a partner, he or she was automatically classified as the main breadwinner. If the respondent lived with a partner, he or she was asked who the main breadwinner was.

In accordance with the results of other studies (Abramson et al. 1982, Winkleby et al. 1992), the socio-economic indicators were only weakly correlated. This supports the view that each of them reflects in part a different dimension of social stratification. Occupation and education in men were the most strongly correlated (.53), whereas the weakest correlation was observed for income and education in women (.25).

Employment status

People were classified according to their employment status by answering a question relating to their main activity. We distinguished five groups: (1) the paid employed (2) the unemployed, defined as those who are officially registered as looking for a paid job (3) people with a long-term work disability, defined as those who are dependent on some form of a social security benefit because of illness; in the Netherlands, an employee is eligible for a work disability benefit if the disability has lasted for more than one year; the benefit equals a minimum of 70 per cent of the least earned wage (4) the early retired (5) housewives (m/f).

Health measures

Two health measures were used. Firstly, chronic conditions were measured by means of a checklist, containing 23 chronic conditions, some of which were severe (such as cancer and heart disease), while others were less severe (such as serious headache and varicose veins). Respondents

were classified according to whether (at the time of the survey) they reported to be suffering from at least one of the conditions listed in the questionnaire. 44.4 per cent of the male and 49.6 per cent of the female study population reported one or more chronic conditions. The second health measure was based on the respondent's answer to the question "How do you rate your health in general?", dichotomized as "(very) good" versus less-than-"good" (fairly good; sometimes good, sometimes bad; bad). 27.9 per cent of the men and 29.0 per cent of the women in the study population perceived their general health as less-than-"good".

Analyses

Logistic regression models were fitted, controlling for potential confounders. These are (number of categories between brackets): age (5 years age groups), marital status (4), religious affiliation (4) and degree of urbanization (5). All variables were coded as dummy variables. Models were fitted for men and women separately because of differences in employment patterns. The analyses were carried out using the Logistic Regression module of Egret (Statistics and Epidemiology Research Corporation 1990). The regression coefficients and their standard errors were used to calculate Odds Ratios and their 95 per cent Confidence Intervals. The highest socio-economic group was always used as a reference category. Given the overlap between the socio-economic indicators, the association between a specific indicator and health was assessed when controlling for the other indicators. In addition, we compared the reduction in deviance due to the inclusion of each indicator. The higher the reduction of deviance the higher the proportion of variation in health accounted for. The reduction in deviance was also used to assess the significance of the socio-economic gradient.

In order to test to what extent the association between each socio-economic indicator and health was due to the relationship between health and employment status, we included that variable in the logistic regression model. Odds Ratios were compared with those of the model in which differences in employment status were not controlled for.

4.1.3 Results

In Table 4.1.1, the Odds Ratios for the socio-economic indicators are compared. All indicators caused a statistically significant reduction in deviance for both health measures, with the exception of education among women in the case of chronic conditions. Among men, the income proxy resulted in the largest reduction of deviance. The risk of the three lower income levels appeared to be increased. The size of the Odds Ratios for the lowest income, educational and occupational groups is largely comparable. For women, a similar pattern was observed, but only for perceived general health. The prevalence of chronic conditions hardly varied with socio-economic status.

Table 4.1.1 Chronic conditions and perceived general health by education, occupation and income proxy: Odds Ratios (OR) and 95 per cent Confidence Intervals (CI), univariate analysis[a]

socio-economic indicator		MEN				WOMEN			
		chronic conditions (n=6019)		perceived general health (n=5934)		chronic conditions (n=6376)		perceived general health (n=6274)	
		OR	CI	OR	CI	OR	CI	OR	CI
proxy household income[b]	1	1.00		1.00		1.00		1.00	
	2	.99	.82-1.20	1.12	.89-1.41	.91	.75-1.12	1.24	.98-1.57
	3	1.32	1.14-1.53	2.24	1.89-2.66	1.10	.96-1.26	1.32	1.12-1.56
	4	1.56	1.35-1.81	3.11	2.63-3.68	1.26	1.09-1.45	2.35	1.99-2.78
	5	1.41	1.11-1.78	3.38	2.62-4.35	1.16	.95-1.43	3.10	2.48-3.88
red. deviance			47.6**		249.4**		14.6*		159.8**
(last/current) occupation main breadwinner[b]	1	1.00		1.00		1.00		1.00	
	2	1.38	1.14-1.67	1.53	1.18-1.98	1.14	.95-1.37	1.33	1.05-1.68
	3	1.19	.87-1.63	3.08	2.15-4.42	.70	.50-.97	1.21	.81-1.81
	4	1.51	1.23-1.86	2.73	2.09-3.55	1.25	1.03-1.53	1.99	1.55-2.55
	5	1.71	1.37-2.12	3.54	2.69-4.66	1.36	1.10-1.68	2.90	2.24-3.74
red. deviance			29.0**		172.1**		24.8**		125.1**
education respondent[c]	1	1.00		1.00		1.00		1.00	
	2	1.34	1.15-1.56	1.68	1.39-2.04	1.00	.83-1.21	1.23	.96-1.57
	3	1.28	1.12-1.47	2.26	1.90-2.69	.97	.82-1.14	1.64	1.32-2.04
	4	1.49	1.26-1.77	3.88	3.19-4.72	1.12	.92-1.36	3.09	2.44-3.92
red. deviance			26.3**		205.7**		4.6		137.2**

[a] Results of logistic regression models including age, marital status, religious affiliation and degree of urbanization
[b] 1=high, 5=low (see Data & Methods for categories)
[c] 1=high, 4=low (see Data & Methods for categories)
* p<.05
** p<.001

The results of the multivariate analyses are presented in Figures 4.1.1 and 4.1.2 (men), 4.1.3 and 4.1.4 (women), and in Table 4.1.2. When differences in the education and occupation indicator were eliminated, the income proxy now resulted in the highest reduction of deviance, except for chronic conditions among women. In men, the prevalence of chronic conditions now hardly varied with occupational and educational status (Figure 4.1.1, shaded bars). For both health measures, the Odds Ratios of the lower income groups were higher than those of the lower occupational/educational levels. The difference between the income proxy and education/occupation indicators was more pronounced for men than for women.

Figure 4.1.1 Chronic conditions by income proxy, occupation and education, men, multivariate[a], and controlling, in addition, for employment status

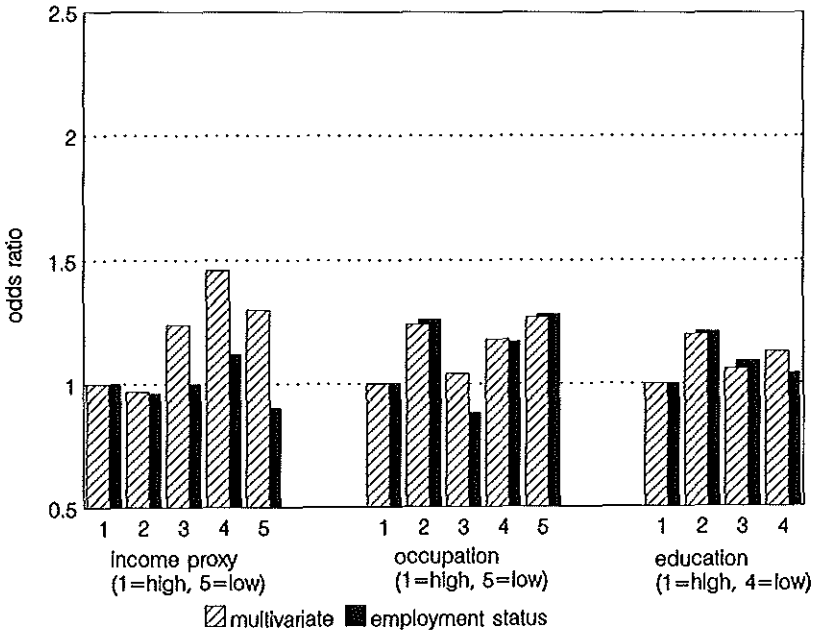


Figure 4.1.2 Perceived general health by income proxy, occupation and education, men, multivariate[a], and controlling, in addition, for employment status

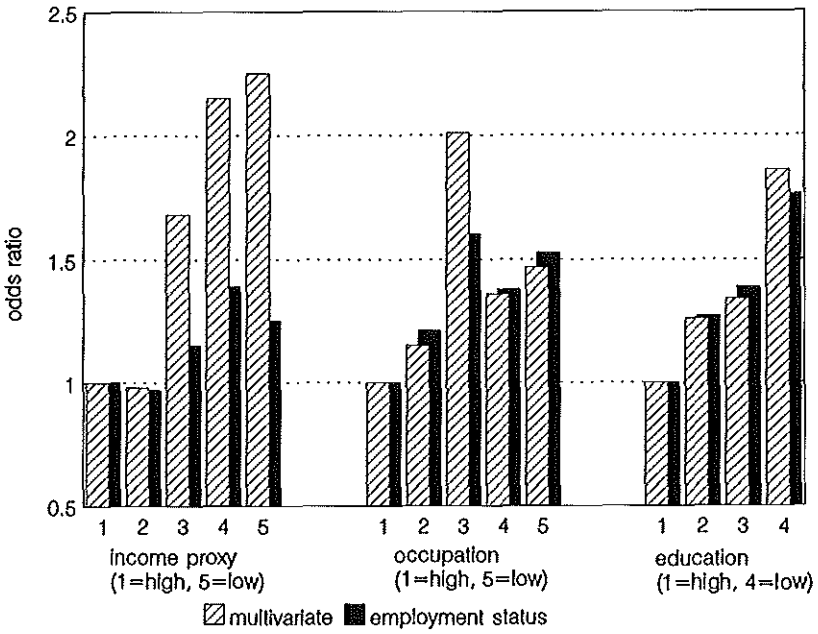


Figure 4.1.3 Chronic conditions by income proxy, occupation and education, women, multivariate[a], and controlling, in addition, for employment status

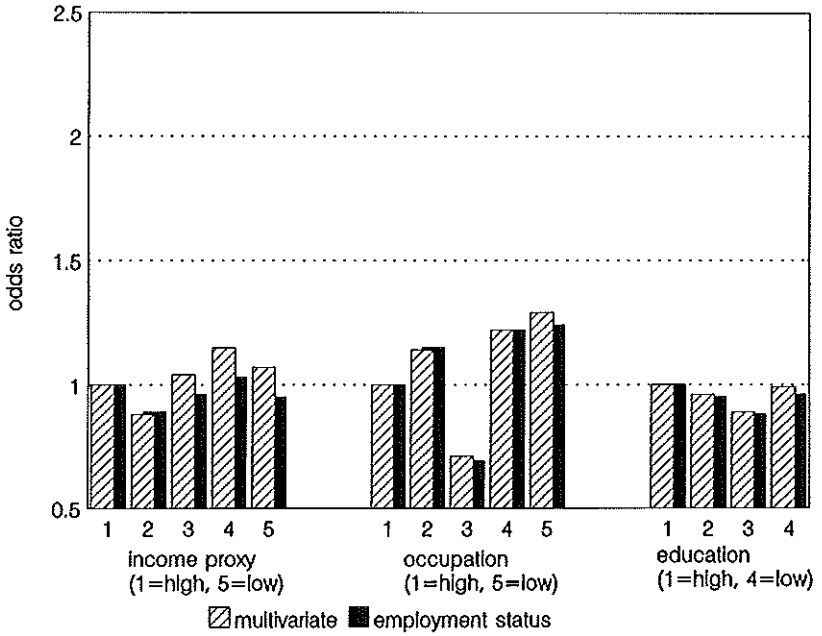
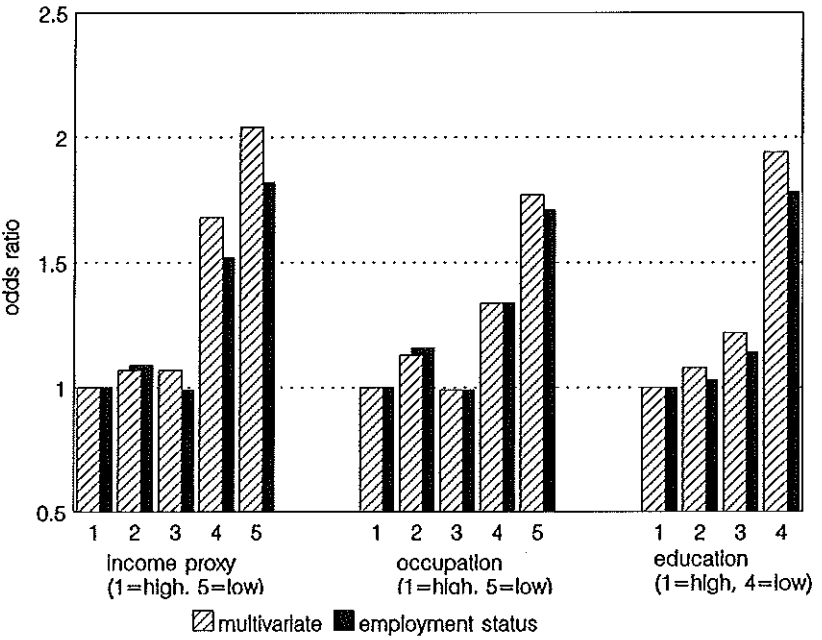


Figure 4.1.4 Perceived general health by income proxy, occupation and eduction, women, multivariate[a], and controlling, in addition, for employment status



[a] Results of logistic regression models also including age, marital status, religious affiliation and degree of urbanization

Table 4.1.2 Reduction in deviance due to the inclusion of the socio-economic indicators (multivariate)[a]

socio-economic indicator	MEN		WOMEN	
	chronic conditions	perceived general health	chronic conditions	perceived general health
income proxy	27.8**	76.5**	7.3	59.1**
occupation	7.7	19.5*	17.8*	28.9**
education	5.6	24.9**	3.7	48.2**

[a] Results of logistic regression models including age, marital status, religious affiliation, degree of urbanization and other socio-economic indicators

* $p<.05$

** $p<.001$

Table 4.1.3 shows the health status of the five employment status groups with those in paid employment used as a reference. The results for men and women were highly similar. Not surprisingly, among people with a long-term work disability, the prevalence of health problems was particularly high. Furthermore the health of the unemployed was significantly worse. Also housewives (in women) perceived their health to be significantly worse than the paid employed.

Table 4.1.3 Chronic conditions and perceived general health by employment status: Odds Ratios (OR) and 95 per cent Confidence Intervals (CI)[a]

	MEN				WOMEN			
	chronic conditions (n=6277)		perceived general health (n=6220)		chronic conditions (n=6616)		perceived general health (n=6531)	
	OR	CI	OR	CI	OR	CI	OR	CI
paid employed	1.00		1.00		1.00		1.00	
unemployed	1.39	1.11-1.76	2.23	1.74-2.85	1.42	1.04-1.95	2.02	1.43-2.84
work disability	4.30	3.55-5.22	10.82	8.82-13.28	5.29	4.02-6.97	11.64	8.95-15.14
early retired	1.14	.91-1.42	.99	.76-1.29	.97	.69-1.36	.85	.57-1.28
housewives	1.12	.47-2.67	2.42	.97-6.04	1.04	.92-1.17	1.56	1.35-1.81

[a] Results of logistic regression models including age, marital status, religious affiliation and degree of urbanization

The association between the household income proxy and employment status is summarised in Table 4.1.4. Among men, the percentage of employed decreased with decreasing income level. Moreover, in both sexes, the proportion of the unemployed and those reporting a long-term work disability was much higher in the lower income levels. For example the proportion of the latter was more than 10 times higher in the lower income groups. For educational and occupational level the clustering of these groups in lower socio-economic levels was less pronounced.

Table 4.1.4 Percentage of men and women categorized by employment status[a], by education, occupation and income

socio-economic indicator		MEN					WOMEN				
		e	h	u	d	er	e	h	u	d	er
proxy household income[b]	1	84.3	.4	.6	2.4	12.3	23.4	72.2	.6	1.3	2.5
	2	73.8	.1	1.2	4.4	20.4	23.8	69.0	.9	2.7	3.6
	3	71.2	.2	4.8	15.3	8.5	45.4	44.1	2.1	6.6	1.8
	4	57.0	.4	9.8	21.9	11.0	36.2	46.5	3.4	11.3	2.7
	5	40.5	1.1	21.6	29.7	7.0	19.2	56.3	10.1	11.8	2.6
(last/current) occupation main breadwinner[b]	1	80.5	.2	2.4	5.3	11.6	38.2	53.7	1.7	3.8	2.6
	2	72.0	.3	4.8	9.1	13.9	46.8	37.4	4.0	7.3	4.5
	3	68.7	.8	6.8	20.8	3.0	41.6	50.0	.8	5.9	1.7
	4	63.1	.8	2.9	11.7	21.6	28.7	59.4	2.2	7.5	2.2
	5	62.3	.1	8.2	20.3	9.1	30.0	54.7	3.2	10.0	2.2
education respondent[b]	1	81.9	.1	2.9	3.5	11.6	56.3	32.1	4.4	3.0	4.1
	2	75.1	.5	4.4	8.5	11.5	49.1	42.5	1.8	4.2	2.3
	3	70.7	.4	5.1	13.6	10.2	28.2	61.2	2.6	6.0	1.9
	4	44.6	.6	11.1	29.8	13.9	15.6	66.9	2.6	11.5	3.4
total		69.9	.4	5.5	12.7	11.5	32.3	55.8	2.7	6.7	2.6

[a] e=employed, h=housewives, u=unemployed, d=working disability, er=early retired
[b] See Data & Methods for categories

The figures also show the Odds Ratios for the income proxy, occupation and education after differences in employment status has been controlled for (black bars). Among men, the Odds Ratios for the lower educational and occupational groups only slightly changed as compared to those of the model in which employment status had not been controlled for. Instead, controlling for employment status did substantially reduce the Odds Ratios for the lower income groups, and they were now smaller than for the lower educational and occupational groups. In the case of perceived general health, only the risk of the second lowest income level was significantly increased, whereas for occupation and especially education, a gradient was observed. As among men, in women the decrease in Odds Ratios due to the inclusion of employment status was the largest for level of income. The risk of the lower income levels was now only slightly higher than that of the lower educational and occupational levels.

Given the high proportion of people with a long-term work disability in low income groups in particular (Table 4) and their high risk of health problems (Table 3), the effect of controlling for employment status is probably largely an effect of controlling for the distribution of those with a long-term work disability. This was confirmed in an analysis in which we excluded this group (results not shown). The Odds Ratios of lower income groups were now reduced to values which were close to those of the model in which employment status is controlled for. For example the risk of chronic conditions for men in the lowest income level decreased from 1.30 [1.01-1.68] to .90 [.68-1.18] after controlling for employment status, whereas the exclusion of the long-term disabled resulted in an Odds Ratio of 1.00 [.75-1.34].

4.1.4 Discussion

In our study population, the (multivariate) association with self-reported health was found to be stronger for an income proxy than for occupation and education. Only one exception was reported, i.e. chronic conditions among women, which were hardly associated with any of the socio-economic indicators. This is due to the fact that this health measure is the sum of a list of 23 conditions, some of which appeared to be negatively related to socio-economic status while others were positively related (van de Mheen et al. 1994).

Although we had to use a *proxy* for income, our results show that these data clearly offer possibilities to study the background to the rather strong association between income and health. The aim was to explore whether the greater inequalities associated with income, compared to the inequalities in health associated with education and occupation, can be understood in terms of differences in the relationship between each socio-economic indicator and employment status. Our results suggest that this is indeed the case.

The percentages of unemployed and those reporting a long-term work disability were consistently higher among the lower income levels, whereas a less pronounced pattern was observed for educational and occupational status. In multivariate analyses, controlling for employment status substantially reduced the risk estimators for lower income levels, whereas those for lower educational/occupational groups hardly changed. An additional analysis in which those reporting a long-term work disability were excluded, resulted in risk estimators which were highly similar to those of the model in which differences in employment status were controlled for. This suggests that the relatively strong association between income and health, relative to that between education/occupation and health, is largely due to the concentration of those with a long-term work disability in the lower income levels. Although the results were more clear-cut for men, for women too the employment status-health relationship appeared to underly the strong association between income and health.

As the data presented here are cross-sectional, they do not provide an insight in the direction of the association between long-term work disability and health. It is plausible however, that this association is largely due to a selection effect, as people are in this group *because* of health problems. This effect, which is closely related to the so-called 'healthy worker effect' has been subject of many studies. These show that the entrance to the labour market and exit from the labour market is health-related (Fox et al. 1982, Dahl 1993). As a result, people in paid employment, in general, show lower morbidity and mortality rates than those out of paid employment.

The selection out of the labourmarket will in its turn lead to a lowering of income, while not affecting education or occupation. We thus interpret our findings as indicating the importance of a selection effect, i.e. an effect of health on income, through employment status. The difference in the results for men and women might be explained by the fact

that in the Netherlands a rather low proportion of women participate in the labour market (Hooghiemstra & Niphuis-Nell 1993). In most households the woman's partner is the main breadwinner. This implies that the effect of employment status on income is more direct for men, yielding a larger reduction of the risks of lower income groups in this sex.

Our results could have been biased by the fact that we had to rely on a proxy for income. Additional analyses, however, suggest that this is not the case. Firstly, we repeated the analyses reported here among a subsample for which data on net household income were available. Because of the small numbers, we could only fit a model for men and women together. As for the proxy for income, we found that controlling for employment status hardly affected the risks of the lower educational/ occupational groups, whereas the risks of the lower income groups were substantially reduced. Secondly, the results reported here are in accordance with the results of another analysis, also based on a subsample, which aimed to explain the lower average income of the chronically ill compared to that of the non-chronically ill. The results of that study showed that almost 50 per cent of the difference in income between both groups could be attributed to differences in health, through employment status (van Agt et al. 1996).

Thus these results indicate that the strong association between income and health does not necessarily imply the relative importance of material factors in the explanation of socio-economic inequalities in health. It, at least for some part, also reflects an association between employment status and health, which should largely be interpreted in terms of a selection effect, i.e. an effect of health on income through employment status. In addition, these results suggest that the explanation of inequalities in health associated with income differs from the explanation of inequalities in health between educational or occupational groups. Whereas previous studies indicate a rather minor role for selection processes in the generation of the latter (Fox et al. 1982, Power et al. 1996), on the basis of our results we hypothesize that health-related selection is more important in the case of health inequalities associated with income. This explanation might probably even be more important for countries with a less generous social security system, in which the lowering of income following selection out of the labour market might be more pronounced.

However, the present study also observed an *independent* association between income and health. After controlling for employment status, the risks of negatively perceived health among the lower income levels were still increased. Thus part of the association between income and health is probably also due to an effect of material factors on health, via a material or psychological link (Wilkinson 1992, Quick & Wilkinson 1991). Further research is necessary to gain more insight into the contribution of this explanation by simultaneously analysing indicators of material factors with other determinants of health. The results of our analyses indicate that any further research studying the causal effect of income on health should at least try to separate out a selection effect through employment status.

Abstract

Objective: Although it has frequently been suggested that income affects health, there is hardly any research in which this issue has been explored directly. The aim of this chapter was, firstly, to examine whether income is independently associated with health, secondly, to assess the extent to which this association reflects high levels of deprivation in low income groups, and thirdly, to examine which specific components of deprivation contribute most to the link between income and health.

Methods: Health indicators used were the prevalence of chronic conditions, health complaints and less-than-"good" perceived general health. The study population consisted of 2567 men and women, aged 15-74, who participated in the oral interview.

Results: We observed large inequalities in health by (equivalent) income after differences in other socio-economic indicators had been controlled for. For example, among those in the lowest income group the risk of bad perceived health was three times as high as among people in the highest income group. The prevalence of deprivation (basic, housing, social) increased with decreasing income to approximately 50-60 per cent in the lowest income group. A substantial part of the increased health risks of the lowest income groups could statistically be accounted for by the higher prevalence of deprivation in these groups. The components which are likely to influence health indirectly, through a psychological or behavioural mechanism, accounted for most of the effect.

Conclusions: These analyses provide evidence to suggest that a low income has detrimental health effects through relative deprivation. Moreover, the results indicate an indirect link between deprivation and health problems involving psychological or behavioural factors.

4.2 A higher prevalence of health problems in low income groups: does it reflect relative deprivation?

4.2.1 Introduction

It has frequently been suggested that the inverse association between social class and health reflects a causal effect of *income* (Townsend et al. 1988, Blaxter 1990, Quick & Wilkinson 1991, Davey Smith et al. 1990a, Davey Smith & Egger 1993). According to this view, the well-known fact that people in lower socio-economic groups are less healthy than their counterparts in higher positions, reflects a differential access to material resources. Some evidence in support of this hypothesis is provided by data which show that the association between income and health is stronger than that between educational or occupational class and health (Blaxter 1990, Morris et al. 1996). It should be borne in mind however, that the association between income and health does not necessarily reflect a causal effect of income. Alternatively, this association might be due to an effect of other risk factors that are associated with, but not the consequence of, income, such as cultural differences (Townsend et al. 1988, Quick & Wilkinson 1991). In addition, these data do not indicate the mechanisms which contribute to the link between income and health.

In this chapter we will explore the link between income and health using more direct evidence. We will first specify the causal pathways by which income might affect health.

When thinking about the explanations for the income-health connection, absolute poverty is probably the first to arise. It indicates a situation in which someone has too little money to afford the basic necessities of life, i.e. sufficient food, access to medical care, shelter, clean drinking water etc. (Blackburn 1991).

Although this concept might have some relevance for small groups in Western societies such as the homeless, it is self-evident that absolute poverty of the sort which is common in parts of the Third World is not found in Western European countries. Here a conceptualization of poverty in terms of *relative* deprivation seems to be more appropriate (Piachaud 1987). One of the 'relative approaches' to the concept of poverty defines disadvantage relative to living standards which are common in a specific society (Townsend 1993). According to the frequently cited definition of Townsend, people can be said to be deprived if "they lack the types of diet, clothing, household facilities and fuel and environmental, educational, working and social conditions, activities and facilities which are customary, or at least widely encouraged and approved, in the society to which they belong" (1987, p. 126/7). Deprivation, according to this approach, is related to the access to material necessities, such as adequate food and heating, as well as social abilities, such as having social contacts with friends. Someone is said to be deprived if the access to these resources is limited relative to what is common in a certain society.

Although deprivation goes hand in hand with low income, there is no perfect association. People in lower income groups are not necessarily deprived (students may serve as an example), whereas a lack of resources

indicates deprivation only when it is enforced by income (Callan et al. 1993). Income in itself is therefore not an adequate proxy of deprivation.

What is the nature of the relationship between relative deprivation and health? The impact of absolute poverty on health is straightforward and even implicit within its definition: someone is said to be poor in an absolute sense if his material resources do not allow for the minimum standard for physical survival.

The causal mechanisms linking *relative* deprivation and health are less well understood (Townsend et al. 1988, Vågerö & Illsley 1995). To some extent a *direct* effect might have some relevance in this context too (Blackburn 1991, Benzeval et al. 1995). Factors which are probably involved in this mechanism include adverse housing conditions, inadequate food or a lack of leisure activities. These resources do not indicate an absolute minimum which is necessary for survival as in the case of absolute poverty, but rather increase the *risk* of diseases or other health problems. The effect of damp and mould on the incidence of COPD is an example of this.

Secondly, relative deprivation might translate into ill health *indirectly*. Living with a lack of material and social resources might act as a stressor and is likely to affect feelings of self-esteem and social isolation (Blackburn 1991, Benzeval et al. 1995, Wilkinson 1992). This might affect the mental or emotional well-being (Stroebe & Stroebe 1995), or might induce people to engage in unhealthy behaviour, such as smoking as a way of coping with deprivation (Graham 1993).

In summary, a low income might lead to deprivation, defined as a limited access to amenities and activities which are customary in a specific society. Being deprived is supposed to affect health directly or indirectly, through a psychological or behavioural mechanism. The aim of this chapter is to explore this link between income and health. More specifically, the aim is:

1. To examine whether income is associated with health, independently of other socio-economic and socio-demographic factors.
2. To assess to what extent the association between income and health reflects relative deprivation.
3. To examine which components of deprivation in particular contribute to the link between income and health. This might elicit indications of the mechanism by which deprivation affects health.

4.2.2 Data and methods

Population

The analyses were based on the population that participated in the oral interview, as income was measured only among this subsample. Income information was not elicited from respondents who still lived with their parents, and they were therefore excluded from the analyses (n=235). This resulted in a study population of 2567 respondents.

Measurements
All variables were classified into categories to allow for linear and non-linear associations with health status.

The income of the respondents is indicated by the household net income per month. As people sharing a household profit from economies of scale, the incomes of people living in families of different size and composition cannot be compared directly. To adjust for the number of persons inside and outside the household who had to live from the household income, we divided the household income by an equivalence factor. This factor was calculated by the formula E=(number adults + c.number children)^b, in which c is a parameter which indicates the 'weight' of children relative to that of adults, and b is the parameter which adjusts for economies of scale. We used the values 0.7 for c, and 0.5 for b (Schiepers 1993). The equivalent income therefore indicates the net income per month which is available for one person. The equivalent income was divided into six categories, which were chosen in such a way that each category contained at least 250 respondents, with the most detailed division at the lower end of the income distribution. This resulted in the following categories: less than 1100 Dutch guilders a month, 1100-1400, 1400-1700, 1700-2100, 2100-3000, and 3000-6000 Dutch guilders a month. We included the missings on income (11 per cent of the total population) as a separate category, in order to explore whether the results might be biased by the item non-response on this variable.

Three health indicators were used in these analyses. Firstly, chronic conditions were measured by means of a checklist, containing 23 chronic conditions, some of which were severe (such as cancer and heart disease), while others were less severe (such as serious headache and varicose veins). Respondents were classified according to whether (at the time of the survey) they reported that they were suffering from at least one of the conditions listed in the questionnaire. 48.2 per cent of the study population reported one or more chronic conditions. Secondly, health complaints were measured by means of a checklist, containing 13 questions on minor complaints about the heart, stomach etc. Respondents were asked whether they suffered from any of these complaints. This variable was dichotomized into suffering from 3 or less *versus* more than 3 complaints. 35.0 per cent of population reported more than three complaints. Finally, perceived general health was indicated by the answer to the question "How do you rate your health in general?". The answer was dichotomized in the analysis into "(very) good" *versus* less-than-"good" (fair, sometimes good and sometimes bad, bad). 29.5 per cent of the population perceived their health as less-than-"good".

The questionnaire included several activities, amenities and resources which are commonly regarded as necessities. If the respondents said they did not have a particular item, they were asked explicitly whether this was because they could not afford it or for another reason. Respondents were classified as deprived if they could not afford one or more of these necessities because of *financial* reasons (Piachaud 1987). If they did not

have a particular item for other reasons, this was supposed to indicate a choice. Following the results of a study by Callan et al. (1993), we made a distinction between a basic and social dimension.

The *basic* items relate to items which most people in Western societies perceive as necessities (Callan et al. 1993, Berghman et al. 1988). These include having at least 1 hot meal a day, eating meat/fish 4 or more times a week, no debts for daily living, paying house rent etc. without problems, having sufficient heating, buying new clothes regularly, being able to save if necessary. People were classified as deprived if they were not able to afford one or more amenities or expenditures from this list of 7. Four categories were distinguished, i.e. can afford all items, can afford all items but one, can afford all items but two, cannot afford three or more items.

People were defined as *socially* deprived if they were not able to engage (because of financial reasons) in one or more of 7 activities listed in the questionnaire. These include: going out regularly, taking a holiday once a year, having friends for dinner regularly, membership of a club, leisure activities, access to car, telephone. Four categories were distinguished, i.e. can afford all items, can afford all items but one, can afford all items but two, cannot afford three or more items.

In addition the questionnaire contained some issues related to *housing* conditions and amenities, including owning a refrigerator or owning a washing machine, living in a dry and damp-free dwelling, and over-crowding. People were defined as deprived if they were not able to afford one of these amenities or if they reported complaints with respect to mould/cold, or if they had less than one room per person (crowding).

Occupational level of the main breadwinner and educational level of the respondent were considered to be confounding variables, as they are associated with, but not the consequence of, a certain income level. The educational level of the respondent was divided into seven categories: primary school only; lower general education; lower vocational education; intermediate vocational education; intermediate/higher general education; higher vocational college; and university. The occupational level of the main breadwinner was determined on the basis of the current occupation if in paid employment, or if not, the last paid employment. The occupations were classified according to five levels outlined in the Erikson, Goldthorpe and Portocarero (EGP) scheme, i.e. higher grade professionals; lower grade professionals and routine non-manual employees; self-employed; high and low skilled manual workers; unskilled manual workers (Erikson et al. 1983). People who had never been in paid employment formed the sixth category. If the respondent did not live with a partner, he or she was automatically classified as the main breadwinner. If the respondent lived with a partner, he or she was asked who the main breadwinner was.

The other confounding variables that have been taken into account are (number of categories between brackets): sex, age (5 years age groups), marital status (4), religious affiliation (4) and degree of urbanization (5).

Analyses

In order to determine whether income and deprivation were associated with health, logistic regression models were fitted, controlling for potential confounders (including other socio-economic indicators). The regression coefficients and their standard errors were used to calculate Odds Ratios and their 95 per cent Confidence Intervals. The reduction in deviance due to the inclusion of income was used as an overall statistical test of its effect. The highest income group and those who were classified as non-deprived were used as a reference category.

In order to describe the distribution of deprivation across income groups, we calculated the percentages in each category, directly standardized for age (10 years age groups) and sex.

In order to estimate the extent to which income differences in health reflect differences in deprivation, we included the deprivation variables in the logistic regression model already containing income and the confounding variables. The reduction in the Odds Ratios of income due to the adjustment of the deprivation variables was used to indicate the latter's contribution to the income gradient in health. In order to explore the contribution of specific components of deprivation, each item was added to a model containing income and the confounding variables. The reduction in Odds Ratios of income due to the adjustment for these variables was used to indicate the importance of each of them. The analyses were carried out with the Logistic Regression module of Egret (Statistics and Epidemiology Research Corporation 1990).

4.2.3 Results

We firstly examined the bivariate associations between income, deprivation and health. Table 4.2.1 shows the association between equivalent income and health problems, as assessed by means of logistic regression.

Table 4.2.1 Association between equivalent income and the prevalence of health problems (less-than-"good" perceived health, one or more chronic conditions, more than 3 health complaints)[a]: Odds Ratios (OR) and 95 per cent Confidence Intervals (CI)

net equivalent income per month, in Dutch guilders		≥ 1 chronic conditions		less-than-"good" perceived general health		>3 health complaints	
	N	OR	CI	OR	CI	OR	CI
less than 1100	253	1.46		3.13		2.90	
1100-1399	305	1.25	.98-2.17	2.34	1.95-5.01	2.23	1.90-4.43
1400-1699	407	1.21	.87-1.80	2.04	1.50-3.66	2.10	1.50-3.32
1700-2099	458	1.07	.87-1.69	2.27	1.34-3.10	1.79	1.45-3.04
2100-2999	502	1.07	.79-1.47	1.33	1.53-3.39	1.42	1.26-2.54
3000-6000	353	1.00	.80-1.43	1.00	.90-1.98	1.00	1.01-1.99
missing	289	.94	.66-1.35	1.85	1.18-2.88	1.88	1.27-2.78

[a] Results of logistic regression models (n=2567) including educational and occupational level, age, sex, marital status, religious affiliation and degree of urbanization

The relative risk of the highest income group is set at 1. The Odds Ratios indicate how much more likely it is for a person with a certain income to have a health problem as compared to those in the highest income group. Both health complaints and perceived general health were statistically significantly related to equivalent income after confounders (including educational and occupational level) were controlled for. The Odds Ratios steadily increased with decreasing income, and the Odds of the lowest income group was around 3 times as high as that of the highest income group. The Odds Ratios for chronic conditions also increased in lower income groups, although not statistically significantly and to a lesser extent than for the subjective indicators. Among people for whom data on the level of income were missing, the risk of health problems was comparable to that in the middle income categories.

We observed a positive association between deprivation and health problems as far as the basic and social items are concerned (Table 4.2.2). As compared to people who were not deprived, the Odds Ratios among the deprived were statistically significantly increased. In general, the more intense the deprivation, i.e. the higher the number of items lacking, the higher the risk of health problems. Adverse housing conditions were not significantly related to health status. The risks of reporting chronic conditions in lower income groups were also significantly increased, but they were again smaller than for the subjective health measures.

Table 4.2.2 Association between deprivation and the prevalence of health problems (less-than-"good" perceived health, one or more chronic conditions, more than 3 health complaints)[a]: Odds Ratios (OR) and 95 per cent Confidence Intervals (CI)

deprivation		≥1 chronic conditions		less-than-"good" perceived general health		>3 health complaints	
	N	OR	CI	OR	CI	OR	CI
basic items lacking							
0	2093	1.00		1.00		1.00	
1	334	1.13	.87-1.47	1.31	.98-1.76	1.31	1.00-1.71
2	90	1.78	1.08-2.93	2.54	1.52-4.27	1.92	1.18-3.12
≥3	41	1.76	.84-3.68	2.15	.98-4.74	2.53	1.21-5.31
housing items lacking							
0	2404	1.00		1.00		1.00	
≥1	146	1.25	.86-1.80	1.24	.81-1.89	1.35	.93-1.97
social items lacking							
0	2212	1.00		1.00		1.00	
1	192	1.17	.83-1.64	1.51	1.05-2.18	1.22	.86-1.71
2	72	1.01	.60-1.71	1.60	.93-2.75	1.10	.64-1.86
≥3	80	1.88	1.07-3.28	3.20	1.78-5.78	2.59	1.48-4.56

[a] Results of logistic regression models including income, educational and occupational level, age, sex, marital status, religious affiliation and degree of urbanization

Not surprisingly, deprivation and income were associated (Table 4.2.3). The percentage of deprived people steadily increased with decreasing

income. Moreover, intense deprivation was found to be more common among the lower income groups. Most of the deprived people in the higher and middle income categories experienced a single form of deprivation only. There was still a relatively high percentage of people in the lowest income categories who were not deprived, implying that a low income not necessarily indicates deprivation.

Table 4.2.3 Percentage of deprived persons on basic, housing and social dimension by equivalent income. Standardized for sex and age (n=2567)

net equivalent income per month, in Dutch guilders	% of persons experiencing deprivation - number of items lacking:									
	basic				housing		social			
	0	1	2	≥3	0	≥1	0	1	2	≥3
less than 1100	41.5	35.2	13.1	10.3	83.9	16.1	53.0	16.6	8.9	21.5
1100-1399	67.1	20.7	8.7	3.5	90.4	9.6	72.4	15.4	6.2	6.0
1400-1699	83.7	13.7	2.4	.2	94.0	6.0	85.5	10.5	2.8	1.3
1700-2099	91.1	7.7	1.1	.2	95.7	4.3	93.2	4.7	1.4	.6
2100-2999	92.8	5.8	1.4	-	97.3	2.7	96.6	2.5	.9	-
3000-6000	95.5	4.5	-	-	99.0	1.0	99.8	.3	-	-
missing	78.2	16.3	2.5	3.0	92.4	7.5	88.2	7.1	2.1	2.0
total population	81.8	13.1	3.5	1.6	94.3	5.7	86.6	7.5	2.7	3.1

Figures 4.2.1-3 show the risk of health problems in each income group after differences in deprivation had been controlled for. The figures indicate that the high prevalence of health problems in low income groups partly reflects high levels of deprivation. After differences in all deprivation measures had been controlled for, the risk of the two lowest income groups decreased by max. 50 per cent. Basic and social deprivation appeared to account for most of the effect. They were of similar importance. Deprivation with respect to housing conditions hardly accounted for the income gradient in health. An examination of the risk of health problems among the most deprived in the lowest income group (data not shown), showed that their risk of reporting less-than-"good" perceived health or health complaints was around 7 times as high as among those in the highest income category.

After allowing for the inclusion of all deprivation measures in the model, some income inequalities in health remained. Firstly, the higher risk of health problems in the lower income groups could not totally be explained by deprivation. Secondly, the increased health risks of the higher and middle income groups was hardly accounted for by deprivation, due to the low prevalence of deprivation in these groups.

Figure 4.2.1 Chronic conditions by equivalent income: explanation by deprivation[a]

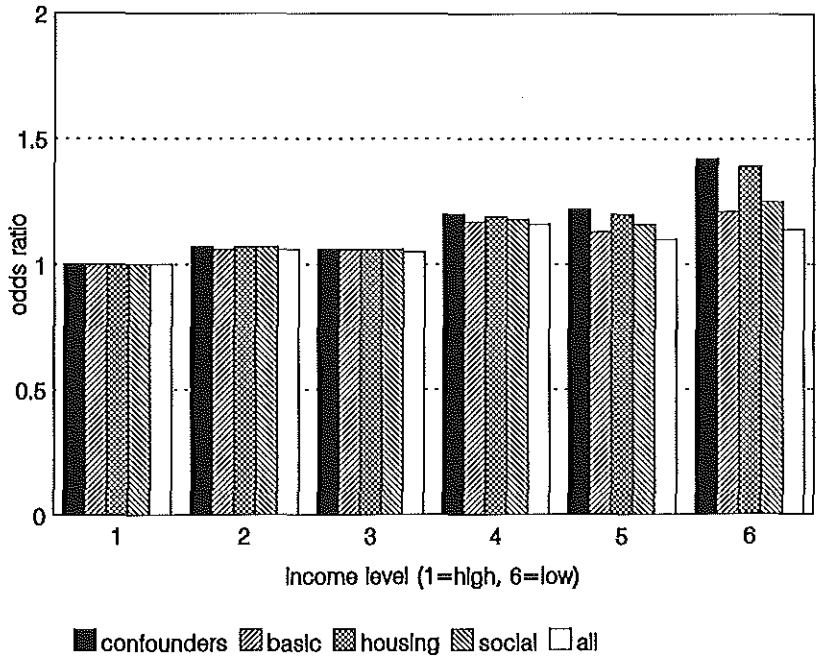


Figure 4.2.2 Perceived general health by equivalent income: explanation by deprivation[a]

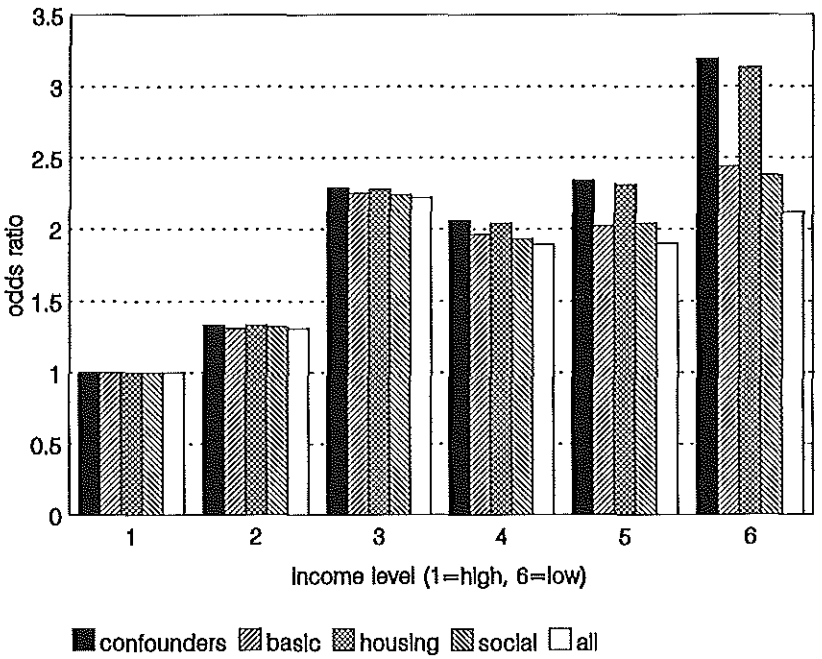
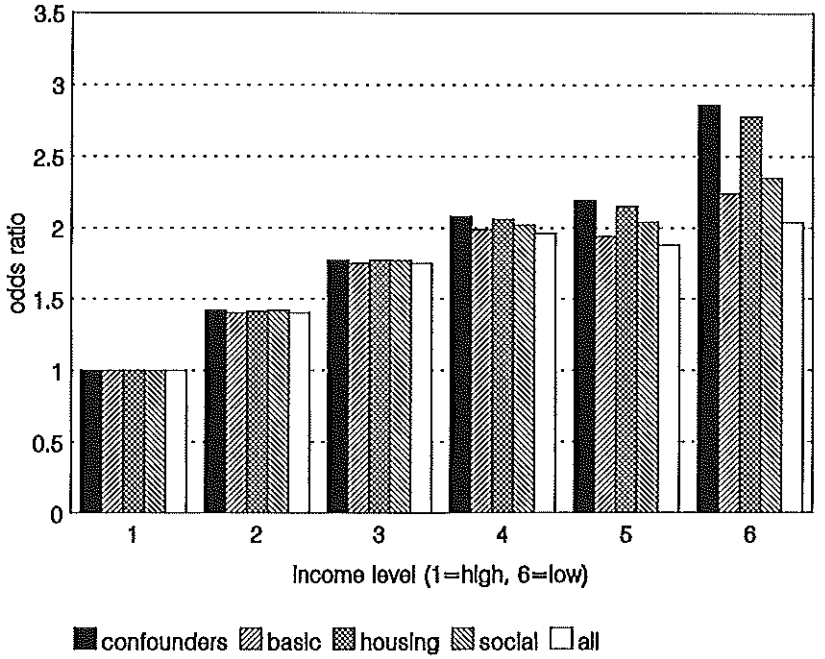


Figure 4.2.3 Health complaints by equivalent income: explanation by deprivation[a]



[a] Results of logistic regression models also including educational and occupational level, age, sex, marital status, religious affiliation and degree of urbanization

Finally, we studied which components of relative deprivation in particular accounted for the effect in the lowest income categories. The results for one health indicator, i.e. perceived general health, are shown as an example (Table 4.2.4). The results for the other health measures were comparable. Deprivation with respect to housing was omitted as this factor hardly accounted for the effect of income (Figures 4.2.1-3).

The item relating to 'going out regularly' appeared to account for most of the effect of social deprivation. Other social items that contribute substantially to the association between income and health relate to the ability of 'having friends for dinner regularly' and 'taking a holiday once a year'. The specific basic items that appeared to account for the effect include the ability 'to save (if necessary)' and 'to buy new clothes regularly'. Those items which are likely to affect health directly, i.e. those related to food and heating, appeared to contribute only marginally to the association between income and health. This was due to their low prevalence as well as their weak relationship with health.

Table 4.2.4 Contribution of individual deprivation items to the association between equivalent income and the prevalence of less-than-"good" perceived health[a]: Odds Ratios (OR) and 95 per cent Confidence Intervals (CI)

net equivalent income per month, in Dutch guilders	OR and CI controlling for confounders		OR after controlling for individual deprivation items:						
basic dimension[b]			meat/ fish	heating	clothes	debts	financial problems	savings	
less than 1100	2.58	1.55-4.27	2.52	2.59	2.21	2.47	2.53	2.30	
1100-1399	1.93	1.20-3.09	1.92	1.93	1.75	1.90	1.93	1.83	
1400-1699	1.87	1.21-2.89	1.87	1.87	1.81	1.86	1.87	1.82	
3000-6000	1.00		1.00	1.00	1.00	1.00	1.00	1.00	
social dimension			car	telephone	leisure activities	going out	holiday	friends dinner	clubs
less than 1100			2.45	2.58	2.42	1.93	2.35	2.33	2.43
1100-1399			1.89	1.98	1.86	1.68	1.85	1.87	1.92
1400-1699			1.84	1.87	1.86	1.71	1.82	1.87	1.86
3000-6000			1.00	1.00	1.00	1.00	1.00	1.00	1.00

[a] Results of logistic regression models also including educational and occupational level, age, sex, marital status, religious affiliation and degree of urbanization (n=2137: the number is different from the number of respondents in the figures, because of a different number of missing values)

[b] The Odds Ratios after controlling for 'having at least one hot meal a day' could not be estimated due to a small number of people who lacked this item

4.2.4 Discussion

The aim of this chapter was to examine the health effect of income. It was hypothesized that this effect partly reflects high levels of deprivation. We found income to be independently associated with health. Also deprivation, and especially intense deprivation, was found to be associated with health. The relatively high prevalence of deprivation in the lowest income groups was found to account for around half of their increased risks of health problems. Due to its low prevalence, deprivation hardly affected the increased risk of health problems in the middle income groups. The data provide evidence in support of an indirect link between deprivation and health, involving psychological or behavioural factors.

The estimation of the association between income and health might have been biased by *non-response*. If, for example, ill people with an extremely low income had not participated, we would have underestimated the association between income and ill-health. We do not expect our results to be substantially biased by non-response however, as the sample studied here highly resembles the original sample as far as socio-demographic characteristics are concerned (chapter 3). Nor do we expect the item non-response on income to substantially bias the results, as the health risk of people who did not report their income was only slightly increased.

The main limitation of these analyses relates to the use of *cross-sectional* data. Whereas our aim was to examine a causal effect of

income, the association between income and health might also reflect the reciprocal effect, i.e. an effect of health on income. The same applies to deprivation, as it is the result of a low income. In order to examine the extent to which a selection mechanism is operative, we assessed the risks of health problems in low income groups after excluding the long-term disabled from the population (results not shown). The underlying rationale of this analysis is the premise that the selection effect is most apparent among the long-term disabled. As people in this group are not in paid employment because of health problems, leading to a lowering in income, their relatively low income partly reflects an effect of ill-health (see chapter 4.1). As expected, after the exclusion of this group, the risk of the lower income categories decreased, implying that the higher prevalence of health problems in these groups might partly reflect a selection effect. The contribution of deprivation to the explanation of this gradient hardly diminished however. The selection effect therefore does not seem to threaten the conclusion that income has a substantial impact on health. This of course should be tested in future research using longitudinal data.

Another reverse effect which might be operative relates to the impact of health problems on deprivation through health-related costs. If ill people incur high expenditures as a result of their illness, less money will be available to meet other needs. As a result, the higher deprivation among the ill might also be the consequence of health problems. We do not expect this mechanism to seriously threaten our results however, as the results of another study based on the same dataset indicate that expenditures as a result of illness are rather high only for a small proportion of the chronically ill (van Agt et al. 1996).

Secondly, there is a possibility that the results are biased due to the fact that the measurement of both health status and deprivation were based on *self-report*. If the reporting of both variables had been affected by some third factor, such as the tendency to complain, this would probably have led to overestimating the contribution of deprivation. Although only the use of health measures which are objectively measured could give more insight into the importance of this potential bias, we do not expect this bias to seriously threaten our conclusions. The main argument to support this view is that the questions used to indicate deprivation elicit a very precise description of the deprived situation. For example people were asked to say whether they were able to go out at least once in two weeks, instead of e.g. 'regularly'. Such a precise description seems to leave little room for complaining. Furthermore, deprivation was also found to be associated with the more objective health indicator, i.e. chronic conditions. The report of this health indicator is less likely to be affected by feelings and emotions than that of the other health indicators. Finally, as the percentage that reported lacking two items or more was rather low (around 5 per cent), is seems unlikely that the overall prevalence of deprivation has been overestimated, although this does not completely rule out the possibility of an overestimation in specific socio-economic groups.

The last bias to be considered is related to the *imprecision* and *incompleteness* of the measurement of deprivation. The deprivation items included in the analyses are clearly not perfect markers for real deprivation. In particular physical aspects such as dietary patterns and housing conditions could not adequately be captured in the questionnaire. Therefore it is likely that the importance of deprivation has been underestimated, in particular as far as the material components are concerned.

The *independent* association between income and health as demonstrated in these analyses is consistent with the results of other studies (Blaxter 1990, Ooijendijk et al. 1992, Wilkinson 1989). This association does not necessarily indicate a *causal* effect of income on health. Apart from the disturbing effect of a selection mechanism, other explanatory factors which are causally related to income might be operative. Cultural variation might serve as example. As people in higher and lower income groups differ with respect to socio-cultural factors that are causally unrelated to income, part of the relationship between income and health might wrongly be attributed to a causal effect. Some studies have tried to overcome this bias by controlling for other risk factors, such as smoking (Haan et al. 1987, Hahn et al. 1995). However, as some of these factors might also be involved in the causal pathway connecting income and health, this probably yields an *under*estimation of the effect of income on health.

This chapter has examined the causal health effect of income in a more direct way, thereby focusing on the role of deprivation. The results provide evidence to suggest that a low income has an independent effect on health. In a multivariate analysis the increased risk of health problems in the two lowest categories could for a large part be traced to the high prevalence of (intense) basic and social deprivation. As income provides the basic prerequisites for health, such as food, shelter and the ability to participate in society, these results suggest that the level of income at the bottom of the social stratification is too low to allow for these prerequisites, and, more importantly, that this has a detrimental effect on health.

Implicit within the concept of deprivation is its clustering in lower income groups. Deprivation could therefore not account for the increased risk of health problems in the middle and higher income groups. This implies that other explanatory mechanisms are operative here. The health effect of income *inequality* rather than the health effects of a low income per se, is such a potentially explanatory mechanism. Studies showing an association between income inequality and life expectancy at the macro-level provide evidence in support of this (Wilkinson 1992). Whereas the mechanism of deprivation explored here is expected to operate through a low income, the mechanism suggested by Wilkinson acts through the *relative* position of an individual in the income distribution, involving psychosocial factors. The relevance of this mechanism for the explanation of health inequalities among the higher and middle income groups should be tested in future research, thereby indicating this and probably also other mechanisms involved in a direct way.

We found little evidence to suggest the importance of a *direct* health effect of deprivation. Firstly, physical housing conditions were found to contribute only marginally to observed health inequalities, due to the fact that they were almost unrelated to health problems. Also other items which might affect health directly (food, heating) hardly accounted for the health effect of income. Not only because they were only weakly related to health, but also because of their low prevalence. However, as mentioned before, the failure to demonstrate a direct effect might also be due to the fact that those aspects of deprivation that directly influence health were not adequately covered in this study.

The analysis of the contribution of individual components indicated a relatively large contribution for those items which are related to social participation, such as having friends for dinner or going out regularly. The relatively strong association between these items and health is in accordance with the results of a British study (Benzeval et al. 1992). These components are likely to influence health *indirectly*, through, for example, self-esteem. A positive self-esteem, indicating the beliefs that an individual holds about himself has been demonstrated to be important for individual well-being (Stroebe & Stroebe 1995), or might affect health behaviour. The results of these analyses therefore indicate the importance of a psychological or behavioural link between deprivation and health. The fact that we found those basic items that are likely to affect health indirectly, such as 'being able to save' or 'to buy clothes regularly' to contribute most to the association between income and health, supports this view.

Furthermore, the importance of the psychological mechanism is suggested by the finding that the income-health relationship differed according to the health indicator employed. If it is assumed that the health indicators 'perceived general health' and 'health complaints' more than chronic conditions cover mental aspects of health status, the stronger effect of income through deprivation on the former is in accordance with a prominent role for the psychological mechanism. In addition, this implies that our results might not be automatically generalized to other health indicators such as the higher mortality rates among the deprived. Future studies, using longitudinal data and objective indicators of health should further explore this issue.

In conclusion, although our analyses are limited in several respects, the results provide evidence in support of a causal effect of income on health. Whereas the relative high percentage of persons experiencing deprivation in lower income groups in itself warrants a policy response, the health effects of deprivation are an extra argument to intervene in this situation. As the Netherlands is characterised by a rather generous social services system, guaranteeing equal opportunities for education, equal access to health care services, an income in the case of illness etc., the extent to which income determines the access to health-related resources is likely to be rather modest. This suggests that in countries with a less developed welfare state the link between income and deprivation might even be stronger.

Abstract

Objective: The uneven distribution of psychosocial stressors as well as their differential health impact have been suggested as a possible explanation for socio-economic inequalities in health. We assessed the importance of both explanations.

Methods: The outcome measure was the prevalence of perceived health problems. Educational level was used as an indicator of socio-economic status, whilst both life-events and long-term difficulties were included as stressors. We controlled for educational differences in neuroticism in order to eliminate any bias which might arise from the fact that people in lower educational groups are more inclined to report both stressors and health problems.

Results: The higher exposure to stressors was found to contribute to the increased risk of perceived health problems, even after differences in neuroticism were taken into account. Long-term difficulties, especially those related to material conditions, accounted for most of the effect. The impact of stress on health was hardly found to be moderated by educational level.

Conclusion: According to the results of our analysis, inequalities in perceived health would decrease by approximately 10-15 per cent if the exposure to stressors in the lowest socio-economic groups was similar to that in the highest stratum. We found hardly any evidence for a stronger association between stress and health in lower socio-economic groups, leading us to reject the vulnerability hypothesis.

Acknowledgements

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4.3 The importance of psychosocial stressors for socio-economic inequalities in perceived health

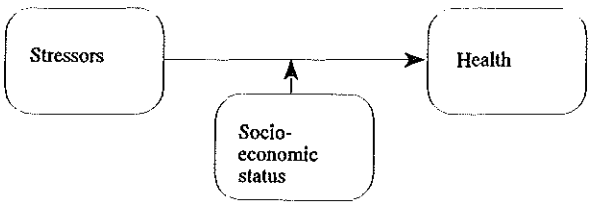
4.3.1 Introduction

Traditionally, it has been hypothesized that socio-economic inequalities in health are due to cultural/behavioural and material/structural differences between socio-economic groups (Townsend et al. 1988, Davey Smith et al. 1994). This implies that socio-economic status does not have a direct effect on health. Instead, according to these hypotheses, its effect is mediated through health behaviour and material conditions. Both are 'obvious' explanations, as they are closely connected to the two components that comprise the position of an individual in the social stratification of society, i.e. the class component primarily reflecting material resources (e.g. differences in physical living conditions), and the status component reflecting lifestyle, values etc. (e.g. smoking differences) (Susser et al. 1985).

More recently, a third group of explanatory factors has been proposed, i.e. *stressful conditions/events*. It has been suggested that the higher prevalence of health problems in lower socio-economic groups may be attributed to a higher exposure to psychosocial stressors in these groups (Kessler 1979, Dohrenwend & Dohrenwend 1981, Murrell & Norris 1991, Adler et al. 1994). This hypothesis may be schematized as follows:

As the differential distribution of psychosocial stressors is not implicit within the concept of social stratification, the hypothesis that the effect of socio-economic status is mediated through stressors is probably less obvious than the hypotheses concerning behavioural or material factors. It is nevertheless a plausible explanation, given for example the fact that psychosocial stressors frequently have a material/structural base.

Furthermore, a differential vulnerability to the health impact of stressors may partly explain inequalities in health. People in lower socio-economic groups are probably less well equipped to *cope* with stressors. As a result, the impact of stressors on health may be stronger in these strata. This may be schematized as follows:



The plausibility of the differential vulnerability hypothesis is suggested by studies on the socio-economic distribution of factors which are considered to be modifiers of the association between stressors and health, such as

coping and social support. Most of these have been shown to be differentially distributed to the disadvantage of the lower socio-economic groups (Marmot et al. 1991, Ranchor 1994).

Differential exposure hypothesis

Several studies have demonstrated a higher exposure to stressors in lower socio-economic groups (Dohrenwend 1973, Kessler 1979, Raats et al. 1987, Marmot et al. 1991, Murrell et al. 1991, House et al. 1992). Other studies however have not indicated such an association and have even suggested that higher socio-economic groups may be more exposed to stressors than lower ones (Husaini et al. 1981, Thoits 1984, Rosengren et al. 1988, Ranchor 1994). Data on the socio-economic distribution of stressors do not, however, give conclusive evidence as to their importance when explaining inequalities in health. The higher exposure to stressors can only account for observed inequalities if stressors increase the risk of health problems. Several studies have indeed demonstrated a causal link between stressful events/conditions and the probability of health problems, directly or through health behaviour (Cohen & Williamson 1991, Rosengren et al. 1993, Stroebe & Stroebe 1995). However, an association between *self-reported* stressors and health complaints should be interpreted cautiously, as there is strong evidence that individual differences in personality traits affect the report of both stressors and health problems. One particular trait that has frequently been identified as having such an effect is neuroticism.

Neuroticism is considered to be one of the basic dimensions of an individual's personality. It refers to a "broad dimension of individual differences in the tendency to experience negative, distressing emotions and to possess associated behavioural and cognitive traits" (Costa & McCrae 1987, p. 301), including anxiety, guilt, nervousness, irritability and low self-esteem (Watson & Clark 1984). Individual differences in neuroticism appear to be rather stable and independent of changes in living or health conditions (Ormel 1983, Conley 1985, Costa & McCrae 1987, Watson & Pennebaker 1989). They are at least partly explained by genetic factors (Eysenck 1990).

Whereas neuroticism has frequently been shown to be related to subjective health complaints, it seems to be unrelated to more objective health indicators, such as mortality (Costa & McCrae 1987). This suggests that it affects the *perception* of symptoms by individuals, such as those reported in a questionnaire, and may be independent of the objective health status. Therefore, it is hypothesized that because of their tendency to focus on the negative side of themselves and others, people who have high neuroticism scores are inclined to respond more negatively to questions relating to health, and also to questions on stressors (Watson & Pennebaker 1989). As a consequence, neuroticism may underly the self-reports of both stressors and health complaints. This implies that the observed association between self-reported stressors and health problems may overestimate the true (causal) effect of stress on health (Schroeder & Costa 1984, Watson & Pennebaker 1989, Brett et al. 1990, Ormel & Wohlfarth 1991, Burke et al. 1993).

Although this causal ambiguity is well-recognized in the psychological literature, studies on the explanation of socio-economic inequalities in health seem to ignore this bias. There are good reasons to assume that the disturbing influence of neuroticism also plays a role within the context of socio-economic inequalities in health. Research has repeatedly demonstrated an association between personality factors, including neuroticism, and socio-economic status. People who have high neuroticism scores are more frequently found in the lower socio-economic groups (Nijhof 1979, Raats et al. 1987, Schreurs 1987, Ranchor 1994). It is hypothesized that both socialization processes and differences in living conditions in childhood play a role in the occurrence of socio-economic differentials in personality, but explanatory studies which test this hypothesis are scarce (House 1981). The high neuroticism scores may underly the higher self-reported exposure to stressors as well as the higher prevalence of self-reported health problems in lower socio-economic groups. As a result, the supposed contribution of stressors to inequalities in health may partly be due to socio-economic differences in neuroticism. For this reason, the results of previous studies, indicating that differences in (self-reported) exposure to stressors partly account for inequalities in health (Dohrenwend 1973, Kessler 1979, Murrell & Norris 1991), probably overestimate the contribution of stressors to the explanation of these inequalities. We are not aware of studies which have controlled for this possible bias.

In this chapter, we will assess the extent to which a differential exposure to stressors contributes to socio-economic inequalities in health when differences in neuroticism are taken into account. Whereas in most studies stressors are indicated by life-events only, we will include both life-events and long-term difficulties.

Differential vulnerability hypothesis

Given the same exposure to stressful conditions/events, the differential vulnerability hypothesis specifies that socio-economic inequalities in health result from a differential *impact* of stressors on health. Assuming that people in lower socio-economic groups are less well equipped to cope with stressors, the health effects are probably more severe in these groups. Although this explanation has been suggested to be more important than the differential exposure explanation (Kessler 1979, Kessler & Cleary 1980, McLeod & Kessler 1990, Ranchor 1994), the evidence relating to this hypothesis is ambiguous. Some studies showed a stronger association between stressors and health complaints in lower socio-economic groups, but others yielded inconsistent results, indicating no such effect or a significant effect in the case of some stressors or some socio-economic indicators only (Dohrenwend 1973, Kessler 1979, Kessler & Cleary 1980, Thoits 1982, Turner & Noh 1983, Thoits 1984, McLeod & Kessler 1990, Murrell & Norris 1991, Ranchor 1994).

In this chapter we will test whether the stronger association between stressors and health in lower socio-economic groups as found in some studies, can be replicated in our dataset, using both life-events and long-term difficulties as indicators of stressors.

Thus the aim of this chapter is to re-examine the differential exposure and differential vulnerability hypothesis. The research questions can be summarised as follows:

1. Differential exposure:
    a. Are people from lower socio-economic groups more frequently exposed to stressors, i.e. life-events and long-term difficulties, than people from higher socio-economic groups?
    b. To what extent does a differential exposure to these stressors contribute to socio-economic inequalities in perceived health problems?
2. Differential vulnerability:
    a. Is the association between stressors and health stronger in lower socio-economic groups than in higher socio-economic groups?
    b. To what extent does a differential vulnerability to the impact of stressors contribute to socio-economic inequalities in perceived health problems?

4.3.2 Data and methods

Population
The analyses presented in this chapter were based on the population that participated in this oral interview (n=2802), as most health problems and stressors were only measured in that part of the study population.

Measurements
The *socio-economic status* of the respondents was indicated by the highest level of education attained, students being classified by their current training. Seven categories were distinguished: primary school only, lower vocational schooling, lower secondary schooling (general), intermediate vocational schooling, intermediate/higher secondary schooling (general), higher vocational schooling, and university.

Both health problems and stressors were based on self-report.
Perceived health problems were indicated by the Nottingham Health Profile (NHP) (Hunt et al. 1986) and by answers to the question "How do you rate your health in general?". The answer was dichotomized in the analysis into "(very) good" *versus* less-than-"good" (fair, sometimes good and sometimes bad, bad). 24.1 per cent of the study population considered in these analyses perceived their health as less-than-"good". The Nottingham Health Profile consists of 38 statements which reflect health problems with respect to six areas: emotional reactions (9 items), energy (3 items), sleep (5 items), pain (8 items), physical mobility (8 items) and social isolation (5 items). Respondents had to answer 'yes' or 'no' to each of these statements. The social isolation scale was left out the analyses because of contamination with the measurement of some stressors. Respondents were classified according to whether they responded positively to one or more items in each subscale. In the study population selected for these analyses 17.9 per cent responded positively to one or

more items on the subscale 'energy'. The corresponding percentages for 'pain', 'physical mobility', 'emotional reactions' and 'sleep', were 23.8, 24.8, 25.2 and 33.7 respectively.

The *stressors* were classified into categories in order to allow for linear and non-linear associations with health. The stressors studied in the analyses were negative life-events and long-term difficulties.

Life-events were measured by means of a checklist of 9 negative life-events: moved to another house, substantial drop in income, victim of robbery/theft etc., becoming unemployed, serious illness of partner or other family member, serious illness of parents (-in-laws), death of partner, death of parents (-in-laws), child, brother, sister or good friend, and divorce. The answers were coded as 0, 1, 2, and 3 or more life-events reported in the previous year.

Long-term difficulties included financial problems, social deprivation, and difficulties relating to neighbourhood conditions, health status of significant others, and relationships. Financial problems were measured by a one item question relating to the severity of problems experienced with the payment of bills, food, rent etc. The answers were pre-coded as no problems, some problems and big problems. People were defined as socially deprived if they were not able to engage in 3 or more of 7 activities listed in the questionnaire because of financial reasons (e.g. going out regularly, holiday once a year, having friends for dinner regularly, membership of a club, leisure activities). Problems with neighbourhood conditions were measured by means of a checklist containing 4 items with respect to noise (traffic and neighbours), smell and vandalism. The answers were classified into 4 categories (0, 1, 2, or 3 or 4 problems). Difficulties with respect to the health status of significant others and relationships were measured by means of two subscales of the Dutch Long-Term Difficulties Questionnaire (Hendriks et al. 1990). The subscale 'difficulties with health problems of significant others', relating to serious illness of partner, parents or children, consisted of 5 items. On each item, respondents had to answer 'yes' or 'no'. The respondents were classified according to whether they reported zero, one, or two or more problems in the last year. The subscale 'problems with relations' consisted of 8 items. Respondents were asked to indicate whether they were exposed to a specific problem in the last year: difficulties in social contacts, difficulties with parents (-in-laws), partner, children, brothers/sisters, sexual relationships, friends/acquaintances, neighbours. The scores on each item ranged from 0 (no problem or not applicable) to 4 (serious problem). The scores for each item were added up, resulting in a score of 0,1,2,3 and 4 or higher.

Neuroticism was measured by means of the Eysenck Personality Questionnaire of 12 items, which do not refer to somatic health problems (Eysenck et al. 1985). Its internal consistency was high (Cronbach's α=.81). The score on this scale ranges from 0 to 12. This variable was classified into quintiles.

The following *confounding* variables have been taken into account: sex, age (5 years age groups), interaction between age and sex, marital status (4 categories), religious affiliation (4 categories) and degree of urbanization (5 categories).

Analyses
We used logistic regression, given the dichotomous outcome variables. The analyses were carried out using the GLIM statistical programme (Baker & Nelder 1978). All variables were coded as dummy variables.

Differential exposure
People for whom information on education, confounders, stressors or neuroticism was missing (n=243), were excluded from the study population (8.7 per cent). 2559 respondents were left.

Firstly, we inspected whether stressors were more prevalent in lower educational groups, to test whether the association between education and health was mediated through stressors. We calculated the percentages in each category, directly standardized for age (10 years' age groups) and sex. The same method was used to check whether health problems and neuroticism were more prevalent in lower educational groups.

Secondly, we established whether stressors and neuroticism were associated with health status by fitting logistic regression models, controlling for confounders. The number of respondents in these analyses slightly varies between health measures because of a varying (small) number of missing values on each health measure.

Thirdly, logistic regression models were fitted in order to estimate educational differences in the prevalence of perceived health problems, controlling for potential confounders. The highest educational group was always used as the reference category. The regression coefficients and their standard errors were used to calculate Odds Ratios and their 95 per cent Confidence Intervals. The reduction in deviance due to the inclusion of education was used as an overall statistical measure of its effect.

In order to estimate the extent to which the distribution of stressors contributed to differences in health, they were added to a model containing the educational variable and the confounders. The percentage reduction in Odds Ratios for education after adjustment for the stressors was used to indicate their contribution to the explanation of educational differences in health. The contribution of stressors *independent* of neuroticism is indicated by the reduction due to the inclusion of stressors in a model already containing neuroticism. The contribution of stressors that is associated with the uneven distribution of neuroticism is indicated by subtracting the independent contribution of stressors from its total contribution.

Differential vulnerability
The supposed differential effect of stressors on health by socio-economic status can be captured by means of an interaction term between socio-economic status and the stressors. We therefore summed the long-term difficulties in all domains referred to above into one score. The sum of long-term difficulties was calculated by counting the number of problems

a respondent reported with respect to all domains. The respondents were classified as having 0,1,2,3 or ≥4 problems. The interaction terms between education and the sum of life-events and long-term difficulties were tested for statistical significance. Secondly, logistic regression models were fitted for different educational groups, in order to determine whether the strength of the association between stressors and health varied between educational levels, to the disadvantage of lower levels.

4.3.3 Results

Differential exposure

Similar to the results of other studies, the percentage of persons reporting health problems increased with decreasing educational level (Table 4.3.1). The risk was especially high among those who attained a primary level of education only. In addition, Table 4.3.1 shows the distribution of stressors among educational groups, indicating the percentage of persons in each educational category that reported stressors.

Table 4.3.1 Percentage of persons reporting health problems and stressors, and percentage in highest quintile of neuroticism score, by level of education, standardized for age and sex (n=2559)

	educational level[1]						
	1	2	3	4	5	6	7
health problems							
% with less-than-"good" perceived health	10.5	14.3	14.1	19.0	21.1	27.3	32.5
NHP-emotional reactions: % with ≥1 problems	15.9	19.2	20.9	18.7	20.4	26.8	39.4
NHP-sleep: % with ≥1 problems	21.4	27.2	25.3	28.9	33.2	35.8	43.5
NHP-energy: % with ≥1 problems	7.2	14.4	13.6	12.9	16.4	16.3	30.8
NHP-pain: % with ≥1 problems	8.2	19.4	15.9	18.4	19.0	30.0	30.3
NHP-mobility: % with ≥1 problems	11.9	20.4	16.8	18.6	22.0	28.1	35.4
life-events							
% 2 or more events	12.7	20.8	17.0	16.6	14.0	18.7	22.8
long-term difficulties							
health others: % with ≥1 problems	31.1	38.2	35.2	41.0	38.5	40.8	38.2
relationships: % with ≥1 problems	50.8	49.6	43.6	44.2	45.5	44.8	46.6
neighbourhood: % with ≥1 problems	31.2	33.3	33.9	35.3	38.0	31.8	29.0
financial problems: % with problems	6.4	11.0	13.9	11.8	14.2	25.7	39.3
social deprivation: % socially deprived	.3	1.8	.7	.9	2.0	5.1	10.4
neuroticism							
% in 5th quintile	9.0	12.2	10.3	13.7	17.8	16.4	27.1

[1] 1=high, 7=low (see Data & Methods for categories)

The exposure to life-events is not consistently related to level of education, although the percentage reporting two or more life-events is the highest among those who had attained primary school level only, and the lowest among respondents with a university education. Surprisingly, the proportion among those with higher vocational education is almost as high as among the lowest educational level. Long-term difficulties with respect to the health status of others and financial conditions (financial

problems and social deprivation) appeared to be more prevalent in the lower educational groups. Problems relating to relationships, however, were reported more frequently in higher educational groups, whereas problems with respect to neighbourhood conditions were relatively frequent in the middle groups. Finally, people in lower socio-economic groups clearly have higher neuroticism scores.

Table 4.3.2 Univariate associations between risk of health problems and psychosocial stressors/neuroticism[a]: Odds Ratios (OR), 95 per cent confidence intervals (CI) and reduction in deviance (RD)

	perceived general health (n=2559)			NHP-emotional reactions (n=2552)			NHP-sleep (n=2556)		
	OR	CI	RD	OR	CI	RD	OR	CI	RD
life-events									
0 events	1.00			1.00			1.00		
1 event	1.15	.92-1.44		1.39	1.12-1.73		1.20	.99-1.46	
2 events	1.67	1.26-2.21		1.81	1.38-2.37		1.10	.85-1.43	
≥3 events	2.22	1.41-3.51	21**	3.76	2.47-5.73	48**	1.38	.90-2.12	5
long-term difficulties									
health others									
0 difficulties	1.00			1.00			1.00		
1 difficulty	1.59	1.27-1.97		1.65	1.33-2.03		1.24	1.02-1.51	
≥2 difficulties	1.71	1.28-2.28	23**	1.99	1.50-2.64	34**	1.48	1.13-1.94	10*
relationships									
0 difficulties	1.00			1.00			1.00		
1	1.37	1.04-1.81		1.89	1.44-2.48		1.48	1.16-1.89	
2	1.95	1.41-2.69		2.96	2.18-4.03		1.50	1.11-2.02	
3	1.69	1.19-2.38		3.14	2.27-4.34		1.99	1.46-2.71	
≥4	2.76	2.01-3.78	48**	7.06	5.22-9.55	193**	2.50	1.87-3.35	51**
neighbourhood conditions									
0 problems	1.00			1.00			1.00		
1 problem	1.30	1.03-1.65		1.31	1.04-1.64		1.09	.88-1.35	
2 problems	1.83	1.31-2.57		1.62	1.17-2.24		1.75	1.28-2.39	
≥3 problems	1.81	1.09-3.02	18**	1.99	1.24-3.19	17**	2.10	1.33-3.33	20**
financial problems									
no problems	1.00			1.00			1.00		
some problems	1.99	1.56-2.55		2.41	1.91-3.04		1.71	1.36-2.14	
big problems	3.17	1.97-5.09	46**	3.78	2.41-5.92	76**	2.50	1.59-3.93	33**
social deprivation									
no	1.00			1.00			1.00		
yes	2.96	1.87-4.69	21**	4.30	2.77-6.69	42**	3.03	1.93-4.75	24**
neuroticism									
1st quintile	1.00			1.00			1.00		
2nd quintile	1.59	1.12-2.25		3.17	2.04-4.93		1.53	1.15-2.03	
3rd quintile	1.78	1.25-2.54		4.29	2.77-6.65		1.46	1.08-1.97	
4th quintile	3.44	2.56-4.63		10.32	7.07-15.04		2.17	1.69-2.79	
5th quintile	7.76	5.71-10.53	214**	56.30	37.81-83.83	684**	5.80	4.42-7.60	183**

[a] Results of logistic regression models also including age, sex, age x sex, marital status, religious affiliation and degree of urbanization

All stressors appeared to be statistically significantly related to the prevalence of health problems, except for life-events in the case of sleeping problems (Table 4.3.2).

	NHP-energy (n=2552)			NHP-pain (n=2552)			NHP-mobility (n=2557)		
	OR	CI	RD	OR	CI	RD	OR	CI	RD
life-events									
0 events	1.00			1.00			1.00		
1 event	1.41	1.11-1.80		1.12	.90-1.45		1.19	.96-1.48	
2 events	1.81	1.34-2.46		1.62	1.22-2.14		1.44	1.09-1.91	
≥3 events	2.32	1.44-3.73	23**	1.81	1.13-2.89	15*	1.64	1.03-2.61	10*
long-term difficulties									
health others									
0 difficulties	1.00			1.00			1.00		
1 difficulty	1.30	1.02-1.66		1.51	1.21-1.88		1.32	1.06-1.64	
≥2 difficulties	1.77	1.29-2.42	14*	1.87	1.40-2.49	24**	1.54	1.15-2.05	11*
relationships									
0 difficulties	1.00			1.00			1.00		
1	1.65	1.22-2.24		1.46	1.11-1.93		1.37	1.04-1.80	
2	2.16	1.53-3.06		1.71	1.23-2.39		1.37	.98-1.92	
3	2.17	1.50-3.12		1.68	1.19-2.38		1.76	1.26-2.47	
≥4	3.27	2.35-4.55	61**	2.93	2.14-4.01	50**	2.28	1.67-3.12	32**
neighbourhood conditions									
0 problems	1.00			1.00			1.00		
1 problem	1.42	1.09-1.83		1.27	1.00-1.60		1.24	.98-1.57	
2 problems	2.11	1.49-3.01		1.73	1.23-2.42		1.34	.95-1.90	
≥3 problems	2.49	1.50-4.14	27**	2.05	1.24-3.38	17**	1.72	1.04-2.86	8*
financial problems									
no problems	1.00			1.00			1.00		
some problems	1.85	1.42-2.41		2.06	1.61-2.63		1.79	1.40-2.29	
big problems	4.20	2.63-6.71	47**	4.21	2.63-6.74	59**	3.14	1.97-5.02	38**
social deprivation									
no	1.00			1.00			1.00		
yes	4.26	2.71-6.69	37**	4.64	2.91-7.39	41**	4.06	2.57-6.43	35**
neuroticism									
1st quintile	1.00			1.00			1.00		
2nd quintile	1.59	1.01-2.51		1.45	1.03-2.04		1.39	.99-1.94	
3rd quintile	2.61	1.70-4.00		1.84	1.31-2.60		1.46	1.03-2.05	
4th quintile	4.67	3.25-6.71		2.80	2.10-3.74		2.78	2.10-3.69	
5th quintile	11.74	8.19-16.82	254**	5.53	4.10-7.45	150**	5.12	3.82-6.86	148**

* p<.10
** p<.001

The higher the number of life-events and long-term difficulties reported, the higher the risk of reporting one or more health problems. The risks were especially large for the items relating to financial conditions, and for relationship problems. The stressors were most strongly related to the outcome measure 'NHP-emotional reactions'. Neuroticism is, as expected, related to health problems. As in the case of stressors, the association is the strongest for the NHP-emotional reaction scale, for which extremely large Odds Ratios were observed.

Figures 4.3.1-3 show the results of the logistic regression models. We observed a (statistically significantly) negative gradient for all health measures, indicating higher risks of reporting health problems among lower educational levels. The risk of the lowest groups was the largest for the NHP-subscales 'pain' and 'physical mobility' (Figure 4.3.2).

The shaded part of the bar indicates the extent to which the increased risk of reporting health problems in lower socio-economic groups is explained by the socio-economic distribution of stressors.

These figures show that around 20 percent of the increased risk of the lowest educational groups was due to the higher self-reported exposure of these groups to stressful events and conditions. The same applies to the second highest group (higher vocational), whereas in the middle categories, their contribution was smaller. The relatively large contribution of stressful events and conditions among the second highest category reflects the relatively high level of stressors reported in this group (Table 4.3.1). The results of logistic regression in which the contribution of long-term difficulties in each domain was assessed separately (results not shown), showed that the exposure to financial problems and social deprivation contributed most to the observed inequalities. This is consistent with their steep educational distribution (Table 4.3.1) and their strong association with health (Table 4.3.2). Long-term difficulties as a whole therefore explained more of the increased risk of lower socio-economic groups than life-events.

The lower shaded part of the bar shows to what extent stressors contributed *independently* of neuroticism. This was established by estimating the contribution of stressors when differences in neuroticism had been controlled for. The contribution of stressors now diminished to around 10-15 per cent in the lowest educational levels and the second highest category, whereas in the middle categories for most health measures the independent contribution now was negligible. The association between long-term difficulties and health, in particular those relating to relationship problems, appeared to be more biased by the influence of neuroticism than the association between life-events and health.

Figure 4.3.1 Inequalities in perceived general health and NHP-sleep, explanation by differential exposure to stressors, controlling for neuroticism[a]

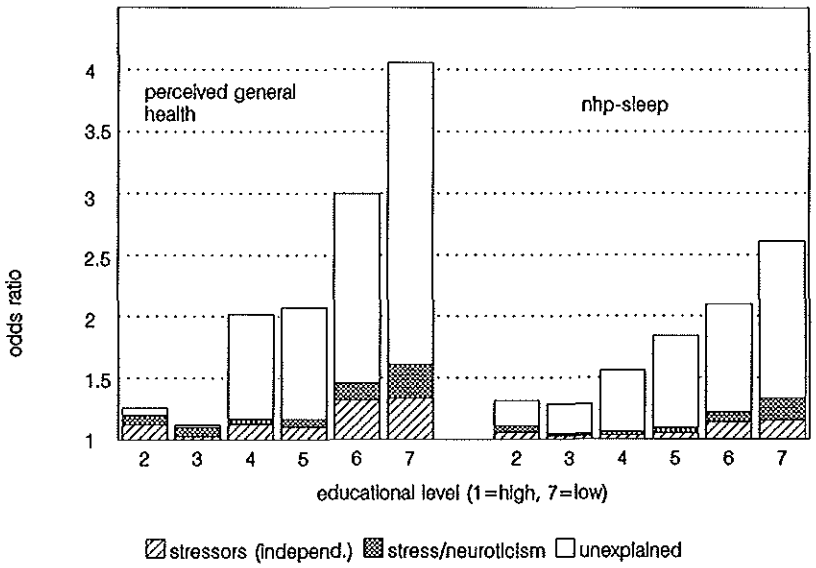
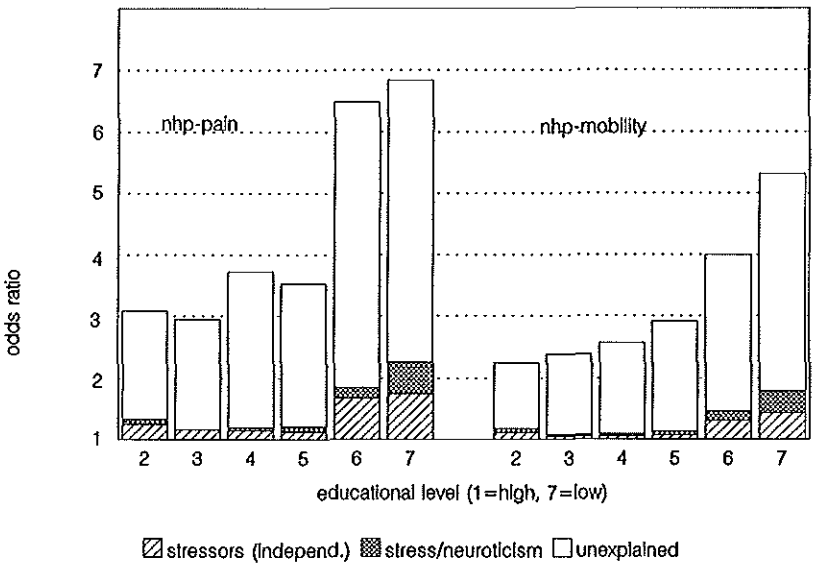
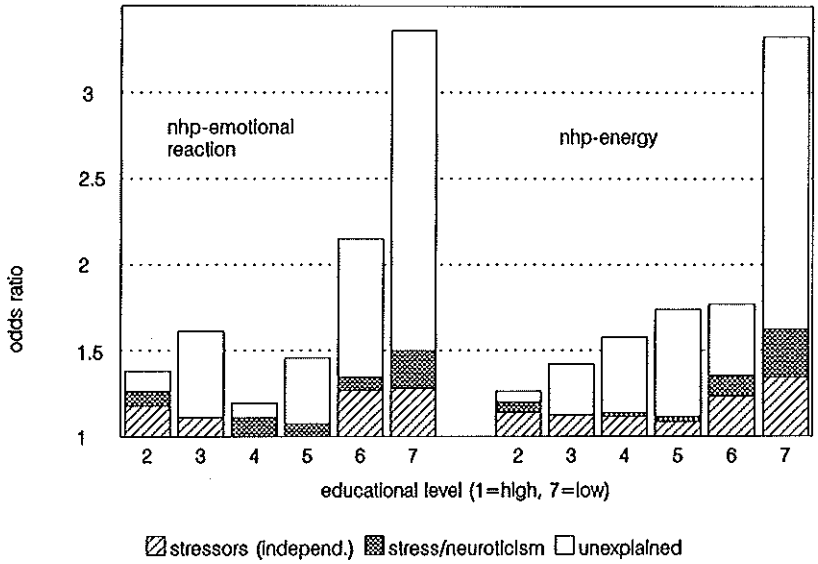


Figure 4.3.2 Inequalities in NHP-pain and NHP-mobility, explanation by differential exposure to stressors, controlling for neuroticism[a]



[a] Results of logistic regression models also including age, sex, age x sex, marital status, religious affiliation and degree of urbanization

Figure 4.3.3 Inequalities in NHP-emotional reaction and NHP-energy, explanation by differential exposure to stressors, controlling for neuroticism[a]



[a] Results of logistic regression models also including age, sex, age x sex, marital status, religious affiliation and degree of urbanization

The educational gradient was still statistically significant after allowing for the inclusion of stressors in the model, implying that inequalities remained which could not be explained by the socio-economic differences in exposure to stressors.

Differential vulnerability

The probably stronger association between stressors and health in lower socio-economic groups can be captured with interaction terms between education on the one hand and life-events/long-term difficulties (both totals) on the other. In these analyses the sumscore of long-term difficulties was used. These interaction terms were tested for statistical significance by adding them to a model containing education and the stressor as a main term. A significant effect ($p<.10$) for the interaction term indicates that the health impact of stressors differs between educational groups. The results are shown in Table 4.3.3.

None of the interaction terms were statistically significant, except for the interaction between education and life-events in the case of NHP-energy. The absence of significant interactions was not due to a lack of power, as classifying both variables in less categories and the use of a linear coding, thereby reducing the loss of degrees of freedom, did not alter the results. Neither did an analysis on the *whole* study population (n=18973), for which data were available on life-events and perceived general health, yield a significant interaction (results not shown).

Table 4.3.3 Significance tests for interaction of education and stressors[a]

interaction term (number of categories)	change in degrees of freedom	reduction in deviance					
		perceived general health	NHP emotional reactions	NHP energy	NHP sleep	NHP pain	NHP mobility
education (7) x life-events (4)	18	16.6	15.3	32.8*	18.3	23.4	22.8
education (7) x long-term difficulties (5)	24	16.0	27.5	28.4	27.0	22.7	20.6

[a] Results of logistic regression models including sex, age, sex x age, marital status, religious affiliation, degree of urbanization, stressors and education as main terms

* $p < .10$

Stratified analyses were carried out to compare the strength of the association between stressors and health (Table 4.3.4), combining educational group 1,2,3; 4,5; and 6,7 because of the rather small numbers. In accordance with the statistical significance test, these analyses showed a stronger association between life-events and the NHP-energy score in lower educational groups. Also in some other cases the association between stressors and health varied by educational level, but the pattern was irregular and not consistently to the disadvantage of the lower educational groups. From Table 4.3.4, which shows the results for a selection of health measures, it can be observed that some associations, e.g. that between long-term difficulties and the NHP-emotional reaction scale, were even weaker in the lower educational groups.

Table 4.3.4 Association between stressors and health problems in different educational levels, Odds Ratios (OR) and 95 per cent Confidence Intervals (CI)[a]

		lowest educational level[b] (n=1046)		middle educational level[b] (n=758)		highest educational level[b] (n=755)	
		OR	CI	OR	CI	OR	CI
NHP-energy							
life-events	0	1.00		1.00		1.00	
	1	1.55	1.09-2.18	2.04	1.28-3.26	.65	.35-1.20
	2	1.52	.98-2.34	2.21	1.15-4.23	2.18	1.19-3.98
	≥3	3.74	1.95-7.16	1.39	.46-4.17	1.05	.32-3.50
long-term	0	1.00		1.00		1.00	
difficulties	1	1.50	.91-2.48	1.47	.67-3.24	1.89	.84-4.27
	2	1.66	1.00-2.77	4.32	2.05-9.11	2.36	1.00-5.57
	3	3.94	2.32-6.67	3.30	1.46-7.48	3.15	1.28-7.74
	≥4	5.31	3.17-8.88	6.64	3.05-14.48	4.79	2.06-11.13
NHP-emotional reaction							
life-events	0	1.00		1.00		1.00	
	1	1.31	.96-1.79	1.51	.99-2.32	1.39	.89-2.18
	2	1.68	1.14-2.46	1.89	1.05-3.40	2.09	1.22-3.59
	≥3	4.37	2.32-8.25	3.94	1.67-9.30	3.38	1.39-8.26
long-term	0	1.00		1.00		1.00	
difficulties	1	1.91	1.21-3.01	2.36	1.18-4.73	2.67	1.21-5.87
	2	2.53	1.60-4.01	3.02	1.50-6.08	3.93	1.77-8.73
	3	4.02	2.45-6.59	4.89	2.36-10.16	8.60	3.77-19.62
	≥4	11.21	6.85-18.34	10.02	4.90-20.47	12.99	5.90-28.61
NHP-mobility							
life-events	0	1.00		1.00		1.00	
	1	1.32	.97-1.80	1.25	.82-1.90	.94	.55-1.60
	2	1.41	.96-2.07	1.12	.59-2.10	2.16	1.20-3.90
	≥3	1.79	.95-3.39	2.16	.84-5.57	.86	.26-2.88
long-term	0	1.00		1.00		1.00	
difficulties	1	1.74	1.16-2.61	1.66	.91-3.04	1.70	.86-3.35
	2	1.80	1.19-2.73	1.39	.74-2.62	1.31	.61-2.80
	3	2.55	1.61-4.06	3.41	1.77-6.55	3.01	1.38-6.58
	≥4	4.12	2.62-6.49	3.86	2.03-7.35	3.07	1.45-6.48

[a] Results of logistic regression models including age, sex, age x sex, marital status, religious affiliation and degree of urbanization

[b] high: level 1-3; middle: level 4,5; low: level 6,7

4.3.4 Discussion

The differential vulnerability hypothesis has received a lot of attention in the literature on the importance of stressors in explaining socio-economic inequalities in perceived health. A differential exposure to stressors has been considered as a less plausible explanation because of inconsistent findings with respect to their socio-economic distribution. The results of our analyses, however, suggest that the importance of the differential exposure hypothesis has so far been underestimated. The stressors we studied were shown to contribute to the observed socio-economic inequalities in perceived health problems, even after differences in neurot-

icism were controlled for. We controlled for educational differences in neuroticism in order to eliminate any bias which may arise from the fact that people in lower educational groups are more inclined to report both stressors and health problems, which may lead to an overestimation of the true importance of stressors. According to the results reported in this chapter, inequalities in perceived health would decrease by approximately 10-15 per cent if the exposure to stressors in the lowest socio-economic groups was similar to that in the highest stratum. The relatively high level of financial problems and social deprivation in these groups accounted for most of that effect. Stressors appeared to be less important in explaining the increased risks of the middle socio-economic groups. We found hardly any evidence for a stronger association between stress and health in lower socio-economic groups, leading us to reject the vulnerability hypothesis.

Despite the fact that the 'total' exposure to long-term difficulties was higher in lower socio-economic groups, a few conditions were found to be less prevalent, especially difficulties relating to relationships. For life-events, an irregular association was found. As previous studies mostly concentrated on life-events as indicators of stressors (a.o. Dohrenwend 1973, Kessler & Cleary 1980, Gottlieb & Green 1984), this could probably explain why these yielded weak associations between socio-economic status and the exposure to stressors. Widening the range of stressors therefore seems necessary in order to obtain a valid estimation of their role in the explanation of socio-economic inequalities in health. However, the list of stressors considered in these analyses was not complete either. For example, work-related stressors were not included. Given the fact that some stressors especially in lower jobs have been shown to affect health, such as decision latitude (Karasek et al. 1981), their inclusion may probably further increase the importance of the stress explanation. In a Dutch study it was shown that this factor indeed explained part of socio-economic inequalities in subjective health status (Schröer & Bullinga 1990).

Thus the results of our analyses suggest that stressors are differentially distributed across socio-economic groups, to the disadvantage of the lower socio-economic groups. Moreover, controlling for that distribution resulted in a decrease of the observed inequalities in health with around 20 per cent. We argued, however, that this percentage does not give an appropriate indication of the contribution of stressors. Given the disturbing influence of neuroticism, it is likely to be an overestimation of their real contribution. We still found a contribution of stressors after controlling for neuroticism, although its size was diminished to around 10-15 per cent. On the other hand this figure might imply an overadjustment as neuroticism might also be an intermediary between stressors and health. Although neuroticism seems to be a rather stable personality factor (Ormel 1983, Conley 1985, Watson & Pennebaker 1989), the possibility that people become neurotic due to the exposure to stressors cannnot be ruled out. Whether this effect is sufficiently powerful to affect the conclusion should be tested used longitudinal data.

Does this finding imply that the differential exposure to stressors partly *explains* the observed inequalities? This question can only be answered positively if stressors are assumed to be causally related to health. In this respect, the use of cross-sectional data, firstly, yields a potential source of bias, as a stressful condition may also be the *result* of a health problem. For example in the case where someone looses his job because of a disease. However, most stressors considered here, e.g. health problems of significant others or problems in living conditions, are not likely to be affected by health problems, implying that selection effects have not substantially biased the results. Longitudinal data are of course necessary to check this.

Secondly, the contribution of stressors probably has to be interpreted in terms of a material link, instead of stress, as some stressors indicate material rather than psychosocial conditions. This applies especially to our measurement of financial problems. Such stressful conditions may operate as a stressor, but they can also have a health effect through a material link, for example in the case where someone's financial resources do not allow for healthy food. The higher risk of health problems is then due to a bad nutritional status rather than stress. It is not plausible, however, that the association between stressors and health as observed here was predominantly due to a material link. If that was the case, we would have expected the association to be less strong for those measures that mainly reflect mental health. In this analysis, however, stressors were related to *all* health measures (Table 4.3.2), some emphasizing mental, and other more physical health problems. In fact, the risk of reporting health problems among people exposed to stressful conditions was the highest for the more psychological health measures, such as emotional reactions. Although this can be considered an indication of the importance of the stress mechanism rather than a material link, further research should search for more direct evidence, e.g. by using measurements of bodily responses indicating stress, and by controlling for material pathways.

We did not find consistent evidence for stressors having a stronger health impact in lower socio-economic groups, as supposed in the differential vulnerability hypothesis. This contrasts with some previous studies, although the results of earlier research are not consistent either.

The inconsistencies of these findings may be due, first, to variations in the measurement of stressors. Some previous studies, for example, included both negative and positive stressful events, whereas we focused on negative events. The inclusion of positive events may bias the results, as there are strong indications that these are not related to health status (Stroebe & Stroebe 1995). That implies that if negative and positive events are summed, the association between health and the total number of life-events reflects an effect of negative events only. If we assume that people from lower socio-economic groups more frequently report negative events than people from higher strata, while the number of positive events remains comparable, the association between stressors and health will be stronger in lower socio-economic groups. The stronger association in that case does not reflect a higher impact of stressors, but, instead, a higher

percentage of people in lower socio-economic groups reporting negative events. As our analyses focused on negative events only, this may explain some of the discrepancy between our findings and those of some previous studies (Dohrenwend 1973, Turner & Noh 1983).

Secondly, inconsistent findings with regard to the differential impact of stressors may also reflect *real* differences. The health impact of some stressors probably differs between socio-economic groups, whereas the impact of others does not. An example of these may be *health-related* events (relating to the health status of the respondent himself) and non-health-related problems. The evidence for a differential impact of the former seems to be more consistent than that for the latter (Thoits 1982, Thoits 1984). Furthermore, the applicability of the vulnerability hypothesis may vary between health measures. For example, in the case of one health indicator we observed a stronger association in lower socio-economic groups, whereas for other health indicators a reverse effect was observed. A further discussion of the extent to which variations in the operationalization of stress and health could explain the inconsistenties between previous studies is beyond the scope of this chapter. But these examples at least indicate that the vulnerability hypothesis needs further specification in future research.

In summary, the analyses in this chapter suggest that the higher prevalence of perceived health problems in lower socio-economic groups is partly due to their higher exposure to stressful conditions and events. However, a comparison with the importance of other explanations as assessed in the same dataset, indicates that the stress explanation is less important than the traditionally mentioned explanations relating to behavioural and material factors, which account for around 30-50 per cent of the increased health risk of lower socio-economic groups (see chapter 5.1). In addition, our findings suggest that the stress and material explanation have at least part of their contribution in common, given that stressors with a material base (financial problems, deprivation) in particular have been found to contribute to socio-economic inequalities. This implies that material factors partly have an effect on health *through* stress. The stress explanation therefore probably not only operates parallel to, but also as a *part* of the material explanation. Therefore, future studies should assess the contribution of each of these explanations simultaneously, preferably using more direct indicators of stress.

Furthermore, future studies should employ other health indicators than perceived health. As the impact of stressors on health may vary between these indicators, the evidence for the importance of stressors which we found here, cannot automatically be generalized to inequalities in more objective health indicators, such as morbidity or mortality. Our results therefore do not give conclusive evidence to support the view that stress differences may lead to a higher susceptibility for diseases in lower socio-economic groups. Such a higher susceptibility has been suggested as an important explanation, in view of the fact that people from lower socio-economic groups are in a disadvantaged position for so many health problems and diagnoses (Syme & Berkman 1976, Marmot et al. 1984).

As far as we know, previous studies on this issue all relate to self-perceived health status. Further research is necessary in order to establish whether the stress explanation also applies to mortality and morbidity differences. Any further research based on *self-reported* morbidity, should at least employ a measure of neuroticism, in order to eliminate its influence on the self-reports of both stressors and health.

Finally, although neuroticism was considered as a nuisance factor, the contribution of this personality trait also has its own implication for the explanation of socio-economic inequalities in health. From a psychological point of view it is interesting that our analyses have shown that at least part of the inequalities in health in our study population are due to the higher neuroticism scores of people from lower socio-economic groups. It indicates the importance of differences in the *perception* of people from higher and lower socio-economic groups. These differences may contribute to the phenomenon that socio-economic inequalities in health are larger for subjective health measures than for more objective health indicators (e.g. chronic conditions and mortality) (Mackenbach 1993, van de Mheen et al. 1994). The importance of differences in personality traits for socio-economic inequalities in health therefore also warrants further research.

Abstract

Objective: Socio-economic inequalities in health are smaller among women than among men. In this chapter, it is hypothesized that this is due to a gender difference in employment status.

Methods: We used data from respondents who answered the postal questionnaire in 1991. The socio-economic indicators were educational level of the respondent and occupational level of the main breadwinner. Logistic regression was used to assess the size of socio-economic inequalities in the prevalence of chronic conditions and less-than-"good" perceived general health.

Results: The smaller socio-economic inequalities in health among women were partly due to a less pronounced concentration among women than among men of relatively unhealthy employment status categories (unemployed, long-term work disabled) in lower socio-economic groups. The smaller inequalities in perceived general health among women could also partly be explained by the smaller over-all size of the group of unemployed/long-term disabled/early retired among women than among men, a group which is characterized by relatively large inequalities in health.

Conclusion: These findings suggest that in the Netherlands the low proportion of women in paid employment, and thereby the low proportion of the unemployed/long-term disabled/early retired, explains part of the smaller socio-economic inequalities in health among women. The more pronounced concentration of those with a long-term work disability in lower socio-economic groups among men, also points at the importance of working conditions for the gender difference in the size of socio-economic inequalities in health.

4.4 Smaller socio-economic inequalities in health among women: the role of employment status

4.4.1 Introduction

The *size* of socio-economic inequalities in health differs between subgroups in the population, in particular between men and women. In the adult population, inequalities among women seem to be smaller than those among men (Millar 1983, Lynge 1981, Blane et al. 1990, Valkonen et al. 1993, Martikainen 1993, Koskinen & Martelin 1994, Lahelma & Arber 1994, Arber 1989).

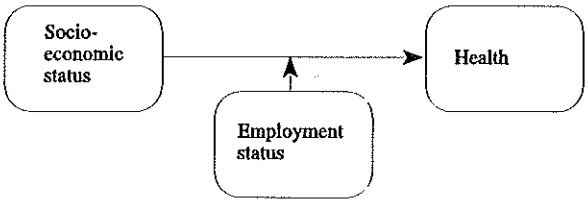
It has been suggested that this gender difference is an artefact of the measurement of socio-economic status (Arber 1989, Dahl 1991, Moser et al. 1988). For example, women are often classified by the occupation of their partner, whereas the socio-economic status of men is often indicated by their own occupation. This probably results in a larger percentage of misclassifications among women. However, studies which compare the socio-economic gradient in health among women for own occupation and occupation of the head of the household, show larger inequalities for the latter indicator (Dahl 1991, Arber 1987). Moreover, inequalities appear to be smaller among women for a very broad range of socio-economic indicators (Koskinen & Martelin 1994). This makes it necessary to search for other explanations. Exploring the causes of this gender difference can be helpful in getting a clear understanding of the background of socio-economic inequalities in health.

In this chapter we will investigate the role of one factor that probably contributes to smaller inequalities among women, namely employment status, which refers to the position of an individual in or outside the labour market (paid job, unemployed, housewife etc.). A previous study has indicated the importance of this factor (Lahelma & Arber 1994). A comparison of socio-economic inequalities in health in Britain, Finland, Sweden and Norway shows that the gender difference in the size of the inequalities is relatively small in Sweden and Finland, compared to Britain and Norway. As women's participation in the labourmarket in Sweden and Finland is higher than in Britain and Norway, these findings suggest that the gender difference in the size of socio-economic inequalities in health is partly due to differences in employment status. We will further explore if, and how a gender difference in employment status contributes to smaller socio-economic inequalities in health among women. Two explanatory mechanisms have been studied.

In the first mechanism, employment status acts as an intermediary factor between socio-economic status and health. As employment status has an effect on health - e.g. being unemployed seems to be bad for someone's health (Moser et al. 1990) - and socio-economic groups differ in employment status, it may explain part of the socio-economic inequalities in health (Arber 1987, Dahl 1993). This can be schematized as follows:

If the concentration of relatively unhealthy employment status categories (such as the unemployed) in lower socio-economic groups is more pronounced for men than for women, this factor will contribute to the smaller socio-economic inequalities in health in women (hypothesis 1).

In the second mechanism employment status acts as a modifier of the association between socio-economic status and health:



Some studies indeed indicate that the size of socio-economic inequalities in health varies by employment status (Arber 1987, Martikainen 1994), but in other studies such a modifying effect has not been found (Kessler 1982, Klein Hesselink & Spruit 1992). If, however, the population share of employment status groups with small inequalities in health is more pronounced among women (e.g. housewives), whereas groups with large inequalities are more prevalent among men (e.g. paid employed), this will contribute to the gender difference in socio-economic inequalities in health (hypothesis 2).

Health is measured by indicators for self-reported health. With respect to the first hypothesis, we investigated whether employment status is associated with health, whether the concentration of unhealthy employment status categories in lower socio-economic groups is less pronounced for women, and whether this could explain the smaller inequalities in health among women. With respect to the second hypothesis, we inspected whether employment status is a modifier of the association between socio-economic status and health, and whether the population share of employment status groups with small inequalities in health is more pronounced among women, and those with large inequalities more pronounced among men.

4.4.2 Data and methods

Population

The analyses in this chapter are based on the population that answered the postal questionnaire in 1991. People younger than 25 (mainly students and conscripts) and people over 64 were excluded because of classification problems with regard to socio-economic status, respectively lack of variation in employment status. Finally, people for whom information

on employment status was missing (1.8 per cent), and conscripts/students aged 25 and over (0.6 per cent) were excluded. This resulted in a study population of 13391 persons.

Employment status
Men and women were classified according to their employment status by using the answers to a question on their main activity. We distinguished five groups:
(1) the paid employed;
(2) the unemployed, defined as those who are officially registered as looking for a paid job, which is a prerequisite for receiving a social security benefit;
(3) those with a long-term work disability, defined as those who are dependent on a social security benefit because of their illness; in the Netherlands men and women are guaranteed an income in the case one cannot do his or her (paid) job because of illness;
(4) the early retired, including a small number of people who lived off of their own private means; and
(5) housewives (m/f), which is a small group among men (n=25).

Indicators of socio-economic status
Two socio-economic indicators are used. Firstly, educational level of the respondent, defined as the highest level of education attained, and divided into four categories: primary school only; lower general and vocational education; intermediate vocational and intermediate/higher general education; higher vocational college and university. Secondly, the occupational level of the main breadwinner was determined on the basis of the current occupation, if in paid employment, or if not, the last paid employment. The occupations were classified according to five levels outlined in the Erikson, Goldthorpe and Portocarero (EGP) scheme, i.e. higher grade professionals; lower grade professionals and routine non-manual employees; self-employed; high and low skilled manual workers; unskilled manual workers (Erikson et al. 1983). People who had never been in paid employment formed the sixth category. If the respondent did not live with a partner, he or she was automatically classified as the main breadwinner. If the respondent lived with a partner, he or she was asked who the main breadwinner was. If information on main breadwinner and/or living arrangement was missing, the highest occupational level in the household was used.

Health measures
Two health measures were used. Firstly, chronic conditions were measured by means of a checklist, containing 23 chronic conditions, some of which severe (such as cancer and heart disease), other less severe (such as serious headache and varicose veins). Respondents were classified according to whether (at the time of the survey) they reported to be suffering from at least one of the conditions listed in the questionnaire. 44.4 per cent of the male and 46.9 per cent of the female study population reported one or more chronic conditions. The second health measure was based

on the respondent's answer to the question "How do you rate your health in general?", dichotomized as "(very) good" versus less-than-"good" (fairly good; sometimes good, sometimes bad; bad). 27.9 per cent of the men and 29.0 per cent of the women in the study population perceived their health as less-than-"good".

Analyses

Risk estimators for each socio-economic and employment status group were obtained by fitting logistic regression models, controlling for several confounders. These are age (5 years age groups), marital status (4 categories), religious affiliation (4 categories) and degree of urbanization (5 categories). Other socio-demographic variables, like number of children, appeared to have no confounding effect on the association between socio-economic status and health. The analyses were carried out with the Logistic Regression module of Egret (Statistics and Epidemiology Research Corporation 1990). The regression coefficients and their standard errors were used to calculate Odds Ratios and their 95 per cent Confidence Intervals, the highest socio-economic group used as a reference category. These parameters were used to compare the size of inequalities in health between men and women. The reduction in deviance due to the inclusion of a socio-economic indicator in a model already containing confounders was used as an overall statistical test of its effect.

4.4.3 Results

Parallel to the results of other studies, inequalities in health are smaller among women than among men for both socio-economic indicators (Figures 4.4.1-2).

Figure 4.4.1 Chronic conditions by education of the respondent and occupation of the main breadwinner[a]

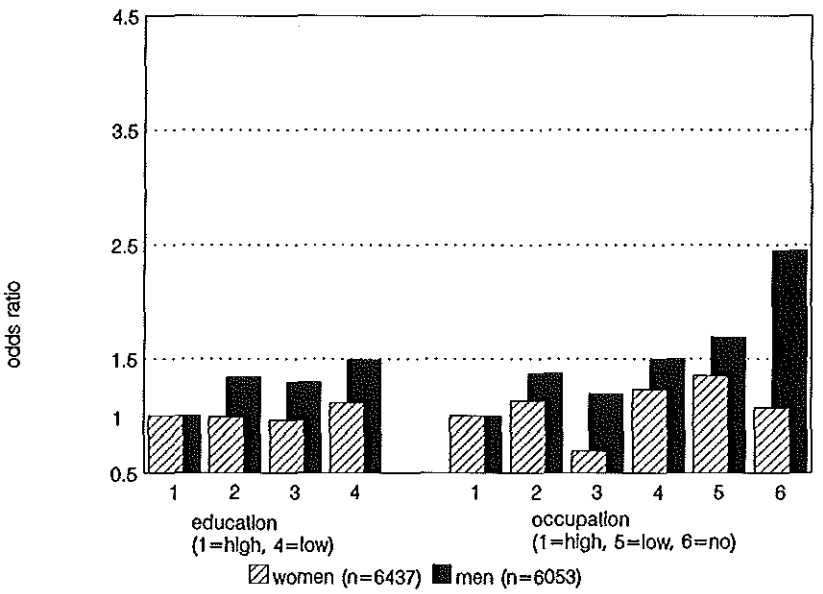
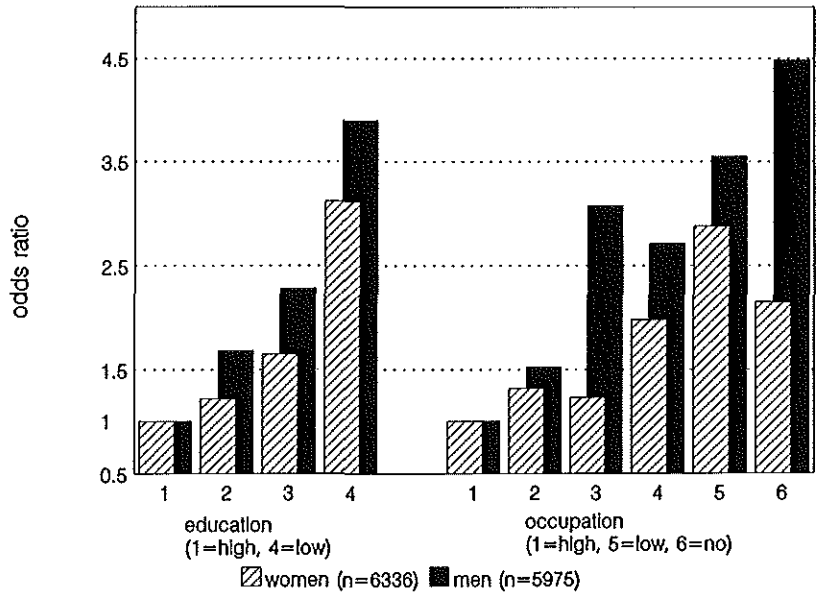


Figure 4.4.2 Perceived general health by education of the respondent and occupation of the main breadwinner[a]



[a] Results of logistic regression models including employment status, age, marital status, religious affiliation and degree of urbanization

Education and occupation cause a significant reduction in deviance ($p<.001$) for both health measures, with the exception of education in the case of chronic conditions among women. While men in the lowest socio-economic groups show a significantly increased risk of reporting one or more chronic conditions, hardly any differences are observed among women. A less-than-"good" perceived general health is differentially distributed in both sexes, but the socio-economic gradient is again less steep in women.

Hypothesis 1: Smaller socio-economic inequalities in health among women are due to a less pronounced concentration of unhealthy employment status categories in lower socio-economic groups.
Table 4.4.1 shows the association between employment status and health. The employed are used as a reference category. The prevalence of health problems varies by employment status, with a similar pattern for men and women. Not surprisingly, the Odds Ratio of people with a long-term work disability is particularly high, and also the health of the unemployed is statistically significantly worse than that of the employed. The early retired do not have an increased risk. Among women, housewives only have a statistically significantly worse health in the case of perceived general health.

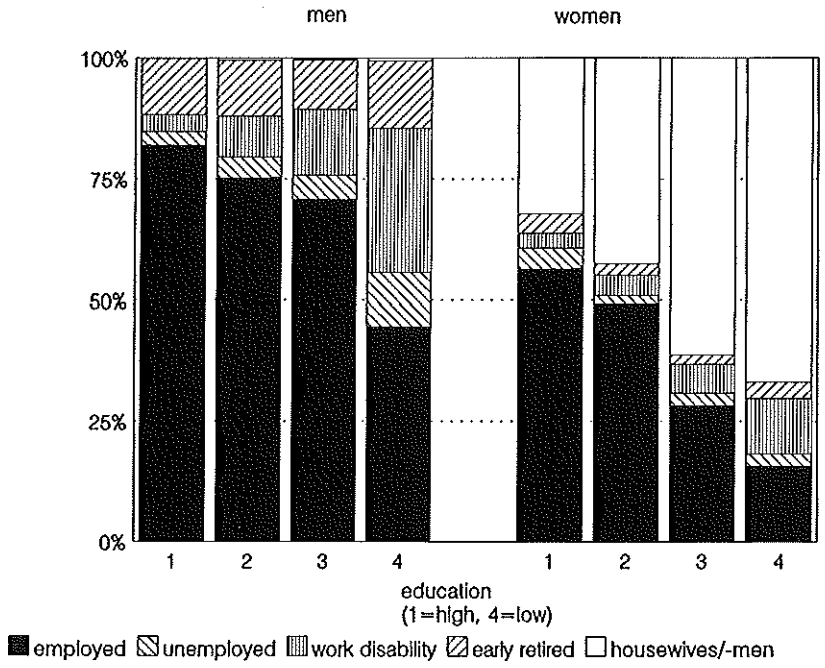
Table 4.4.1 Chronic conditions and perceived general health by employment status[a]: Odds Ratios (OR) and 95 per cent Confidence Intervals (CI)

employment status	MEN				WOMEN			
	chronic conditions		perceived general health		chronic conditions		perceived general health	
	OR	CI	OR	CI	OR	CI	OR	CI
paid employment	1.00		1.00		1.00		1.00	
housewives (m/f)	1.63	.64-4.15	2.51	.94-6.72	1.04	.92-1.17	1.58	1.36-1.84
unemployed	1.41	1.11-1.78	2.24	1.74-2.89	1.45	1.05-2.00	1.95	1.37-2.78
work disability	4.93	4.02-6.05	10.82	8.76-13.36	5.71	4.25-7.68	11.95	9.08-15.73
early retired	1.21	.96-1.53	1.01	.77-1.32	1.04	.73-1.47	.87	.57-1.32

[a] Results of logistic regression models including age, marital status, religious affiliation and degree of urbanization

The association between education and employment status is summarised in Figure 4.4.3 (data for occupation were largely similar). The proportion of employment status groups with a particularly bad health, i.e. the unemployed and people with a long-term work disability, is higher in lower educational levels and this concentration is much more pronounced among men than among women. The difference is particularly large for long-term work disability. The percentage among men ranges from about 3 per cent in the highest, to 30 per cent in the lowest educational group.

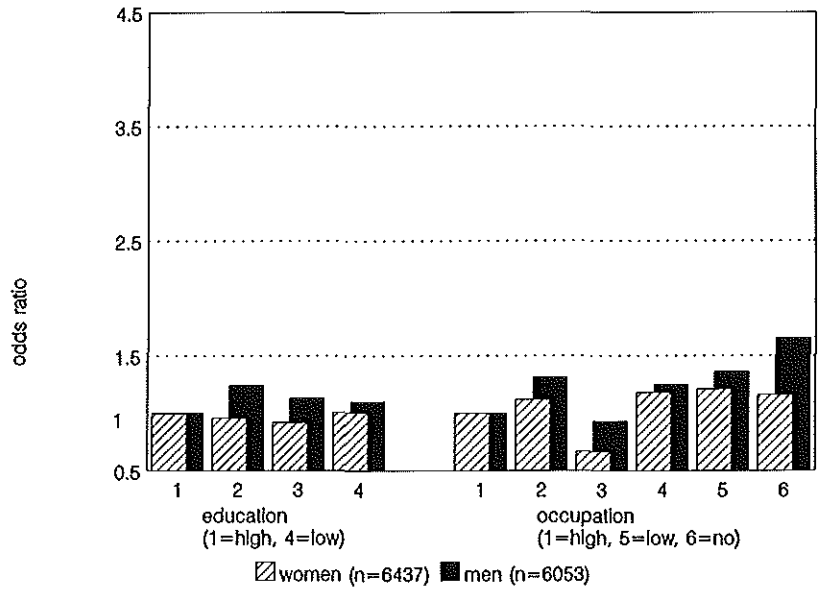
Figure 4.4.3 Men and women categorized by employment status and education



In women, the percentage in the lowest group was only 12 per cent. Moreover, the percentage of unemployed women hardly differs between low and high levels, whereas among men large differences are observed. The percentage of housewives is larger in lower educational groups.

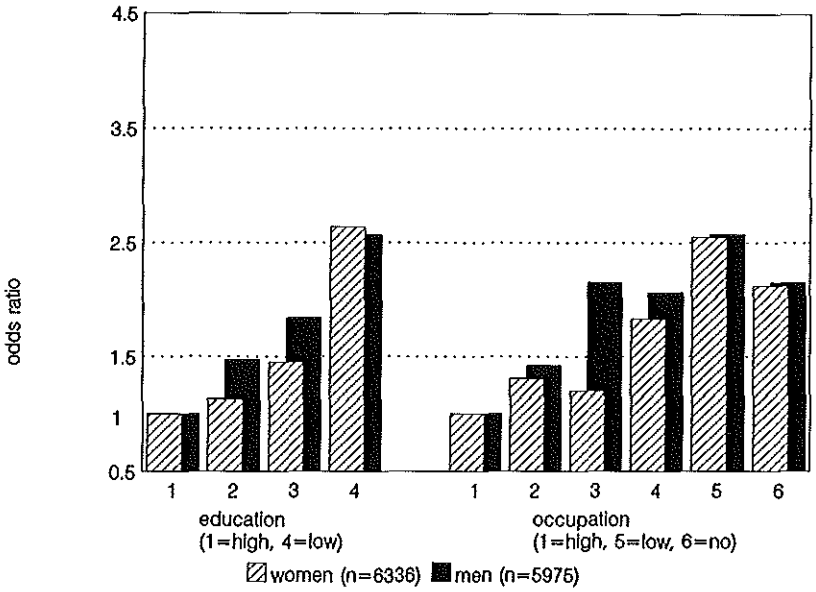
Figures 4.4.4-5 show the size of inequalities in health among men and women after controlling for employment status. For both sexes, the Odds Ratios have decreased compared to the results of the model without control for employment status (Figures 4.4.1-2). This implies that employment status accounts for some part of the association between socio-economic status and health. The socio-economic gradient is still less steep in women, but the difference in steepness between men and women is much smaller now, especially in the case of perceived general health.

Figure 4.4.4 Chronic conditions by education of the respondent and occupation of the main breadwinner, controlling for employment status[a]



[a] Results of logistic regression models also including age, marital status, religious affiliation and degree of urbanization

Figure 4.4.5 Perceived general health by education of the respondent and occupation of the main breadwinner, controlling for employment status[a]



[a] Results of logistic regression models also including age, marital status, religious affiliation and degree of urbanization

Hypothesis 2: Smaller socio-economic inequalities in health among women are due to a more pronounced population share of employment status groups with small inequalities in health in this sex, and of those with large inequalities among men.

Not surprisingly, the proportion of men and women participating in paid employment is different (Table 4.4.2). The majority of men has a paid job (around 70 per cent), compared to only 32 per cent among women. Also the proportion of the unemployed and people reporting a long-term work disability or early retirement is much larger among men. In women, the majority reports to be housewife.

Table 4.4.2 Percentage (and numbers) of men and women categorized by employment status

	men		women	
employment status	%	N	%	N
paid employment	69.9	(4547)	32.3	(2218)
housewives (m/f)	.4	(25)	55.8	(3845)
unemployed	5.5	(356)	2.7	(186)
work disability	12.7	(828)	6.7	(460)
early retired	11.5	(750)	2.6	(176)

To test whether employment status is a modifier of the association between socio-economic status and health, the interaction between education and occupation on the one hand and employment status on the

other, was tested on statistical significance. The unemployed, those with a long-term work disability and the early retired are combined because of their rather small numbers. The results are shown in Table 4.4.3.

Table 4.4.3 Significance tests for interaction of socio-economic status and employment status[a]

interaction term (number of categories)	change in degrees of freedom	reduction in deviance	
		chronic conditions	perceived general health
education (4) x employment status (3)	6	6.0	17.8**
occupation (5) x employment status (3)	8	10.9	18.3*

[a] Results of logistic regression models including age, marital status, religious affiliation and degree of urbanization
* $p < .05$
** $p < .01$

Employment status does not appear to be a modifier of the association between socio-economic status and chronic conditions. The association between perceived general health and socio-economic status however varies by employment status. When the size of socio-economic inequalities in perceived general health is compared between the three employment status groups (Table 4.4.4), it appears that the gradient among the unemployed/those with a long-term work disability/the early retired is particularly large in the case of educational differences. Socio-economic inequalities among housewives are larger than those among the paid employed if occupation is used as an indicator. The larger proportion of housewives therefore does not appear to contribute to smaller socio-economic inequalities in perceived general health among women, but the smaller proportion of the unemployed/those with a long-term disability/ the early retired does, especially in the case of educational differences.

Table 4.4.4 Perceived general health by education and occupation in employment status groups[a]

socio-economic indicator		paid employed		housewives/-men		unemployed/work disability/early retired	
		OR	CI	OR	CI	OR	CI
education	1	1.00		1.00		1.00	
respondent[b]	2	1.41	1.15-1.71	.96	.64-1.44	2.03	1.48-2.77
	3	1.68	1.40-2.02	1.44	1.02-2.04	2.54	1.92-3.36
	4	2.77	2.22-3.47	2.53	1.76-3.64	4.08	3.05-5.45
(last/current)	1	1.00		1.00		1.00	
occupation	2	1.27	.99-1.64	1.58	1.14-2.19	1.28	.87-1.88
main	3	1.58	1.07-2.33	1.28	.73-2.23	3.71	2.09-6.61
breadwinner[b]	4	2.06	1.58-2.69	2.14	1.53-2.99	2.02	1.36-3.00
	5	2.55	1.94-3.36	3.09	2.16-4.41	2.86	1.91-4.27

[a] Results of logistic regression models including age, marital status, religious affiliation and degree of urbanization
[b] 1=high, 4/5=low (see Data & Methods for categories)

4.4.4 Discussion

The observation that socio-economic inequalities in health are smaller among women than among men was confirmed here, for both health measures. Inequalities in the prevalence of one or more chronic conditions were absent among women. This is due to the fact that this measure is the sum of a list of 23 conditions, some of which appeared to be negatively related to socio-economic status while others were positively related (van de Mheen et al. 1994). The number of conditions that were negatively associated with socio-economic status was larger in men.

It is unlikely that the observed gender difference in the gradient in health as a whole is an artefact of the measurement of socio-economic status as both educational and occupational status produced smaller inequalities among women. Also use of the variable 'own occupation' in an additional analysis among the employed resulted in smaller inequalities in health among women (data not shown).

There is also a possibility that the results are an artefact of the measurement of health status, which in this study was based on self-report. Systematic differences in the answering pattern could only have influenced the results however, if the answering was differently related to socio-economic status in men and women. This bias does not seem very likely.

We hypothesized that smaller socio-economic inequalities in health among women are partly the result of a gender difference in employment status via the following two mechanisms. Firstly, the concentration of relatively unhealthy employment status categories in lower socio-economic groups may be less pronounced among women than among men. Secondly, the population share of employment status groups with relatively small inequalities in health may be more pronounced among women, while groups with large inequalities may be more prevalent among men.

The first hypothesis was confirmed here. Health problems were more prevalent among the unemployed and those reporting a long-term work disability, and both groups were concentrated in lower socio-economic levels. As hypothesized, this pattern was less pronounced among women. This is probably partly due to the large proportion of women not in paid employment, who cannot claim a social security benefit in the case of illness and who are often not registered as unemployed if they are looking for a job.

Also the perceived general health of housewives was relatively bad, while the proportion of housewives was larger in lower socio-economic groups. This implies that part of the higher prevalence of health problems in lower socio-economic groups among women is due to the socio-economic distribution of paid and unpaid work in this sex. As a consequence, this factor could *not* explain why socio-economic inequalities in health among women are smaller than those among men.

After differences in employment status were controlled for, highly similar inequalities in health among men and women resulted, especially

in the case of perceived general health. What does this finding imply? If unemployment and long-term work disability in itself have a negative effect on health, these will be intermediary factors, explaining the association of socio-economic status and health. However, if they are largely *determined* by health, their socio-economic distribution is only the result of a higher prevalence of health problems that can be due to *any* intermediary factor.

As the data used here are cross-sectional, they do not give an indication of the direction of the relation between employment status and health. Results from other studies suggest that the association between unemployment and health is at least partly due to the causal effect of unemployment on health (Bartley 1994, Valkonen & Martikainen 1992). It is plausible however, that the association between long-term work disability and health is largely due to a selection effect: people in this group are not in paid employment *because* of health problems. Given the high proportion of this category in lower socio-economic groups and given their high risk, the effect of controlling for employment status is probably largely an effect of controlling for the distribution of those with a long-term work disability. This was confirmed in an analysis in which this group was excluded. This in itself reduced the Odds Ratios for men and women to values which were close to the Odds Ratios of the model in which employment status is controlled for (Figures 4.4.4-5). E.g. the risk of a bad perceived general health, for men of the lowest educational level, decreased from 3.88 [3.19-4.72] to 2.56 [2.08-3.16] after controlling for employment status, whereas excluding the long-term disabled resulted in an Odds Ratio of 2.82 [2.26-3.52].

We therefore conclude that the more pronounced clustering of unhealthy employment status groups among men only partly points at the importance of the effect of employment status on health as such. For a large part, this distribution points at the importance of *other* intermediary factors that explain the high prevalence of health problems, which then leads to a high prevalence of long-term work disability in lower socio-economic groups. The analyses presented in this chapter do not answer the question which factors. But they at least suggest that working conditions are important, if one assumes that some of those reporting a long-term work disability do not work because of *work-related* health problems. The more pronounced clustering of the long-term disabled among men is probably the result of a different distribution of men and women across various occupations, with men more often employed in jobs involving physical health risks. For a further test of this hypothesis the distribution of working conditions should be studied directly.

The second hypothesis was only partly supported by the data. More than 50 per cent of the women reported to be housewife, whereas about 70 per cent of the male population was in paid employment. But, as the size of inequalities in chronic conditions did not vary by employment status, the second mechanism does not apply to this health measure. For inequalities in perceived general health, somewhat larger inequalities were observed among housewives compared to those in paid employment, with oc-

cupation used as a socio-economic indicator. It is thus likely that the large proportion of housewives accounts for part of the socio-economic inequalities in health among women, but this cannot explain why this inequalities are smaller in this sex. The largest inequalities in perceived general health were observed among the unemployed/those with a long-term work disability/the early retired. As the proportion of this group is more than twice as high among men than among women, the smaller socio-economic inequalities in perceived general health among women are probably partly explained by this phenomenon.

In summary, these findings suggest that the low proportion of women in paid employment, and thereby the low proportion of the unemployed/ those with a long-term work disability/the early retired, explains part of the gender difference in the size of socio-economic inequalities in health. Compared to other Western European countries, the difference in employment pattern between men and women is large in the Netherlands. The participation of women in the labour market has been the lowest in Europe for a long time. Especially women aged 45-64 (a group which has been overrepresented in this study) are underrepresented in the labour market (Hooghiemstra & Niphuis-Nell 1993). This extreme position of the Netherlands in itself does not hamper the generalizability of our conclusion however. Question is whether in countries with a higher labour market participation of women the socio-economic distribution of employment status groups or the modifying effect of employment status will be different from the results presented here. The scarce data from other studies do not point in that direction. For example in a British study, the clustering of the unemployed and long-term disabled in lower socio-economic groups was also less pronounced among women (Arber 1987). Moreover, in Britain as well as in the United States, the inequalities in health seem to be relatively large among those not in paid employment (Arber 1987, Martikainen 1994).

Finally, these findings may indicate the direction of future trends of socio-economic inequalities in health among women. Our results suggest that an increase of the participation of women in the labour market will lead to an increase of inequalities in health among this sex, if this rise in employment participation goes together with an increase of the proportion unemployed and long-term disabled, especially in lower socio-economic groups. This depends on the distribution of men and women across various jobs, involving different health risks. This again stresses the importance of working conditions for the explanation of socio-economic inequalities in health.

5 THE ROLE OF BEHAVIOUR IN RELATION TO LIVING CIRCUMSTANCES

Abstract

Objective: The aim of this chapter was to investigate the importance of the 'cultural/behavioural' and 'materialist/structuralist' explanation for socio-economic inequalities in health, and to examine the interrelationship between them.

Methods: Educational level was used as a socio-economic indicator. Data were obtained from the postal questionnaire. Health indicators used were the prevalence of chronic conditions, health complaints and perceived general health.

Results: When analysed separately, both behavioural and material factors contributed substantially to observed inequalities in health. In a simultaneous analysis, both groups of factors had a substantial part of their contribution to health inequalities in common. We consider it to be more likely that behaviour is embedded in material conditions than vice versa. We therefore defined the overlap between both explanations as an indirect contribution of material conditions, through behaviour. In our analysis, the total (direct plus indirect) contribution of material factors is larger than that of behavioural factors.

Conclusions: These analyses suggest that both material conditions (direct or through behaviour) and behaviour (independent of material conditions) are important factors when explaining socio-economic inequalities in health. If the overlap between both explanations is ignored, this could lead to an overestimation of the 'cultural/behavioural' explanation. However, because of, in particular, the cross-sectional character of the data, these analyses must not be considered a *final* answer to the question of the relative contribution of material and behavioural factors. Instead, they are an illustration of the way the importance of behavioural and material factors could be assessed, taking the effect of material conditions on lifestyle into consideration. We hope these analyses will be replicated using more powerful datasets.

5.1 Behavioural and material factors in the explanation of socio-economic inequalities in health: an empirical analysis

5.1.1 Introduction

Following the British Black Report, part of the debate on the explanation of socio-economic inequalities in health has concentrated on the contribution of 'cultural/behavioural' versus 'materialist/structuralist' explanations (Townsend et al. 1988, Blane 1985, Davey Smith et al. 1994). This issue is of vital importance, as it has consequences for the normative judgement of observed inequalities and the strategies for reducing them. In chapter 2.2 it was argued that inequalities in health which result from differences in living conditions are unfair and should be reduced, while inequalities which arise as a result of free choices made by an individual cannot be called unjust.

Most empirical studies which seek to explain socio-economic inequalities in health deal with cultural/behavioural factors (Davey Smith et al. 1994). These studies, which analyse data on socio-economic status, health and lifestyle simultaneously, show that a substantial part of the observed socio-economic inequalities in health is due to the differential distribution of behavioural factors across socio-economic groups. For example, in the British Whitehall Study and the Regional Heart Study almost half of the increased risk of heart disease mortality of the lowest socio-economic group could be attributed to lifestyle related factors such as smoking, blood pressure, cholesterol and obesity (Marmot et al. 1978, Pocock et al. 1987). But, in both studies some gradient remained which was not explained by the traditional risk factors. This suggests that there are other explanatory factors which have not been measured in these studies (Marmot et al. 1978), although there is also a possibility that the contribution of traditional risk factors have been underestimated due to inadequate measurements (Pocock et al. 1987).

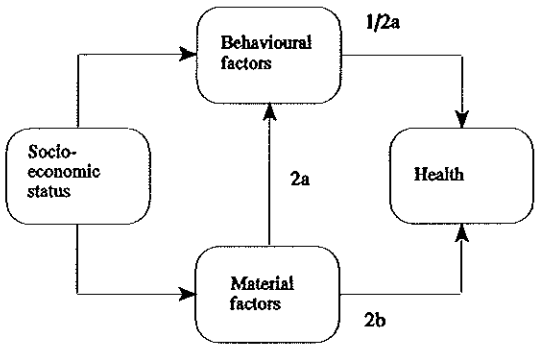
Given their effect upon health (Forsdahl 1977, Martin et al. 1987, Hasan 1989) and their differential distribution across socio-economic groups (Hasan 1989, Mackenbach 1992), material factors such as housing and working conditions and material deprivation are also expected to contribute to the socio-economic gradient in health. There are, however, very few studies which quantify the relative importance of living conditions in the way that the contribution of lifestyle has been assessed. Instead, their importance is frequently inferred *in*directly. For example, studies examining health differences between areas with high and low levels of material deprivation (Phillimore et al. 1994), and studies comparing the relationship between inequalities in health and inequalities in income (Wilkinson 1989), suggest that material conditions play an important role in generating socio-economic inequalities in health.

Although behavioural and material explanations can be distinguished conceptually, several authors have emphasized that they cannot be isolated (Whitehead 1988, Macintyre 1986). It is plausible that behaviour is to some extent embedded in the environment through aspects such as

material deprivation, living and working conditions. In the first place, freedom of choice with respect to behaviour may be restricted by the environment, for example healthy food may be beyond someone's means. Moreover, an individual may choose to smoke as compensation for unfavourable conditions such as a low income (Davey Smith et al. 1994).

This interrelationhip between lifestyle and material conditions implies that part of the differential distribution of lifestyle is actually due to the skewed distribution of living conditions. Higher smoking rates among women in lower socio-economic groups for example, are associated with a high level of material deprivation in these groups (Graham 1993). If this is so, the independent contribution of behavioural factors can only be assessed after controlling for material conditions. We are not aware of studies which have explored this issue. The possible implication of this lack of research is that the importance of lifestyle factors may have so far been *over*estimated.

In this chapter, we will present the results of an empirical study in which we tried to assess the extent to which lifestyle and material factors contribute to socio-economic inequalities in health. Our aim is to study whether material factors indeed play an important role in the production of these inequalities, and to estimate the independent contribution of behavioural factors. In order to unravel the contribution of both explanations we specified the following conceptual model. It is assumed that the association between socio-economic status (SES) and health is largely due to an effect of SES on health, rather than to the effect of health on SES. This is not a direct influence however. Socio-economic status influences health through more specific risk factors, such as smoking and working conditions (Marmot et al. 1987). These factors, both behavioural and material, may account for inequalities in health if they are in turn related to both socio-economic status and health. Given the above mentioned assumption that behaviour is partly embedded in the environment, material conditions can have a direct effect on health, or an indirect effect, through behaviour. These assumptions can be schematized as follows:



1 independent effect of behavioural factors (*i.e.* not dependent on material factors)
2a indirect effect of material factors (*i.e.* through behavioural factors)
2b direct effect of material factors

Health is indicated by the prevalence of chronic conditions, health complaints, and less-than-"good" perceived general health. The health measures are based on self-report. We will try to assess to what extent inequalities in health associated with socio-economic status can be attributed to:

1. An effect of the differential distribution of behavioural factors across socio-economic groups which is *independent* of material conditions.
2. An effect of the differential distribution of material conditions across socio-economic groups which acts either
   a. *through* behavioural factors, or
   b. *directly*.

Given certain characteristics of the data, which will be discussed in the last section, we are not aiming for a *final* answer to the question of the relative contribution of behavioural and material factors. We have, however, given an illustration of the way this issue could be approached empirically, and we hope that others will try to replicate our analyses using more powerful datasets.

5.1.2 Data and methods

Population
The analyses in this chapter are based on the population that answered the postal questionnaire in 1991 (n=18973).

Measurements
The socio-economic status of the respondents is indicated by the highest level of education attained, students (mostly in the youngest age-group) being classified by their current training. Seven educational levels have been distinguished: primary school only, lower vocational schooling, lower secondary schooling, intermediate vocational schooling, intermediate/higher secondary schooling (general), higher vocational schooling and university.

Three health indicators were used in these analyses. Firstly, chronic conditions were measured by means of a checklist, containing 23 chronic conditions, some of which were severe (such as cancer and heart disease), whereas others were less severe (such as serious headache and varicose veins). Respondents were classified according to whether (at the time of the survey) they reported to be suffering from at least one of the conditions listed in the questionnaire. 43.7 per cent of the male and 49.7 per cent of the female population reported one or more chronic conditions. Secondly, health complaints were measured by means of a checklist, containing 13 questions on minor complaints about the heart, stomach etc. Respondents were asked whether they suffered from each of these complaints. This variable was dichotomized into suffering from 3 or less *versus* more than 3 complaints from this list. 29.3 per cent of the male and 36.6 per cent of the female population reported more than three complaints. Finally, perceived general health was indicated by the answer

to the question "How do you rate your health in general?". The answer was dichotomized in the analysis into "(very) good" *versus* less-than-"good" (fair, sometimes good and sometimes bad, bad). 26.4 per cent of the men and 27.6 per cent of the women perceived their health as less-than-"good".

The explanatory factors involved in the analyses were divided into behavioural and material factors.

Behavioural factors were defined as the following (number of categories between brackets, see Table 5.1.1 for categories):

- smoking (5): measured by a question relating to the actual smoking status and the number of cigarettes/cigars/pipes smoked each day;
- average alcohol consumption (5): based on a question relating to the average number of units drunk a day and the number of days a respondent drinks in general;
- physical exercise (4): measured by a question on the number of hours engaged in exercising, or cycling/walking/gardening etc., with the number of hours for the latter given twice as less weight as those for the former;
- body mass index (3): defined as (weight/height^2) (based on self-report), and considered to be the outcome of several behavioural factors, such as physical exercise and fat consumption (Bouchard 1991).

Material factors were defined as the following:

- crowding: defined as the number of persons per room;
- physical housing conditions (4): indicated by the number of problems relating to damp, mould and cold, which were measured by means of a checklist of 3 items;
- neighbourhood conditions (4): indicated by the number of problems relating to noise (traffic and neighbours), smell and vandalism, which were measured by means of a checklist of 4 items;
- financial problems (3): measured by a question relating to the severity of problems experienced with paying bills, food, rent etc.;
- employment status (6): measured by a question relating to the respondent's main activity;
- physical working conditions (4): indicated by the number of problems relating to noise, dusty conditions, dangerous work etc., which were measured by means of a checklist of 6 items; working conditions were measured only among those for whom paid employment was the main activity.

Existing studies show that these factors are risk factors pertaining to physical health problems (Whitehead 1988, Ben-Shlomo et al. 1994, Breslow & Breslow 1993, Curfman 1993, Shaper 1990, Bartley 1994). It should be mentioned, however, that one of these factors, i.e. employment status, is also partly a *consequence* of health problems, as some of these groups are not in paid employment *because* of their bad health (especially the long-term disabled).

The following confounding variables have been taken into account (number of categories between brackets): age (5 years age groups), marital status (4), religious affiliation (4) and degree of urbanization (5). These factors are determinants of health problems, and associated with socio-economic status. In contrast with the explanatory factors mentioned above, however, we do not consider them to be in between socio-economic status and health, because it is unlikely that a certain marital status etc. is *caused* by the socio-economic status.

Analyses

We excluded people for whom information on health indicators, education, confounders or explanatory factors was missing. These were around 1500 (approximately 17 per cent of the study population) among men, and around 2000 (approximately 20 per cent of the study population) among women (different number for each health measure). Men and women were analysed separately. We estimated logistic regression models, in which the outcome variable is dichotomous (Hosmer & Lemeshow 1989).

In order to determine whether a specific risk factor had an independent association with health, logistic regression models were fitted, controlling for potential confounders and other behavioural and material factors respectively. The aim was to check whether established causal relationships between risk factors and health could be reproduced in our cross-sectional data. The regression coefficients and their standard errors were used to calculate Odds Ratios and their 95 per cent Confidence Intervals. The Odds Ratio indicates how much more likely it is for a person with a certain value on the risk factor to have, for example, a chronic condition. The reduction in deviance due to the inclusion of a certain risk factor was used as an overall statistical test of its effect. The deviance of the model is the mathematical function which compares the observed values of the response variable to those predicted by the model. The deviance of a model can be compared to the deviance of an extended model in order to assess the statistical significance of the variable(s) that had been added to the model.

In order to describe the distribution of behavioural and material factors across socio-economic groups, we calculated the percentages in each category, directly standardized for age (5 years age groups). Logistic regression models were fitted to estimate socio-economic differences in the prevalence of health problems, controlling for potential confounders. The highest socio-economic group was always used as a reference category.

In order to estimate the extent to which behavioural and material factors contribute to differences in health, the following logistic regression models were fitted:

1. education + confounders + behavioural factors
2. education + confounders + material factors
3. education + confounders + material factors + behavioural factors

The percentage reduction in the Odds Ratios of education, after adjustment for explanatory factors, was used to indicate the latter's contri-

bution to the explanation of socio-economic differences in health. The contribution of behavioural factors, *independently* of material factors (research question 1), is indicated by the percentage reduction due to the inclusion of behavioural factors to a model already containing material factors (model 3 compared to model 2). The *overlap* between the contribution of behavioural and material factors is assessed by subtracting the independent contribution of behaviour from its total contribution as indicated in the first model. That overlap is defined as the contribution of material factors, *through* behaviour (research question 2a). The *direct* contribution of material factors (research question 2b) was assessed by subtracting that overlap from their total contribution as indicated in the second model.

Parallel to this series, we carried out a second series in which we excluded those people reporting a long-term work disability, one of the categories of our variable employment status. As the differential distribution of those with a long-term work disability must be considered as a *consequence* of the higher prevalence of health problems, it is important to check whether excluding this effect will alter the estimated contribution of material conditions.

Furthermore models with interaction terms between explanatory factors were fitted, including interaction terms between behavioural and material factors. A few interactions were statistically significant ($p<.10$), but none of these substantially changed the Odds Ratios of education. Results presented in this chapter are therefore based on models including main effects only[1].

The analyses were carried out with the GLIM statistical programme (Baker & Nelder 1978).

5.1.3 Results

Table 5.1.1 shows the relationship between the risk factors and the probability of reporting health problems. The Odds Ratios compare the probability for those who, for example, smoke to that for those who never smoke, with the probability of the latter set at 1. In this table, the data for only one health measure, namely health complaints, are shown as an example. The results for the other health measures (i.e. chronic conditions, perceived general health) were very similar.

1 This implies that in our analyses the health effect of behaviour is similar for people in good and bad structural conditions, contrary to what is suggested by Blaxter's 'Health and Lifestyle' study. A further discussion of this issue is outside the scope of this thesis.

Table 5.1.1 Association between explanatory factors and the prevalence of more than 3 health complaints, men and women: Odds Ratios (OR) and 95 per cent Confidence Intervals (CI)[a]

		MEN		WOMEN	
		OR	CI	OR	CI
smoking	never	1.00		1.00	
	former	1.33	1.13-1.57	1.22	1.08-1.38
	cigar/pipe	1.45	1.12-1.88	1.18	0.46-3.00
	1-20 cig./day	1.58	1.34-1.87	1.41	1.25-1.60
	>20 cig./day	2.13	1.70-2.68	1.97	1.57-2.46
alcohol consumption	no	1.00		1.00	
	low	.63	.54-.74	.80	.71-.89
	moderate	.57	.48-.68	.67	.57-.79
	excessive	.55	.44-.69	.84	.60-1.18
	very excessive	.59	.46-.77	.59	.34-1.03
physical exercise	never	1.00		1.00	
	< 1 hour/week	.88	.68-1.14	.78	.60-.1.02
	1-2 hours/week	.68	.54-.86	.53	.42-.67
	≥2 hours/week	.50	.39-.63	.39	.30-.50
quetelet index	<20	1.00		1.00	
	20-27	1.02	.80-1.31	.84	.72-.99
	>27	1.36	1.04-1.78	1.18	.98-1.43
housing conditions	0 problems	1.00		1.00	
	1 problem	1.27	1.09-1.47	1.24	1.09-1.43
	2 problems	1.68	1.36-2.08	1.67	1.38-2.03
	3 problems	1.73	1.24-2.42	2.17	1.61-2.92
neighbourhood conditions	0 problems	1.00		1.00	
	1 problem	1.25	1.09-1.43	1.24	1.10-1.41
	2 problems	1.67	1.39-2.01	1.67	1.41-1.99
	≥3 problems	2.10	1.60-2.76	1.98	1.49-2.62
financial problems	no problems	1.00		1.00	
	some problems	1.58	1.37-1.82	1.70	1.49-1.93
	big problems	2.40	1.79-3.22	2.92	2.25-3.79
working conditions	0 problems	1.00		1.00	
	1 problem	1.35	1.11-1.64	1.33	1.05-1.67
	2 problems	1.36	1.07-1.72	1.79	1.36-2.35
	≥3 problems	1.89	1.55-2.31	2.45	1.80-3.33
employment status	paid employment	1.00		1.00	
	unemployed	1.36	1.01-1.84	2.01	1.41-2.87
	work disability	5.54	4.35-7.05	7.34	5.39-10.0
	(early) retired	1.09	.82-1.44	1.64	1.23-2.19
	housewives(m/f)	1.26	.54-2.97	1.50	1.24-1.82
	other	1.22	.84-1.79	1.17	.81-1.69
crowding (no. persons/room)		.92	.73-1.16	1.11	.90-1.36

[a] Results of logistic regression models including age, marital status, religious affiliation, degree of urbanization, education and all other behavioural and material factors respectively

All behavioural factors were statistically significantly related to health, and for most factors the pattern of Odds Ratios was as expected. Current smokers had a higher risk of reporting health complaints. The higher the cigarette consumption, the higher the Odds Ratios, except for chronic conditions, where former smokers had the highest risk. The prevalence of health complaints was higher among people who reported taking less physical exercise, and people who were overweight. We observed a higher risk among those who reported that they never drank alcohol, but, contrary to the results of some other studies (Shaper 1990), respondents reporting (very) excessive alcohol consumption appeared to be as healthy as moderate drinkers. Furthermore, material factors were statistically significantly related to the prevalence of health problems, except for crowding. The larger the number of reported problems relating to housing, working or neighbourhood conditions, and the more financial problems, the higher the risk of health complaints. With regard to employment status, the prevalence of health problems among the unemployed and those with a long-term work disability was especially high. All associations were highly similar for men and women.

Table 5.1.2 shows the distribution of explanatory factors across socio-economic groups, using one selected category from each explanatory factor only.

Table 5.1.2 Explanatory factors by educational level, standardized for age, men and women

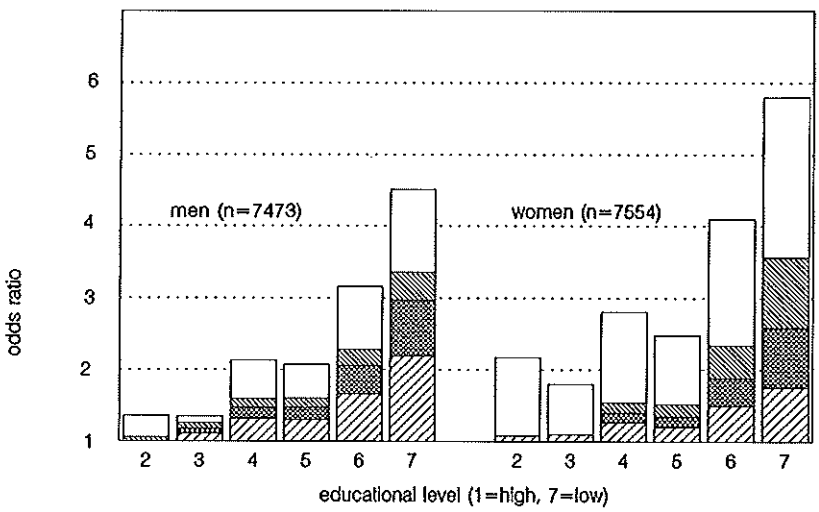
explanatory factor	sex	educational level[1] 1	2	3	4	5	6	7
behavioural factors								
smoking cigarettes (1-20 p.d.) (%)	m	15.1	20.5	23.3	26.0	29.5	31.7	36.6
	f	10.1	17.8	22.0	24.9	27.4	29.1	32.7
never drink alcohol (%)	m	7.0	8.0	12.3	12.8	14.5	15.6	24.1
	f	9.7	21.0	17.2	27.3	27.1	38.1	50.8
QI >= 27 (%)	m	9.1	12.5	16.4	18.5	17.6	23.2	25.1
	f	11.6	10.8	10.7	17.8	15.2	21.8	27.4
never take physical exercise (%)	m	2.5	2.1	5.4	4.9	4.9	6.9	7.9
	f	7.3	1.8	2.7	3.8	4.5	4.4	7.4
material factors								
persons/per room (average)	m	.58	.61	.61	.65	.67	.69	.68
	f	.53	.55	.55	.61	.61	.66	.69
no complaints housing conditions (%)	m	81.4	80.2	81.0	79.2	76.3	74.8	69.3
	f	74.3	73.8	80.1	77.6	76.0	73.1	67.0
some financial problems (%)	m	7.0	8.7	13.1	16.2	17.1	22.4	29.2
	f	6.3	11.1	11.8	16.1	16.1	19.7	29.5
no complaints neighbourhood (%)	m	67.9	68.1	64.1	64.2	64.2	68.4	65.9
	f	58.1	59.5	67.4	63.2	67.1	69.8	65.7
paid employment	m	64.6	61.6	51.8	56.8	57.0	58.3	43.9
	f	45.6	44.5	28.7	37.5	29.7	24.6	18.8
≥3 complaints working conditions	m	3.2	4.6	11.5	24.0	21.8	46.5	50.3
(among paid employed)	f	2.8	5.4	7.8	10.6	10.4	16.7	18.9

[1] 1=high, 7=low (see Data & Methods for categories)

All behavioural factors were shown to be differentially distributed across socio-economic groups. The percentage of (former) smokers, as well as the percentage of overweight people and those who reported taking no physical exercise, increases with decreasing educational class, although the latter association was less clear for women. The association between alcohol consumption and socio-economic status was not clear either. The percentage of total abstainers was the highest in the lower socio-economic levels, while people from higher groups were most likely to be moderate drinkers. Excessive drinking was more prevalent in the lowest groups, but only among men. Bad material conditions were more prevalent in lower socio-economic groups. Among women, however, the percentage reporting bad housing conditions was also relatively high in the higher socio-economic groups. Both among (employed) men and women, the socio-economic difference in the percentage reporting three or more complaints about working conditions was especially large. The percentage reporting financial problems was more than four times as high in the lowest socio-economic group when compared to the highest.

Figures 5.1.1-3 show the observed differences in health associated with education, for all health measures. We observed a negative socio-economic gradient for almost all health measures, as shown by the overall height of the bars. Chronic conditions among women were the only exception. The lower the educational level, the higher the risk of reporting health problems. The prevalence of health problems was especially high among those who attained a primary level of education only.

Figure 5.1.1 Inequalities in perceived general health by educational level, explanation by behavioural and material factors[a]



[a] Results of logistic regression models including age, marital status and religious affiliation, degree of urbanization, and all behavioural and material factors

Figure 5.1.2 Inequalities in health complaints by educational level, explanation by behavioural and material factors[a]

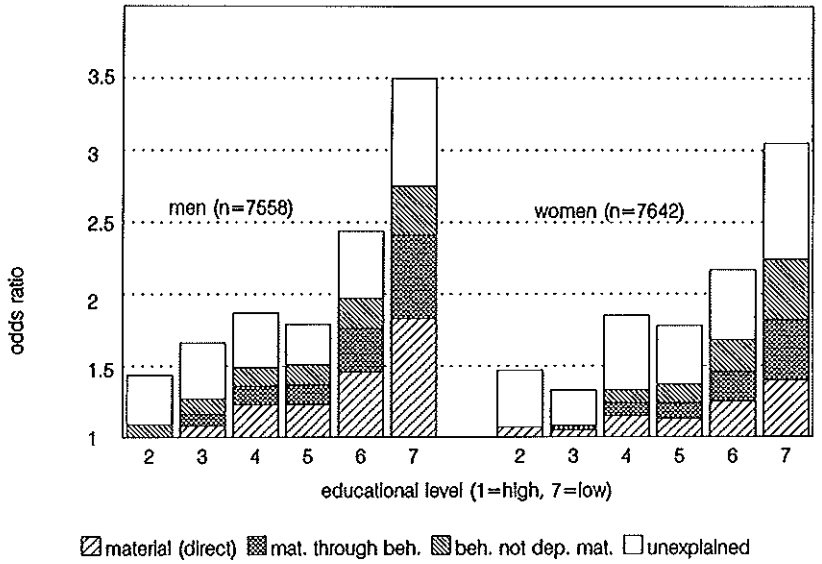
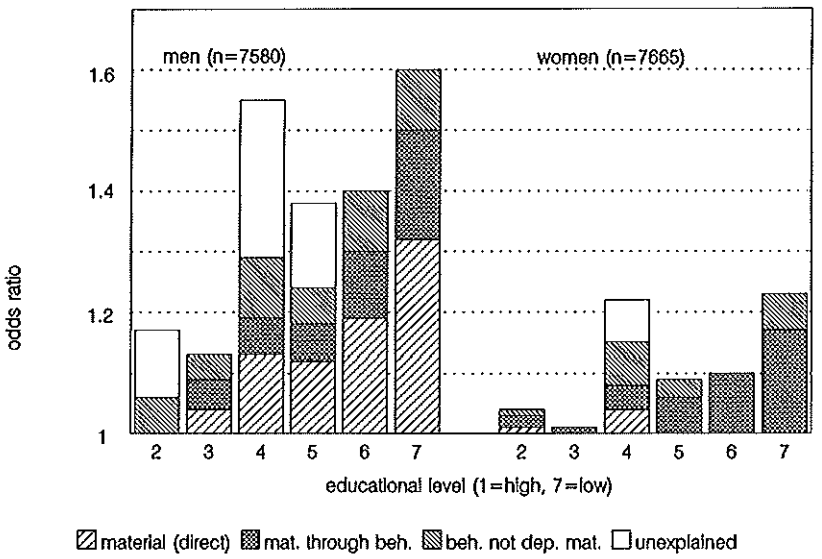


Figure 5.1.3 Inequalities in chronic conditions by educational level, explanation by behavioural and material factors[a]



[a] Results of logistic regression models including age, marital status and religious affiliation, degree of urbanization, and all behavioural and material factors

The shaded areas within each bar illustrate graphically the extent to which socio-economic differences in each measure of health can be attributed to behavioural factors, material factors and the overlap of the two. Before

commenting on these figures, we will give an illustration of the way they have been constructed (Table 5.1.3) using the data for health complaints for men as an example. The first column of this table shows that the risk for the lowest educational class of having more than three health complaints, controlling for confounders, is 3.51 times as high as that of the highest group. Controlling for behavioural factors results in a reduction of the Odds Ratio to 2.58 (model 1). This implies that around 37 per cent of the increased risk can be explained by behavioural factors (model 1 compared to confounder model: 3.51-2.58/2.51). The *independent* contribution of behavioural factors is much lower however. It is indicated by the reduction of Odds Ratios due to the inclusion of behavioural factors in a model already including material factors (model 3 compared to model 2). Only 14 per cent (2.09-1.75/2.51) of the increased risk of the lowest group could be explained by behaviour not dependent on living conditions. The remaining part (37-14=23 per cent) is explained by behavioural and material factors simultaneously, and defined as the contribution of material living conditions *through* behaviour. The total contribution of material factors to the explanation of the higher prevalence of health complaints in the lowest educational group is around 56 per cent (model 3 compared to confounder model: 3.51-2.09/2.51). In summary, in this example the increased risk of the lowest socio-economic group is the result of the independent effect of behavioural factors (14 per cent), plus the direct effect of material living conditions (33 per cent) plus the indirect effect of living conditions through behavioural factors (23 per cent), whereas 30 per cent remained unexplained.

Table 5.1.3 Association between educational level and the prevalence of more than 3 health complaints, as assessed by logistic regression models controlling for behavioural and material factors separately and simultaneously, men: Odds Ratios (OR) and reduction in Odds Ratios

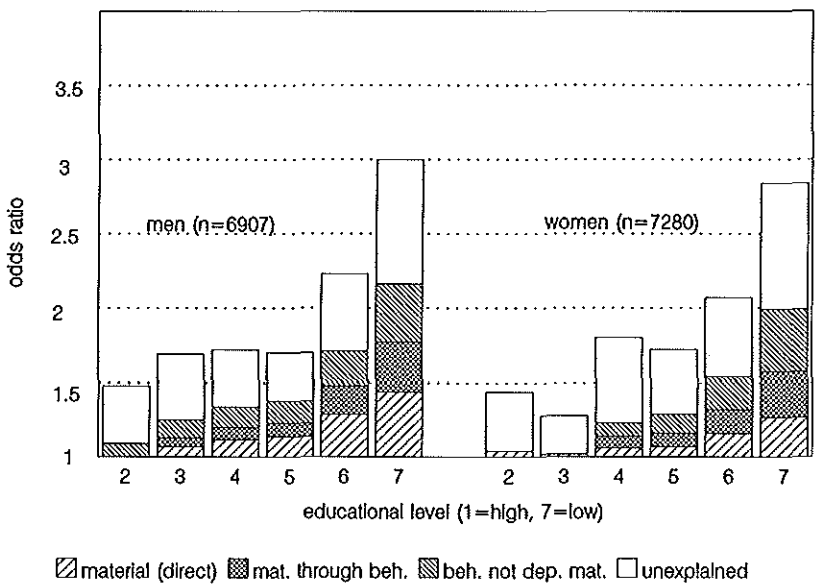
	confounders[a]		confounders + behavioural factors (model 1)		confounders + material factors (model 2)		confounders + behavioural and material factors (model 3)
educational level[1]	OR	OR	reduction OR behaviour total (%)[b]	OR	reduction OR material total (%)[b]	OR	reduction OR behaviour indep. (%)[c]
1	1.00	1.00		1.00		1.00	
2	1.44*	1.35*	19	1.48*	0	1.42*	19
3	1.66*	1.48*	28	1.50*	25	1.39*	16
4	1.86*	1.61*	30	1.51*	41	1.38*	15
5	1.79*	1.51*	35	1.42*	47	1.28*	17
6	2.43*	1.93*	35	1.67*	53	1.47*	14
7	3.51*	2.58*	37	2.09*	56	1.75*	14

1 1=high, 7=low (see Data & Methods for categories)
a confounders: age, marital status, religious affiliation, degree of urbanization
b percentage reduction of the increased risk estimated in the confounder model
c percentage reduction of the increased risk estimated in model 2
* confidence interval does not include 1

If behavioural and material conditions factors were controlled for separately, around 30-40 per cent of the increased risk of the lowest educational categories was explained by behavioural factors among both sexes. The results were highly similar for all health measures (Figures 5.1.1-3). The contribution of material conditions was different for men and women. Among women, material and behavioural factors contributed equally, while among men material factors accounted for around 40-50 per cent of the increased risk of all health problems within the lowest educational level. The overlap between the two groups of factors, representing the contribution of material living conditions *through* behaviour, is substantial. Almost half of the contribution of behavioural factors among women and around 2/3 of the contribution among men was due to material factors. Thus, for all health measures, the contribution of behavioural factors diminished after controlling for material factors to around 10-20 per cent.

Figure 5.1.4 presents some of the results of an additional analysis in which those with a long-term work disability were excluded. The results of the analyses for health complaints are presented as an example, the results for chronic conditions and perceived health are similar.

Figure 5.1.4 Inequalities in health complaints by educational level, explanation by behavioural and material factors, long-term disabled excluded[a]



[a] Results of logistic regression models including age, marital status and religious affiliation, degree of urbanization, and all behavioural and material factors

Excluding the long-term disabled changed the estimates of the relative contribution of both groups of explanatory factors (Figure 5.1.4 compared to Figure 5.1.2). The contribution of material factors was now smaller, while the independent contribution of behavioural factors was larger when

compared to the results for the whole population. Although the difference in relative importance was much smaller now, material conditions still explained more of the increased risk of health complaints in lower socio-economic groups, especially among men.

The socio-economic gradient was still statistically significant after allowing for the inclusion of all explanatory factors in the model. This implies that inequalities in health remained which could not be explained by the socio-economic distribution of these explanatory factors.

5.1.4 Discussion

The aim of the analyses presented in this chapter was to illustrate the way in which the importance of behavioural and material factors for inequalities in health could be studied empirically, thereby taking into account the interrelationship between them. In our study population, the observed inequalities in health could to a large extent be attributed to socio-economic differences in behaviour and material conditions. We found however that the contribution of material living conditions was greater. In addition, we demonstrated that if the overlap between behavioural factors and material conditions had been ignored, the contribution of behavioural factors would have been overestimated. In order to obtain an indication of the generalizability of these results, we carried out an additional analysis in which we used occupational level as an indicator of socio-economic status (results not shown). Although the gradient in health was less regular than in the case of education, the pattern of the explanation of the increased risks was similar. This includes the relative contribution of material factors, both directly and indirectly through behavioural factors.

The size of the inequalities varied with the health indicator used. The largest inequalities in health were found for the most subjective health indicator (perceived general health). Inequalities in chronic conditions were much smaller, and even absent among women. This may have been due to the fact that we had to rely on self-reported data. In an additional analysis we estimated differences in the prevalence of cancer, using two data sources: the checklist in the questionnaire and the case cancer registry. When the prevalence of cancer was indicated by data obtained from the questionnaire, socio-economic inequalities were found to be underestimated (Schrijvers et al. 1994). This suggests that inequalities in chronic conditions are, in fact, greater than we observed using self-reported data.

Despite differences in the size of the gradient, the explanatory pattern was highly similar for all health measures. This is not surprising, as the measures we included indicate the actual health status in a rather general way. In other words, people who report health complaints will also most likely be the ones reporting a bad perceived health status or one or more chronic conditions. As a result, the background of socio-economic inequalities is highly similar for all three health indicators. This does not alter the fact, however, that the inclusion of more specific health problems, such as mortality from specific causes of death, could have

yielded (slightly) different estimates of the relative importance of material and behavioural factors. For example in the case of inequalities in lung cancer, of which smoking is the single most important determinant, the contribution of behavioural factors might be larger than indicated in these analyses. Yet, we expect the observation that a substantial part of the behavioural factors is embedded in material living conditions to apply to all inequalities in health, independently of the health indicator used.
As stressed in the introductory paragraph, these analyses must be considered as an illustration of how the importance of both explanations may be assessed, taking the effect of material conditions on behaviour into consideration. It is difficult to draw a definite conclusion as to the relative contribution of both groups of explanatory factors. Given certain characteristics of the data used, it is not possible to conclude whether material factors indeed carry more weight than behaviour as the data presented here seems to suggest.

In the first place, it is assumed that the explanatory factors considered had a *causal* effect on health. However, because these analyses are based on cross-sectional data, the association between health and the explanatory factors could also reflect a *selection* process. A clear example of this is the association between employment status and health, which will be discussed later. Moreover, the association between health and some behavioural factors is probably due to selection. It is plausible for example, that persons who suffered from health problems had decided to stop smoking or drinking, especially in the case of 'limiting' conditions (Blaxter 1990). This mechanism probably explains the high risk of reporting chronic conditions among former smokers. It is however encouraging that for most behavioural factors, the observed association with health was consistent with causal relationships reported in other studies. Alcohol consumption was the most important exception. We did not find the expected higher risk in excessive drinkers. As this group is more prevalent among lower socio-economic levels (among men), we may have underestimated the contribution of this factor, and thereby the contribution of behavioural factors relative to material conditions. Longitudinal data are necessary to check this, and to ensure that the association between explanatory factors and health reflects an independent, causal effect.

Secondly, following the suggestions of several authors (Whitehead 1988, Macintyre 1986), we assumed that material conditions have an effect on behaviour, implying that their overlap indicates the contribution of material factors *through* behaviour. However, recent studies also point at the opposite effect, i.e. an effect of lifestyle on material conditions. For example a recent British study indicates the effect of smoking on economic hardship (Marsh & McKay 1994). Whether this effect of behaviour on living conditions is sufficiently powerful to affect the conclusions of the current study, would have to be tested using longitudinal data.

Thirdly, there is a possibility that the results are biased due to the fact that the measurement of health status and explanatory factors were based on self-report. If health problems affect the reporting of risk factors, or the reporting of both variables is affected by some third factor, this would probably lead to overestimating the contribution of those risk

factors. For example, people who are more inclined to report health complaints may also report more complaints relating to risk factors. Some of especially the material factors, e.g. problems with housing and working conditions, are subjective and could contribute to material factors and the overlap between material and behavioural factors being overestimated. The validity of self-reported data on several of the behavioural indicators used, e.g. smoking habits, physical activity and height/weight, seems to be fair (Patrick et al. 1994, Aaron et al. 1995, Rowland 1990), but we are not aware of studies on the validity of our measurements of material factors. The use of measures which are not based on self-reported data should give more insight into the importance of this potential bias.

Fourthly, the results may be an artefact of the imprecision in the measurements used to indicate behavioural and material factors. The measurements included in this analysis clearly are not *perfect* markers for the individual's life-time exposure to behavioural or material factors. Smoking behaviour for example was indicated by the current smoking status, thereby neglecting the smoking history of an individual, whilst the measurement of working conditions includes only a selection of all the health damaging circumstances to which people in the work place may be exposed. Due to the imprecision in the measurements of both material and behavioural factors, we do expect the contribution of both set of factors to be underestimated. In addition, we expect an underestimation, in general, to be more likely for material conditions than for behaviour, as the health damaging aspects of material conditions seem to be less easily captured in a short questionnaire. If this assumption is correct, also the overlap between both explanations will be underestimated. Further research should therefore include more precise measurements of for example housing and working conditions, preferably by using physical measurements.

Finally, the selection of explanatory factors used here makes it difficult to draw firm conclusions as to the relative contribution of each group of factors. If, for example, our set of behavioural factors is a more appropriate representation of the lifestyle of lower socio-economic groups than the set of material factors is of their living conditions, this could lead to overestimating the contribution of behavioural factors. Furthermore, a more extensive set of material conditions probably would have resulted in a greater overlap between behavioural and material factors, which would have further decreased the independent contribution of behavioural factors. Whether this is likely is difficult to say, as we do not know *all* the determinants of health problems involved in these analyses. In view of this, future research should focus on more specific health measures. If, for example, the analyses will be repeated for the outcome measure 'incidence of heart disease', the determinants are known in more detail than for the general measures we used. That should enable the investigators to establish whether the explanatory factors included in the analyses adequately cover the set of relevant behavioural and material factors.

In our analyses, both lifestyle and material living conditions contributed substantially to observed inequalities in health. The estimation of the explanatory power of the former is consistent with the results of other studies, most of which concern the explanation of inequalities in heart disease (Marmot et al. 1978, Pocock et al. 1987, Liu et al. 1982, Woodward et al. 1992). In regard to the contribution of material living conditions our results confirm the impression that these factors are of great importance in the generation of inequalities in health. This is inferred indirectly in existing studies, e.g. studies on the explanatory power of income versus that of other socio-economic indicators (Goldblatt 1990). Although we observed that the contribution of material factors was larger than that of behavioural ones, caution is recommended in the interpretation of this result, given the drawbacks of the data mentioned above. Blaxter (1990), in her book on Health & Lifestyles, also observed that living circumstances, indicated by social class, were more important than behaviour for the explanation of health differences in the population. Her conclusion, however, does not refer to health differences systematically related to socio-economic position, but to *all* differences in health in the population. Although it is encouraging that the results of these analyses appear to concur with the results of the current study, they are not completely comparable.

Unlike other studies on the relative contribution of explanatory factors, the present study examined the interrelationship between behavioural and material factors. A substantial part of the contribution of behavioural factors could also be attributed to material conditions, especially among men. According to our conceptual model, that overlap may be attributed to material factors, resulting in a reduction of the contribution of behavioural factors. Although the estimation of the size of the overlap might have been biased, as discussed before, the results clearly show that the overlap between both explanations is substantial, implying that further studies should at least employ material and behavioural factors simultaneously.

Because of the inclusion of employment status as a living condition, the relative importance of living conditions is expected to be overestimated in these analyses. This expectation is based on the fact that employment status is not only a specific risk factor. Employment status has a causal effect on health, but may also be partly a *consequence* of health problems. This applies especially to those with a long-term work disability. In order to examine the extent to which the results were biased by that selection mechanism, we carried out a second series of analyses, excluding those reporting a long-term work disability. The contribution of material conditions was now reduced to around 2/3 compared to the estimates made in the first series. Moreover, the overlap between material and behavioural factors was smaller. Although the difference in relative contribution of behaviour and structure is not as large as the results of the first series of analyses suggest, the results of this second series however, do not alter the conclusion that both material conditions and behavioural factors explain a substantial part of the increased health risk of lower socio-economic groups. In addition, material conditions in men still

carried more weight than behavioural factors.

We have been concerned to analyse the interdependence between the contribution of behavioural and material factors in order to avoid the so-called 'ideology of victim blaming' (Crawford 1977). If socio-economic inequalities in lifestyle cannot be attributed to the individual's free choice, it is unjust to blame people for their unhealthy behaviour. The results presented in this chapter support the idea that environment restricts freedom of choice, or that behaviour is chosen to compensate for unfavourable circumstances. This has consequences for policy measures which are necessary to reduce socio-economic inequalities in health. Policies promoting healthy behaviour should in any case be supplemented with measures which aim at a reduction of material inequalities.

We hope that others will try to replicate our findings using more powerful datasets. More research is necessary to assess whether the results remain valid using a more extensive set of explanatory factors, or if other more 'objective' outcome measures are used. Moreover, longitudinal data are necessary to ensure that the association between explanatory factors and health reflects a causal effect. Finally, our research demonstrated that behaviour is for an important part embedded in material conditions. We have not however addressed the issue how this association between both groups of explanatory factors is to be explained. These issues should be studied further in order to achieve a deeper understanding of the background of socio-economic inequalities in health.

Abstract

Objective: The aim of this chapter was to identify the cultural, material and psychosocial correlates of socio-economic differences in smoking among adults.

Methods: The analyses were based on the population that participated in the oral interview, aged 25-74. Educational level was used as a socio-economic indicator. Logistic regression was used to assess the educational gradient in smoking. Current smokers were compared with former and never smokers respectively.

Results: The risk of being a current smoker as compared to being a former/never smoker was higher in lower socio-economic groups. For example, the odds of current smokers as compared to never smokers among the lowest educational level was more than 5 times as high as that of persons in the highest level. A substantial part (20-40 per cent) of the increased risk of being a smoker in lower socio-economic groups appeared to be associated with adverse material conditions. The financial situation especially accounted for that effect. One of the cultural factors, i.e. locus of control, was found to account for around 30 per cent of the educational gradient in the case that smokers were compared with former smokers. Psychosocial factors, i.c. neuroticism and coping styles, accounted for less of the socio-economic gradient in smoking than cultural and material factors.

Conclusions: As a result of the cross-sectional character of the data, the associations between cultural, material and psychosocial factors and smoking as identified here do not necessarily have a *causal* interpretation. The hypotheses generated in this chapter should therefore be tested in more powerful studies. On the basis of the results of our analyses we hypothesize that both cultural factors and material conditions contribute substantially to the higher smoking rates in lower socio-economic groups. Psychosocial factors seem to be less important. If our results are confirmed in more powerful studies, then this would indicate, firstly, that possibilities for a reduction of smoking differences may be found in tailoring smoking cessation programs to the more externally oriented locus of control and the coping styles that are common in lower socio-economic groups, and secondly, that a reduction of smoking differences may follow from an improvement of the material living conditions of lower socio-economic groups.

5.2 Cultural, material and psychosocial correlates of the socio-economic gradient in smoking behaviour among adults

5.2.1 Introduction

After a period in which smoking was a habit of people within all socio-economic strata, the percentage of smokers has declined faster in higher socio-economic groups. This trend has been observed in many countries, including the Netherlands (Van Reek & Adriaanse 1988, Pierce 1989, Graham 1995). As a result, in industrialized countries smoking is now more prevalent in lower socio-economic groups. The uneven distribution of this risk factor is likely to make a substantial contribution to the higher prevalence of health problems and the higher mortality rates in lower socio-economic groups. This has been confirmed in several studies, most of which aimed at the explanation of socio-economic inequalities in heart disease (Marmot et al. 1978, Pocock et al. 1987, Liu et al. 1982).

This suggests that socio-economic inequalities in health could partly be prevented by reducing the proportion of smokers in the lower socio-economic strata, e.g. by means of health education programs. However, if policy measures are to be effective, they should consider the reasons for the higher smoking rates. For example, if the higher rates among people in disadvantaged positions are due to adverse material conditions, health education campaigns are not sufficient to reduce the proportion of smokers. They should be supplemented with measures which aim to improve the living conditions of these groups. Knowledge of the background of socio-economic differences in smoking is therefore crucial for the design of policy measures aimed at the reduction of socio-economic inequalities in health. Although such differences have been frequently described, less attention has been paid to finding an explanation for this social pattern (Pill et al. 1995). In this chapter, we will try to identify the cultural, material and psychosocial correlates of socio-economic differences in smoking among adults.

When thinking about the explanation for the social pattern of smoking, a *cultural* explanation is probably the first to arise, as members of a particular socio-economic group are seen as sharing a certain culture (Morgan et al. 1985, Grusky 1994, Susser et al. 1985). In other words, values, beliefs, orientations, knowledge etc. are features which vary between individuals from different socio-economic groups. Socio-economic differences in orientation towards health-related behaviour have been the subject of many studies (Calnan & Johnson 1985, Pill & Stott 1985, Williams 1995, Blaxter 1990). As such differences have been shown to be related to smoking, they may account for some of the differential distribution of this risk factor.

One example of a concept frequently applied in this context is 'locus of control', which refers to the belief that a person has control over his own life. A person with a more internal locus of control believes that he is able to influence his or her health by engaging in health

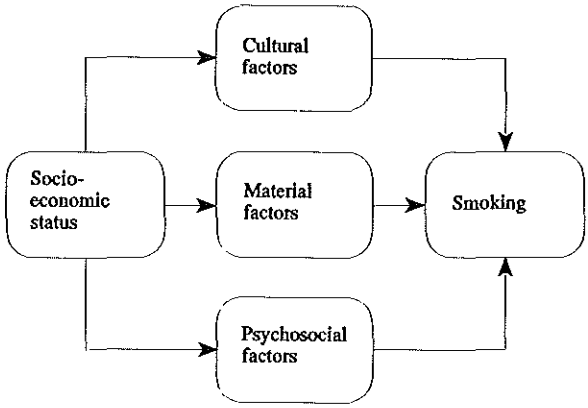
promoting activities or avoiding health damaging activities. Internal locus of control has been shown to be negatively related to smoking, and to be more common among those in higher socio-economic groups (Blaxter 1990, Dean 1989, Calnan 1989, Halfens 1985).

Access to *material* resources is a second component of the socio-economic position of an individual. As unfavourable material conditions may 'promote' smoking, they probably explain part of the social pattern of smoking. Examples of such conditions are material deprivation and living and working conditions. Evidence regarding the association between these factors and smoking can be found particularly in the British literature (Blaxter 1990, Graham 1993, Marsh and McKay 1994). For example, in a study among working class women, Graham (1994) shows that the percentage of women who can hardly afford any necessities is more than three times as high among heavy smokers than among those who had never smoked.

The most obvious link between material factors and behaviour is probably one in which material conditions limit the possibilities to engage in healthy behaviour, e.g. when one cannot buy healthy food because of financial restrictions (Williams 1990, Whitehead 1988). This mechanism does not seem to be applicable to smoking however, as the cheapest choice (not smoking) is also the healthiest. Instead, smoking might be linked to disadvantaged conditions by a coping mechanism (Gottlieb & Green 1984, Graham 1987, Robbins & Kline 1991). People may engage in smoking as a coping behaviour when confronted with the stress of disadvantaged circumstances. This may explain why smoking is more prevalent in the lower socio-economic strata.

Such a link between material conditions and smoking is closely connected to *psychosocial* factors. In studies on socio-economic differences in behaviour, psychosocial factors have so far received little attention. It is hypothesized that people in lower socio-economic groups are more frequently exposed to stressful events or circumstances (e.g. life-events), or less well equipped to cope with that stress because of differences in coping resources (e.g. coping styles, social support, personality) (Kessler & Cleary 1980). As both stressors and coping resources have been shown to be related to smoking (Dean 1989, Stroebe & Stroebe 1995, Griffin et al. 1993, Broman 1993), this may lead to higher smoking rates in the lower socio-economic strata.

Given their association with both smoking and socio-economic status, cultural, material and psychosocial factors as mentioned above are likely to account for the higher smoking rates in lower socio-economic groups. This may be schematized as follows:



In this chapter we will examine the potential importance of cultural, material and psychosocial factors for the generation of socio-economic differences in smoking, by identifying the correlates of these differences. The cross-sectional data on which these analyses are based obviously will not permit conclusions as to the *causal determinants* of the higher smoking rates in lower socio-economic groups. Yet given the scarcity of empirical evidence on the background of this phenomenon, an examination of the cross-sectional correlates of these differences can provide useful clues as to the potential importance of explanatory factors. These should be tested in more powerful datasets. As the correlates of becoming a smoker may differ from the correlates of smoking cessation, we carried out two separate analyses, contrasting current smokers with never and former smokers respectively.

5.2.2 Data and methods

Population

The analyses presented were based on the population which participated in the oral interview (n=2802). As the aim was to explain smoking differences in the adult population, people aged 25 years and older were selected for these analyses (n=2462).

Non-response analyses suggest that this study population closely resembles the original sample.

Firstly, differences in response to the postal questionnaire between socio-economic groups and other subgroups were relatively small (e.g. 67 per cent response in the lowest to 73 per cent response in the highest socio-economic group as indicated by postcode). Moreover, a small sample of those who did not respond to the postal questionnaire (n=239) was approached for a non-response interview. Respondents to this interview did not significantly differ from the respondents to the postal questionnaire with respect to socio-economic characteristics such as the source of income or the presence of financial problems (van der Meer et al. 1993).

Secondly, differences in response to the oral interview were small too (see chapter 3). Moreover, as both educational level and smoking has been measured in the postal questionnaire, we were able to check whether the socio-economic distribution of smokers among those participating in the oral interview was similar to that in the whole study population. We observed a similar pattern of current, never and former smokers among educational levels, although differences were slightly more pronounced among the respondents to the oral interview than in the total population.

Measurements

The socio-economic status of the respondents is indicated by the highest level of education attained, students being classified by their current training. In our analyses, seven categories were distinguished: primary school only, lower vocational schooling, lower secondary schooling (general), intermediate vocational schooling, intermediate/higher secondary schooling (general), higher vocational schooling, and university.

People were classified according to their smoking habits at the time of the survey. Three categories were distinguished, i.e. current smokers, former smokers and those who have never smoked. The percentage of current smokers was 35.6 per cent, 34.3 per cent were former smokers, and 30.1 per cent had never smoked. In two separate analyses, current smokers were contrasted with never and former smokers respectively. The first analysis (current versus never smokers) focuses on socio-economic differences in the proportion of people who have ever started smoking and are still smokers at the time of the survey. In the second series of analyses, current smokers were contrasted with former smokers to indicate socio-economic differences in smoking cessation.

The (potential) correlates of differences in smoking were classified into categories in order to allow for linear and non-linear associations with smoking.

The *cultural* factors, all asked for in the oral interview, refer to differences in orientations or attitudes. Three specific factors were examined in the analyses: locus of control, parochialism and orientation towards the future. They were all classified into 5 equal categories.

Locus of control refers to the belief that a person has control over his own life. It was measured by means of an adapted unidimensional Dutch questionnaire, based on Rotter's Locus of Control scale (Andriessen 1972). This scale, containing 11 items, had a high internal consistency (Cronbach's α=.84). We expected a high score (max. 55, min. 11), indicating a more external locus of control, to be related to a higher prevalence of smokers (Blaxter 1990, Dean 1989).

Parochialism refers to an attitude which is relatively closed, narrow, local and non-scientific (Moody & Gray 1972). We expected this to be positively related to smoking. A higher score (max. 25, min. 5) indicates a more parochial attitude. This factor was measured by a 5 item scale (Tax 1982). The internal consistency was good (Cronbach's α=.63).

The third cultural factor measured is orientation towards the future. People with a high score on this scale (max. 20, min. 4), indicating a lack of orientation towards the future, are probably less likely to incorporate the long-term effects of smoking in their decision to smoke. They are therefore expected to smoke more than people with a low score. We used a 4 item scale to measure this factor (Tax 1982). The internal consistency was low (Cronbach's α=.51).

Material factors which were considered are crowding, problems with housing and neighbourhood conditions, income, financial problems, material and social deprivation and employment status. All these, except for income and deprivation, were measured in the postal questionnaire.

Crowding was defined as the number of persons per room, and coded as a continuous variable. Physical housing conditions were measured by means of a checklist of 3 items with regard to problems relating to damp, mould and cold. This variable was classified according to the number of problems reported (0, 1, 2, or 3).

Problems with neighbourhood conditions were also measured by means of a checklist, containing 4 items with respect to noise (traffic and neighbours), smell and vandalism. The answers were classified into 4 categories (0, 1, 2, or 3 or 4 problems).

Financial problems were indicated by difficulties reported by the respondent relating to the payment of bills, food, rent etc. The answers were pre-coded as no problems, some problems and big problems. Income was indicated by the family net income per month, divided by the number of people that were dependent on that income (with children given less weight than adults). This so-called equivalent income, ranging from between around 600-6000 Dutch guilders per month, was divided into five categories of around 1000 guilders.

People were defined as materially deprived if they were not able to afford one or more amenities or expenditures (telephone, basic food etc.) out of a list of 6. If people could not engage in 3 or more of 7 activities listed in the questionnaire because of financial reasons (e.g. going out, going on holiday, having friends for dinner), they were classified as socially deprived.

The worse the material conditions (crowding, problems with housing and neighbourhood, financial problems, material and social deprivation), the higher the prevalence of smokers expected (Marsh & McKay 1994).

The employment status of the respondent was indicated by the answer on a question to his or her main activity. A distinction was made between the paid employed, the unemployed, the long-term work disabled, the (early) pensioned, the housewives (m/f) and others (mainly students). We anticipated a higher prevalence of smokers among those not in paid employment.

Psychosocial factors were divided into stressors and coping resources, i.e. factors which have an effect on the way people cope with stressors. The stressors studied in the analyses are negative life-events and long-term difficulties. The coping resources are social support (emotional and

instrumental), neuroticism and coping styles. All psychosocial factors except for life-events were asked for in the oral interview.

Life-events were measured by means of a checklist of 9 negative life-events, and coded as 0, 1, 2, and 3 or more life-events reported in the previous year.

Long-term difficulties were also measured by means of a self-report questionnaire, an adapted version of a Dutch Long-Term Difficulties Questionnaire (Hendriks et al. 1990). The 18 items in this questionnaire refer to difficulties with living and working conditions (e.g. housing, schooling, work), problems in personal relationships, and health problems of significant others. This variable was coded into 5 categories (0, 1, 2, 3, ≥4 problems in the last year). We expected a higher exposure to the stressors to be related to a higher percentage of smokers (Conway et al. 1981).

An adapted version of a Dutch questionnaire was used to measure two dimensions of social support (van Tilburg 1988): emotional and instrumental support referring to three significant others. Both subscales had a good internal consistency (emotional resp. instrumental support Cronbach's α=.60 resp .67). The score on both scales (min. 0, max. 30 for emotional support, and 24 for instrumental support) was coded as lack of social support (lowest quintile) versus social support reported. We expected lack of social support to be associated with higher smoking rates (Dean 1989).

Neuroticism was measured by means of the Eysenck Personality Questionnaire of 12 items (Eysenck et al. 1985), which had a high internal consistency (Cronbach's α=.81). We expected a higher score on the neuroticism scale (min. 0, max. 12) to be associated with a higher prevalence of smoking (Vingerhoets et al. 1990).

The Utrechtse Coping Lijst (UCL) was used to measure styles of coping (Schreurs et al. 1983). This questionnaire contains seven subscales, i.e. active problem focusing (min. 8, max. 32), avoidance behaviour (min. 7, max. 28), depressive reaction pattern (min. 7, max. 28), social support seeking (min. 6, max. 24), palliative reaction pattern (min. 6, max. 24), disclosure of emotions (min. 3, max. 12) and optimism (min. 4, max. 16). The internal consistency of the subscales was good (Cronbach's α ranging from .59 to .80). In particular, we expected a palliative coping style to be related to smoking, as this style is defined as palliating the emotional consequences of stressful situations by, e.g., smoking and drinking. Moreover, smoking is supposed to be positively related to avoidance behaviour and a depressive reaction pattern. We expected negative associations for active problem focusing, social support seeking, disclosure of emotions, and optimism.

The variable neuroticism and all coping styles were classified into 5 equal categories.

Age and sex were considered as confounding variables. They might be determinants of smoking and associated with socio-economic status. In contrast with the cultural, material and psychosocial factors however, age and sex are not *caused* by a particular socio-economic status. They

therefore should be considered as confounders of the association between socio-economic status and smoking rather than intermediate variables.

Analyses

People for whom information on smoking, education or confounders was missing, were excluded, i.e. 70 persons (2.8 per cent of the study population). All variables except for crowding were coded as dummy variables.

Successively, we investigated whether the (potential) correlates of smoking differences were related to smoking, whether they were associated with socio-economic status, and to what extent their differential distribution statistically accounted for the higher smoking rates in lower socio-economic groups.

In order to determine whether the potential correlates were associated with smoking, we fitted logistic regression models, controlling for potential confounders (5 years age groups and sex, and interaction between both variables). The aim was to check whether current smokers differed from never/former smokers with respect to specific cultural, material or psychosocial factors. The reduction in deviance due to the inclusion of a particular factor was used as an overall statistical measure of its effect.

In order to describe the distribution of cultural, material and psychosocial factors as well as current, former and never smokers across educational levels, we calculated the percentages in each category, directly standardized for age (10 years age groups) and sex.

Logistic regression models were fitted to estimate educational differences in the prevalence of smoking, controlling for potential confounders. The highest educational group was always used as a reference category. The regression coefficients and their standard errors were used to calculate Odds Ratios and their 95 per cent Confidence Intervals. The reduction in deviance due to the inclusion of education was used as an overall statistical measure of its effect.

In order to estimate the extent to which each set of correlates could statistically account for differences in current smokers, they were added successively to a model containing the educational variable and the confounders only. The percentage reduction in Odds Ratios for education after adjustment for a set of factors was used as an indicator of its relevance. In order to make the results of the models directly comparable, those respondents who had a missing value on one or more of these factors were excluded from these analyses. An exception was made for those whose response was missing on the income variable. Excluding these respondents significantly changed the estimation of the relevance of other correlates. We therefore included the missing values on income as a separate category. In the first series of analyses, relating to those who had never smoked, 115 respondents were excluded (7 per cent of the study population). In the second series (former smokers), 103 respondents were excluded (6 per cent of the study population).

The analyses were carried out using the GLIM statistical programme (Baker & Nelder 1978).

5.2.3 Results

We observed substantial differences in the proportion of smokers (Table 5.2.1). This is consistent with the results of other studies. The percentage of current smokers steadily increased with decreasing educational level: 50 per cent of the respondents in the lowest educational groups were classified as current smokers as compared to 20 per cent in the highest group. The percentage of never smokers was higher among people in higher educational groups. Moreover, among those who had ever smoked (i.e. current *plus* former smokers) the proportion of former smokers was smaller among lower educational groups. This implies that lower educated people were less inclined to quit smoking. These results are similar to those of another recent Dutch study (Hoeymans et al. 1993).

Table 5.2.1 Prevalence of current, former and never smokers by level of education, standardized for age and sex, total population (n=2392)

	educational level[1]						
	1	2	3	4	5	6	7
% current smokers	20.8	27.4	28.3	34.5	41.2	35.9	50.7
% former smokers	29.8	40.1	42.8	37.9	33.2	34.7	24.7
% never smokers	49.5	32.5	28.9	27.6	25.5	29.4	24.5
number of respondents	132	336	173	315	361	540	535

[1] 1=high, 7=low (see Data & Methods for categories)

The differences between current smokers and never/former smokers relating to the cultural, material and psychosocial factors are shown in Table 5.2.2.

Current smokers more frequently had an externally oriented locus of control than both never and former smokers, although that association was only statistically significant for the latter. Furthermore, compared to never and former smokers, current smokers more frequently had a lower score on the scale that indicates a lack of 'orientation to the future' (not significant), as well as on the parochialism scale. This was contrary to our expectations.

Housing conditions (problems with housing and neighbourhood conditions, and crowding) did not differ between smokers and never/former smokers. Other material conditions were, however, worse among smokers compared to never and former smokers. Smokers more frequently had lower income and financial problems, and were more frequently deprived and not in paid employment.

Table 5.2.2 Univariate associations between risk of being a current smoker and cultural, material and psychosocial factors: Odds Ratios (OR), 95 per cent Confidence Intervals (CI) and significance of Reduction in Deviance (RD)[a]

		smokers *versus* never smokers			smokers *versus* former smokers		
		OR	CI	RD[c]	OR	CI	RD[c]
cultural factors							
external locus of control[b]	1	1.00			1.00		
	2	1.09	.55-2.15		1.38	.76-2.52	
	3	1.29	.65-2.55		2.11	1.15-3.87	
	4	1.60	.77-3.29		2.76	1.45-5.24	
	5	2.76	.97-7.90	ns	4.04	1.60-10.20	**
parochialism[b]	1	1.00			1.00		
	2	.99	.40-2.45		.65	.25-1.67	
	3	.95	.39-2.31		.78	.31-1.97	
	4	1.03	.42-2.55		1.04	.41-2.66	
	5	.81	.31-2.15	ns	.87	.32-2.37	*
lack of orientation towards future[b]	1	1.00			1.00		
	2	.77	.45-1.29		.56	.35-.90	
	3	.74	.44-1.25		.55	.34-.89	
	4	.70	.40-1.20		.69	.42-1.14	
	5	.77	.37-1.61	ns	.56	.29-1.07	ns
material factors							
equivalent income (in Dutch guilders)	600-1600	1.00			1.00		
	1600-2600	.78	.59-1.02		.78	.61-1.00	
	2600-3600	.61	.44-.86		.52	.38-.70	
	3600-4600	.50	.30-.81		.57	.37-.90	
	4600-5800	.65	.06-6.62	*	1.68	.27-10.23	**
financial problems	none	1.00			1.00		
	some	1.85	1.37-2.48		1.50	1.15-1.96	
	big	4.16	2.14-8.08	**	3.06	1.75-5.34	**
deprivation	material	4.10	1.52-11.11	*	2.31	1.05-5.09	*
	social	3.47	1.93-6.24	**	2.34	1.39-3.94	**
employment status	paid employment	1.00			1.00		
	unemployed	1.79	.91-3.50		1.52	.84-2.72	
	work disability	2.17	1.31-3.60		2.18	1.43-3.31	
	(early) retired	1.37	.76-2.47		1.76	1.07-2.88	
	housepersons	1.04	.75-1.45		1.48	1.05-2.10	
	other	1.28	.46-3.55	*	2.13	.40-11.48	*
housing conditions	0 problems	1.00			1.00		
	1 problem	1.00	.73-1.37		.81	.60-1.09	
	2 problems	1.45	.92-2.27		.95	.64-1.41	
	3 problems	1.00	.48-2.10	ns	.93	.47-1.84	ns
neighbourhood conditions	0 problems	1.00			1.00		
	1 problem	.73	.56-.96		.98	.76-1.26	
	2 problems	.86	.57-1.29		.98	.68-1.42	
	≥3 problems	1.07	.58-1.97	ns	.73	.42-1.26	ns
crowding (no. persons/room)		.96	.85-1.08	ns	1.04	.91-1.18	ns

		smokers *versus* never smokers			smokers *versus* former smokers		
		OR	CI	RD[c]	OR	CI	RD[c]
psychosocial factor							
life-events	0	1.00			1.00		
	1	1.32	1.03-1.70		1.00	.80-1.26	
	2	1.41	1.02-1.94		1.13	.84-1.52	
	≥3	1.93	1.10-3.39	*	1.23	.75-2.01	ns
long-term difficulties	0	1.00			1.00		
	1	1.04	.77-1.40		1.16	.88-1.54	
	2	.98	.71-1.36		1.00	.74-1.34	
	3	1.34	.92-1.96		1.09	.77-1.52	
	≥4	1.52	1.07-2.16	ns	1.37	.99-1.88	ns
lack of social support							
instrumental	no	1.00					
	yes	.99	.75-1.32	ns	.83	.64-1.08	ns
emotional	no	1.00					
	yes	1.00	.75-1.32	ns	.82	.64-1.05	ns
neuroticism[b]	1	1.00			1.00		
	2	1.21	.91-1.61		.80	.62-1.04	
	3	1.31	.97-1.78		1.24	.93-1.66	
	4	1.65	1.07-2.54		1.05	.71-1.55	
	5	2.57	1.56-4.22	*	2.61	1.54-4.42	**
coping styles[b]							
active problem focusing	1	1.00			1.00		
	2	.53	.24-1.21		.68	.32-1.41	
	3	.48	.22-1.06		.63	.31-1.30	
	4	.64	.29-1.45		.59	.29-1.22	
	5	.44	.18-1.08	ns	.92	.41-2.05	ns
avoidance behaviour	1	1.00			1.00		
	2	.64	.49-.85		.91	.70-1.16	
	3	.67	.48-.93		1.32	1.01-1.74	
	4	.63	.33-1.18		.81	.49-1.36	
	5	.01	.00-7.06	*	1.28	.53-3.12	*
depressive reaction pattern	1	1.00			1.00		
	2	1.09	.84-1.41		1.01	.80-1.28	
	3	1.29	.88-1.88		1.12	.79-1.60	
	4	3.72	1.27-10.92		2.92	1.03-8.25	
	5	1.32	.21-8.16	ns	2.25	.36-14.16	ns
social support seeking	1	1.00			1.00		
	2	.71	.50-1.03		.58	.42-.80	
	3	.71	.48-1.03		.61	.43-.86	
	4	.88	.58-1.35		.61	.42-.91	
	5	.73	.37-1.44	ns	.93	.43-2.01	*
palliative reaction pattern	1	1.00			1.00		
	2	.71	.51-1.00		1.05	.78-1.40	
	3	.77	.54-1.11		1.08	.79-1.47	
	4	.81	.50-1.30		1.03	.70-1.50	
	5	.47	.08-2.77	ns	1.60	.75-3.43	ns

		smokers *versus* never smokers			smokers *versus* former smokers		
		OR	CI	RD[c]	OR	CI	RD[c]
disclosure of emotions	1	1.00			1.00		
	2	.90	.65-1.26		.61	.44-.84	
	3	1.12	.79-1.60		.56	.40-.78	
	4	1.37	.89-2.13		.70	.47-1.05	
	5	1.52	.64-3.60	ns	.67	.30-1.49	*
optimism	1	1.00			1.00		
	2	1.00	.53-1.87		1.35	.78-2.36	
	3	1.36	.75-2.48		1.35	.81-2.27	
	4	1.24	.66-2.34		1.37	.78-2.38	
	5	1.11	.54-2.29	ns	1.55	.81-2.97	ns

a Results of logistic regression models including age, sex, age x sex
b classified into 5 equal categories (1=lowest score; 5=highest score)
c p-value based on the reduction in deviance due to the inclusion of the factor in the model
** $p < .001$
* $p < .05$
ns not significant

Moreover, the exposure to stressors was higher among smokers, although this association was only statistically significant when smokers were compared with never smokers in the case of life-events. Social support did not differ between smokers and never/former smokers, whereas smokers more frequently had higher scores on the neuroticism scale than never/former smokers. These groups also differed with respect to some coping styles. In contrast to our expectations, smokers were less inclined to display 'avoidance behaviour' than never smokers, while they did not systematically differ with former smokers in this respect. Moreover, smokers were less inclined to seek social support or to show their emotions, compared to former smokers.

Table 5.2.3 shows the distribution of cultural, material and psychosocial factors across educational levels, using one selected category from each determinant only. Those factors that appeared *not* to be statistically significantly related to smoking (Table 5.2.2), have not been included in Table 5.2.3.

Table 5.2.3 Percentage of persons in selected category of cultural, material and psychosocial factor, by level of education, standardized for age and sex, total population (n=2392)

	educational level[1]						
	1	2	3	4	5	6	7
cultural factors							
external locus of control:							
% in 4th and 5th category (highest score)	.9	5.1	8.7	13.8	10.9	25.0	36.7
parochialism:							
% in 4th and 5th category (highest score)	13.3	14.5	14.3	31.9	30.9	52.7	56.3
material factors							
mean equivalent income per month:							
% with income < 1600 Dutch guilders	8.5	16.1	14.6	35.6	25.4	55.9	69.0
financial problems: % with big problems	.3	1.3	2.2	2.0	1.9	4.4	10.8
deprivation							
% materially deprived	.4	1.2	1.1	.2	.7	1.4	6.8
% socially deprived	.0	1.8	1.1	1.2	2.2	4.7	11.6
employment status: % with work disability	1.3	4.0	2.8	5.2	5.2	9.3	11.6
psychosocial factors							
life-events: % 3 or more events	2.0	4.5	3.4	4.5	2.9	4.9	6.9
neuroticism:							
% in 5th category (highest score)	.7	2.1	2.5	3.7	4.2	4.2	14.4
coping style: % in 4th and 5th category (highest score):							
avoidance behaviour	.9	2.0	3.1	1.6	4.1	3.6	7.0
social support seeking	25.8	22.6	24.1	17.0	17.9	14.1	16.6
disclosure of emotions	9.0	13.3	15.2	12.2	15.7	12.3	14.0

[1] 1=high, 7=low (see Data & Methods for categories)

As expected, the prevalence of an externally oriented locus of control and a parochial attitude was higher in lower socio-economic groups. Also (all) adverse material conditions are more prevalent within these groups. The exposure to life-events was not consistently related to level of education, although the percentage reporting 3 or more events was the highest in those who had primary schooling only. Finally, people in lower educational groups had higher neuroticism scores, and were more inclined to use avoidance behaviour as a coping style and less inclined to seek social support. The pattern was irregular for the 'disclosure of emotions' scale.

Figure 5.2.1 shows a steep educational gradient associated with the risk of being a smoker as compared to the risk of being a never smoker. The odds of current smokers as compared to never smokers among people who attained a primary level of education only was more than 5 times as high as that of persons who attained university education. When smokers were contrasted with former smokers, the gradient was smaller (Figure 5.2.2). Only people in the lowest educational category were significantly less inclined to stop smoking.

Figure 5.2.1 Association between educational level and the risk of being a current smoker versus a never smoker, controlling for confounders only, and controlling for cultural, material and psychosocial correlates, Odds Ratios (n=1485)[a]

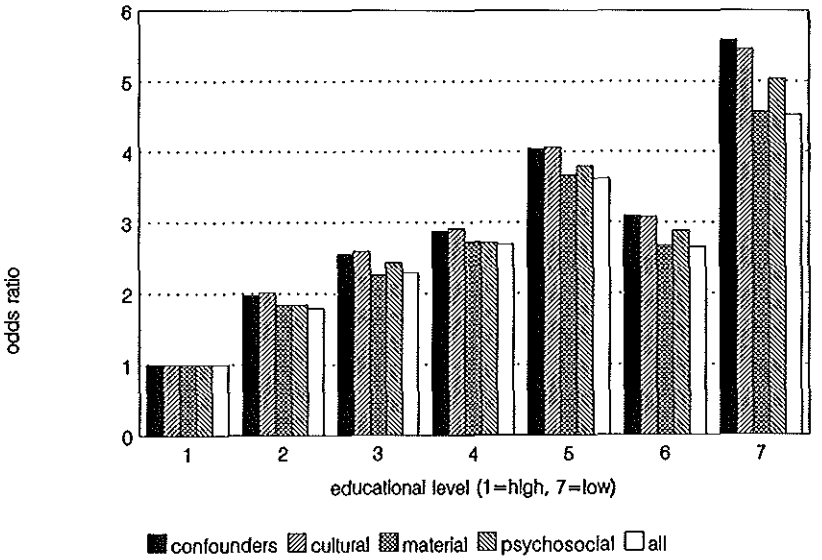
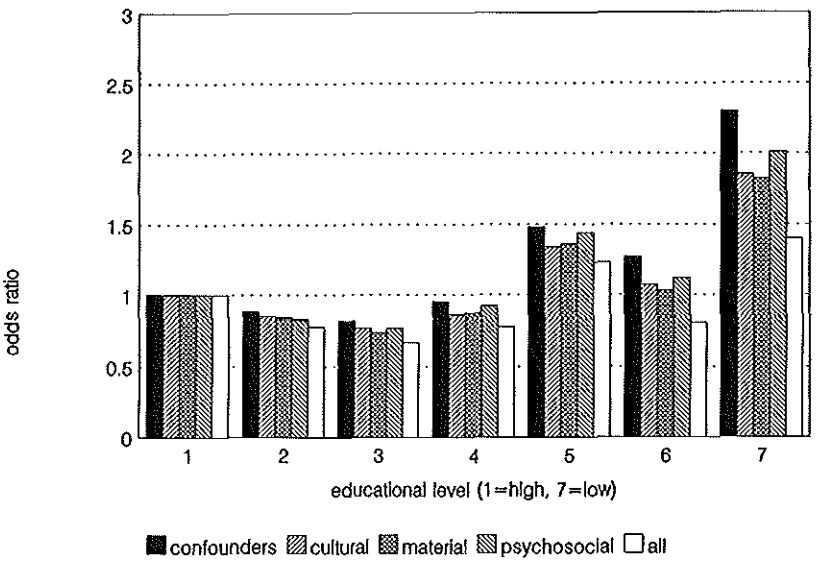


Figure 5.2.2 Association between educational level and the risk of being a current smoker versus a former smoker, controlling for confounders only, and controlling for cultural, material and psychosocial correlates, Odds Ratios (n=1572)[a]



[a] Results of logistic regression models including age, sex and age x sex

Furthermore, these figures show the results of models in which each set of correlates has been controlled for. The difference in Odds Ratios between these models and the first model, controlling for confounders

only, gives an indication of the extent to which the correlates statistically account for differences in smoking. Although cultural factors were not statistically significantly related to smoking among smokers/never smokers, they were included in Figure 5.2.1 in order to make this figure consistent with Figure 5.2.2.

In an analysis in which the effect of each specific factor had been assessed separately (results not shown), some factors did *in*crease the risks of smoking among lower educational groups. Parochialism can serve as an example. As smokers have a less parochial attitude (Table 5.2.2), and a parochial attitude is more common in the lower socio-economic groups, its distribution could not account for the higher smoking rates in lower socio-economic groups. As the aim of the analyses was to identify the factors that are potential determinants of the educational gradient, they were excluded from the model. This applies to parochialism, employment status and coping styles among (never) smokers, and parochialism among (former) smokers.

Differences with respect to cultural factors could not statistically account for the educational gradient in smoking when smokers were contrasted with never smokers (Figure 5.2.1). Part of the gradient was accounted for by material factors. Controlling for these factors reduced the Odds Ratios up to 20 per cent in the lowest educational levels. The prevalence of financial problems and a low equivalent income, both strongly related to smoking (Table 5.2.2), particularly appeared to account for that effect. The reduction of the Odds Ratios due to the inclusion of the deprivation indicators was smaller, because of the low percentage of people classified as deprived (Table 5.2.3). Finally, psychosocial factors, i.e. the higher exposure to life-events and the higher neuroticism scores, were found to be correlates of the socio-economic differences in smoking. They statistically accounted for around 10 per cent of the increased risks of lower socio-economic groups.

The reduction of Odds Ratios controlling for all sets of explanatory factors simultaneously was almost as large as the reduction due to controlling for material factors only, implying that psychosocial and material conditions had a large part of their contribution in common. Most of the educational differences remained after we had controlled for all cultural, material and psychosocial factors.

When smokers were contrasted with former smokers (Figure 5.2.2), controlling for locus of control resulted in a substantial reduction of the risks among the lowest educational groups (around 30 per cent). Also material conditions statistically accounted for a substantial part of the gradient. The odds of the lowest educational level was reduced by almost 40 per cent. Financial problems, having a low income, and not being in paid employment especially accounted for the result. Finally, differences in psychosocial factors (neuroticism and coping styles) statistically accounted for part of the increased odds in lower educational groups. After controlling for all factors simultaneously, hardly any differences remained.

5.2.4 Discussion

We observed higher smoking rates in lower socio-economic groups - a pattern similar to the findings of other studies in the Netherlands and other Western countries, including the United States (Pierce 1989). The aim of the analyses was to identify the cultural, material and psychosocial correlates of the social pattern of smoking behaviour. Cultural as well as material and psychosocial factors were found to statistically account for part of the higher smoking rates in lower educational groups, with psychosocial factors being the least important.

Our results might have been biased by non-response. This is the case if the association between the correlates and smoking on the one hand and educational level on the other, is different among respondents and non-respondents. If for example smokers living in adverse conditions were underrepresented among the respondents, the importance of those circumstances as correlates of differences in smoking would have been underestimated. Unfortunately, data on these associations among non-responders are not available. Yet we consider serious non-response bias to be unlikely, as firstly, the respondents very much resemble the original sample as far as the distribution of socio-economic characteristics is concerned, and secondly, similar socio-economic differences in smoking were found in the subpopulation considered here as compared to the whole study population.

Before interpreting the results of these analyses, a few issues concerning the cross-sectional character of the data are to be considered.

Firstly, as the explanatory factors were measured as the same time as smoking status, their interrelationship does not necessarily reflect a *causal* association. It could also reflect an effect of smoking on the explanatory factor. For example the association between material conditions and smoking is assumed to reflect an effect of the former on the latter, but an effect of smoking on material conditions cannot be ruled out completely. A British study e.g. indicates an effect of smoking on economic hardship, as money spent on cigarettes etc. diminishes the available income (Marsh & McKay 1994). Furthermore, smoking may affect orientations, e.g. in the case that failing to quit smoking strengthens a person's belief that he cannot control his life.

Secondly, the correlates may have been measured a long time after respondents had taken the decision to start or to quit smoking, especially in the older age-groups. When interpreting the results, the correlates must therefore be considered as factors associated with the decision to *continue* rather than to start or quit smoking.

As a consequence, the correlates of socio-economic smoking differences as identified here are not necessarily *causal determinants* of these differences. The importance of the correlates for the explanation of the social pattern of smoking should therefore be tested in future research using more powerful datasets.

With respect to the cultural factors included here, only locus of control was found to be a correlate of the socio-economic gradient in smoking. A substantial part of the educational differences in the risk of being a smoker compared to being a former smoker was found to be associated with the fact that people in lower socio-economic groups more frequently have an external locus of control. This supports the results of a previous study relating to differences in preventive health behaviour (Pill et al. 1995). If the association between locus of control and smoking reflects a causal effect, which should be confirmed in more powerful studies, this finding suggests that people from higher educational groups may be more inclined to stop smoking because they more frequently believe that quitting will have a positive effect on their own health.

Furthermore, we observed a more parochial attitude among people in lower socio-economic groups. We expected this difference in attitude to account for a cultural lag in diffusion of advances across socio-economic strata (Blaxter 1976). It therefore might have contributed to the higher proportion of quitters in higher socio-economic groups after research had demonstrated the health risks of smoking. Contrary to our expectations, however, smokers were found to have a less parochial attitude than former/never smokers. This factor therefore could not account for socio-economic differences in smoking. The same applies to the factor 'orientation towards the future'.

These findings probably support the opinion of some authors that the importance of a cultural explanation for differences in health-damaging behaviour has been overestimated in the past (Pill & Stott 1985, Whitehead 1988). On the other hand, it may also be the consequence of the rather general character of the measures employed. Previous studies indicate that the correlation between general measures and specific health behaviour is, in general, weak (Stroebe & Stroebe 1995). Other indicators of cultural differences, indicating more specific cultural aspects, probably would have yielded stronger associations. Also the use of cross-sectional data may have contributed to the result, since it may imply that the correlates have been measured a long time after most respondents had taken the decision to start or to quit smoking.

Material conditions were found to be major correlates of the socio-economic gradient in smoking. Almost 40 per cent of the increased risk of being a smoker compared to being a former smoker was found to be associated with unfavourable material conditions. The corresponding figure in the case that current smokers were contrasted with never smokers was 20 per cent. In particular limited financial resources, indicated by the level of available income, financial problems and deprivation, appeared to account for the effect. Housing conditions were not found to be related to smoking. Further investigation may show whether the absence of this association has to do with the fact that we used rather crude measures to indicate these conditions.

As indicated before, the association between material conditions and smoking does not necessarily reflect a causal association. There is evidence from other studies, however, that material factors have a causal impact on smoking. Qualitative studies, most of which were carried out in

the United Kingdom, indicate that these conditions may induce people to smoke, and hinder people to stop smoking. Smoking thus may be considered as a way of coping with adverse circumstances (Graham 1995). On the basis of our results we hypothesize that this mechanism contributes considerably to the higher proportion of smokers in lower socio-economic groups.

As mentioned in the introductory paragraph, psychosocial factors have not frequently been studied in the context of research on socio-economic differences in behaviour. With respect to the extensive set of psychosocial factors included in the analyses, neuroticism, coping style and the exposure to life-events were found to be correlates of the educational gradient in smoking. These factors statistically accounted for a rather small part of this gradient, however. Moreover, the material and psychosocial correlates were found to overlap, which supports the interpretation of the contribution of material conditions in terms of stress, and smoking as a way of coping with that stress.

What do these results indicate as to how to reduce the proportion of people in lower socio-economic status group that smoke?

First, on the basis of our results we hypothesized that people in lower socio-economic groups are less inclined to stop smoking because they have less belief in the positive effects of quitting on health. This might explain why health education campaigns aimed at making people aware of the health risks of smoking seem to be less effective in lower socio-economic groups. People in lower socio-economic groups probably less frequently believe that smoking will be a cause of ill-health to them personally, even if they are aware of the health risks of smoking in general. Also coping styles which are associated with smoking were more frequently observed in lower socio-economic groups. This might indicate that people in lower socio-economic groups more frequently use smoking as a way of coping with life problems. If our results are confirmed in more powerful studies, these results would indicate that a further reduction of socio-economic differences in smoking cessation can be found in tailoring smoking cessation programs to the more externally oriented locus of control and the coping styles that are common in lower socio-economic groups.

Such interventions programs might benefit from further research on the orientations of people in lower socio-economic groups. It should be studied, for example, why people in lower socio-economic strata less frequently believe that their behaviour might affect health. Illness and premature death might for example be seen as inevitable in these groups, given their high prevalence. In addition, people in lower socio-economic groups might be less optimistic about the effects of altering their health behaviour, since other health risks that are beyond their control, such as adverse working or housing conditions, are also more prevalent in these groups.

Yet health promotion campaigns, even if they are tailored to the orientations of specific groups, might not necessarily yield a substantial reduction of smokers in lower socio-economic groups. This is indicated

by the fact that a substantial part of the socio-economic gradient was found to be associated with the situational contraints that people in lower socio-economic strata face, such as a low income, financial problems, and unemployment. In combination with the results of other studies, indicating that these constraints should be considered as risk factors for smoking and barriers for smoking cessation, we suggest that policy measures aimed at a reduction of smoking should address the living conditions of people in lower socio-economic groups. The results of our analyses indicate in particular the potential importance of improving the financial situation and labour market position of lower socio-economic groups for the reduction of the percentage of smokers in these groups.

Finally, the results of our analyses indicate that the efforts to reduce the percentage of smokers in lower socio-economic groups should include smoking cessation interventions as well as measures which prevent people from taking up smoking. Even if smokers in lower and higher socio-economic groups are equally inclined to stop smoking, this will not lead to a 100 per cent reduction of smoking differences between socio-economic groups. If, in our study population, the prevalence of smokers in lower and higher socio-economic groups is to become similar, the proportion that quit smoking should be the highest in the lowest socio-economic groups. It is not realistic to expect this situation to occur, given the distribution of especially material and cultural factors across socio-economic groups. Therefore, eliminating socio-economic differences in smoking in future populations may only be achieved if we can equally induce people in lower and higher socio-economic groups not to *start* smoking in the first place. The fact that intervention strategies aimed at preventing people from taking up health damaging behaviour seem to be more effective than interventions aimed at behavioural change, supports this view (Stroebe & Stroebe 1995, Chatrou 1992).

We hope that others will try to confirm our findings using more powerful datasets. This should indicate whether the correlates of socio-economic differences in smoking as identified here are *causal determinants* of the social pattern of smoking. Moreover, further research should pay attention to important determinants of smoking that were omitted here, including social pressure and smoking behaviour of peers (Stroebe & Stroebe 1995, Warburton et al. 1991, Goddard 1990, Castro et al. 1987, de Vries 1995). In addition, younger age-groups should be included too, since most smokers start during adolescence, and socio-economic differences in smoking already exist in that age-group (de Vries 1995, Chatrou 1992). A more detailed examination of the background of the socio-economic gradient in smoking can provide information that should enable us to reduce smoking rates more effectively.

6 GENERAL DISCUSSION AND CONCLUSIONS

6.1 Summary of the results of the empirical studies

We observed substantial inequalities in health to the disadvantage of people in lower educational, occupational and income groups. These findings are similar to the results of other studies in Western European countries (Fox 1989, Illsley and Svensson 1990, Kunst et al. 1995). The health indicators used relate to objective (chronic conditions) as well as subjective health problems (health complaints, perceived health problems and perceived general health). All were based on self-report. Inequalities in subjective health were found to be larger than inequalities in the objective health indicator. The risk of health problems was especially high in the lowest socio-economic group, in particular in the case of educational differences. Finally, we observed smaller inequalities in health among women than among men. Again this is similar to the results of other studies (Koskinen & Martelin 1994, Lahelma & Arber 1994).

The primary aim of the empirical analyses was to elicit indications for the *explanation* of socio-economic inequalities in health. More specifically, we intended to estimate the relative importance of differences in behaviour and living conditions and to explore the way behavioural differences are embedded in living conditions. In this final chapter, the results of the empirical studies are summarised and discussed along the lines of the study aims and related to the conceptual framework as specified in chapter 2.

6.1.1 Contribution of living conditions

Income and selection effects

There is little direct evidence which supports the importance of material living conditions for socio-economic inequalities in health, hence studies providing *in*direct evidence play a central role in the scientific debate (Davey Smith et al. 1990a, Vågerö & Illsley 1995). One example of such indirect evidence is the observation that the association between income and health is stronger than that between other indicators of socio-economic status and health. In chapter 4.1 we critically assessed this piece of evidence. As job loss often implies a lowering of income, we expected the association between income and health at least partly to reflect an association between employment status and health. Our results show that this is indeed the case. Especially the uneven distribution of the long-term disabled was found to underlie the association of income and health. As the disabled mainly are out of paid employment because of health problems, we concluded that the relationship between income and health at least partly reflects a selection effect: an effect of health on income through employment status. Hence the relatively large differences in health between income groups may not simply be considered as indicating the relative importance of material factors for inequalities in health.

In the Longitudinal Study on Socio-Economic Health Differences (LS-SEHD), we are fortunate to have a large set of measurements indicating living conditions. In this thesis the importance of material conditions has been assessed in a more direct way using these measurements.

Income and deprivation

The independent effect of income on health was studied as well as the extent to which the higher morbidity rates in lower income groups can be traced to relative deprivation (chapter 4.2). The results of these analyses show that income is independently related to health. In the lowest income groups the effect to a large extent reflected a high level of basic and social deprivation, indicating a direct effect of income on health. Moreover, the results provide evidence in support of an indirect link between deprivation and health involving psychological or behavioural factors.

Other material factors

In chapter 5.1 we focused on the full range of material conditions rather than on the lower end. The role of adverse housing and neighbourhood conditions, health-damaging working conditions, financial problems and employment status was studied. All these adverse material conditions were found to be more prevalent in the lower socio-economic strata, similar to the results of other Dutch studies (Stronks et al. 1993, Mackenbach 1994a).

The inclusion of employment status probably needs some explanation. In contrast with all other factors mentioned above, this explanatory factor does not indicate a material condition. Yet the choice to extend the set of material conditions to include employment status was prompted by the fact that a substantial part of the population does not have a paid job, and therefore cannot be exposed to working conditions. As being out of paid employment as such has been demonstrated to have a negative effect on health (Valkonen & Martikainen 1992, Bartley 1994), employment status should be considered as the equivalent for working conditions among those out of paid employment. But, as indicated before, employment status is also partly the consequence of health problems, implying that some part of the association between employment status and health reflects a selection effect. The way in which this might bias the results will be discussed in section 6.2.

From the results of chapter 5.1, it might be concluded that material factors (other than deprivation) to a large extent account for socio-economic inequalities in health. Overall, they explained 30-50 per cent of the observed inequalities. This applies to all health indicators considered.

Interestingly, the contribution of material factors was larger for men than for women. This seems particularly related to the lower participation of women in the labour market, since the statistical model in which people without a paid job had been excluded yielded a similar pattern for both sexes. This suggests a potential explanation for the observation that inequalities in health are smaller among women, which was explored in a separate analysis (chapter 4.4). We concluded that the smaller inequalities in health among women were partly due to a less pronounced concentration of people with a long-term work disability in the lower strata. Because at least a substantial part of them do not work because of *work-related* health problems (Balemans & van Vliet 1991), this might indicate the importance of working conditions for the larger inequalities in men.

Psychosocial stressors

The *psychosocial* stressors considered include life-events, long-term difficulties in relationships with others and relating to the health status of others, neighbourhood conditions, financial problems and social deprivation (chapter 4.3). It may have been noticed that some living conditions are considered as material and psychosocial factors. This applies to neighbourhood and financial conditions and social deprivation. The reason is that these psychosocial stressors have a material base, for example when an adverse financial situation causes stress. Compared to the 'materially based' stressors, we observed a less steep socio-economic distribution for the 'non-materially based' stressors. Life-events for example, were irregularly related to socio-economic status, whereas problems relating to relationships were even more prevalent in higher socio-economic groups. Other Dutch studies also do not show a clear pattern (Sivera van der Sluijs et al. 1996).

The stressors as a whole explained 10-15 per cent of the inequalities in perceived health problems. The stressors which arise from bad financial conditions particularly accounted for this result. This provides evidence to suggest that psychosocial factors act as intermediaries between material factors and health, rather than as an explanation parallel to the material explanation.

Our results did not yield evidence to support the view that people from lower socio-economic groups are more *affected* by stressful events and conditions because of, for example, a less effective coping style. Although the strength of the association between stressors and health was found to vary between socio-economic groups, it was not systematically stronger among the lower strata.

6.1.2 Contribution of behavioural factors, and their interrelationship with living circumstances

In accordance with the results of other studies (Hoeymans et al. 1993, Stronks et al. 1993, Mackenbach 1994a) most unhealthy behaviour was found to be more common in lower socio-economic groups (chapter 5). This applied in particular to smoking and overweight.

The higher frequency of unhealthy behaviour appeared to account for a substantial part of the inequalities in the prevalence of both chronic conditions and subjective health problems (chapter 5.1). For all health indicators, their contribution was assessed to be 30-40 per cent.

Interrelationship with living circumstances

Given the interdependency with living conditions, we argued that the contribution of behavioural factors should be studied simultaneously with that of living conditions (chapter 5.1). We are not aware of other studies in which this research strategy was followed. From this analysis, we concluded that both groups of intermediary factors have an important part of their contribution in common. More than half of the contribution of behaviour was embedded in the distribution of material conditions, implying, inversely, that material factors for some part affect health through unhealthy behaviour.

It would have been interesting to know to what extent the contribution of behaviour was embedded in the uneven distribution of psychosocial stressors too. However, as most stressors were measured among a subsample only, they could not be included in the analyses in chapter 5.1 with health as the dependent variable. Limiting the analyses to the subsample was not possible either, due to a lack of power. Nevertheless, in order to obtain insight into the way behaviour is embedded in psychosocial conditions, we carried out an analysis with behaviour as the dependent variable (chapter 5.2). Smoking was taken as an example and related to material and psychosocial but also cultural factors. Whereas material factors contributed substantially to differences in smoking (cessation), the results indicate a minor role for non-materially based stressors and psychosocial characteristics of the individual (neuroticism, coping styles). For material conditions, the indicators relating to the financial situation accounted for most of the effect, whereas housing conditions and employment status hardly seem important. Psychosocial and material factors had a large part of their contribution in common. These findings were similar to the results of chapter 4.3, relating to health as the dependent variable.

With regard to attitudes and personality, i.e. parochialism, orientation towards the future and locus of control, only the more external locus of control of people in the lower strata accounted for part of the observed differences in smoking, especially smoking cessation.

6.2 Validity of the results

Validity of the results of the empirical studies should be considered before drawing final conclusions. The possible sources of bias which could threaten the internal validity of the specific studies have already been discussed in the discussion sections of chapter 4 and 5. They will now be discussed in a more general way (6.2.1). Moreover, the generalizability of the results to other populations and health indicators will be explored (6.2.2).

6.2.1 Internal validity

Internal validity refers to the extent to which the results of a study are valid for the target population (Bouter & van Dongen 1988) which is, in the LS-SEHD, the sample drawn from the population registries. Several sources of possible bias might threaten the internal validity of our results. This relates to non-response, the use of cross-sectional and self-reported data, and the selection of explanatory factors. These sources of bias will be discussed below.

Non-response

The main results of this thesis, relating to the *background* of health inequalities, might be biased by non-response if the association between socio-economic status and explanatory factors on the one hand, and health on the other, differs between responders and non-responders. In order to gain insight into this form of selection bias, mortality and morbidity (hospital admission and cancer registry) data will in the future be obtained for both responders and non-responders to the postal questionnaire. A comparison of the gradient in mortality among responders and non-responders, using a proxy for socio-economic status based on postcode (Schrijvers 1996), might indicate whether the association between socio-economic status and health is similar among both groups. However, these data are not yet available. Currently we have to rely on data indicating whether the study population resembles the original sample as far as the distribution of socio-demographic factors and health problems is concerned. The available data suggest that this is indeed the case.

We observed only small differences in response to the postal questionnaire by socio-economic status as indicated by postcode. This implies that the total study population closely resembles the original sample as far as the distribution of socio-demographic factors is concerned. This was confirmed in an additional survey among non-responders to the postal survey. A small sample of them (n=239) was approached for a non-response interview (see chapter 3). It appeared that the non-responders to the postal questionnaire did not differ from the responders with respect to socio-economic status, nor with regard to health status (van der Meer et al. 1993). Unfortunately, the numbers involved in the non-response interview are too low to allow for analyses of the association between socio-economic status/explanatory factors and health.

Differences in response to the oral interview which followed the

postal questionnaire were even smaller than in the case of the postal questionnaire. People from higher and lower socio-economic groups participated almost equally in the interview. This suggests that the subpopulation of responders to the oral interview also closely resembles the original sample as far as the distribution of socio-demographic factors is concerned. Furthermore, for those factors that were measured in the postal questionnaire we were able to compare the distribution in the population of responders to the postal questionnaire with that as observed in the subpopulation of responders to the oral interview. We for example studied the association between smoking and educational level in both populations (chapter 5.2). The gradient in smoking among the subpopulation appeared to be highly similar to that in the total population. Therefore we do not expect the results of the studies that were based on the subpopulation (chapter 4.2, 4.3 and 5.2) to be substantially biased by non-response to the oral interview.

Despite the similarity between the study population and the original sample with respect to the socio-demographic profile, it is beyond doubt that certain groups are not represented in the study population. For example, people who cannot read or write, probably a few percent among the adult Dutch population (Leseman & de Vries 1990). Overall, however, we do not expect our results to be substantially biased by selective non-response.

Cross-sectional data

The empirical studies in this thesis are all based on cross-sectional data. This yields a potential source of bias.

When assessing the relative contribution of explanatory factors, it is crucial that the association between a risk factor, say smoking, and health reflects a *causal* effect. Only in that instance can its higher prevalence in lower socio-economic groups *explain* health differentials. If a selection mechanism is operative, i.e. if people's smoking status depends on their health status, the higher smoking rates in lower socio-economic groups partly reflect the higher level of health problems in these groups. This potential bias has already been discussed with respect to the association between employment status and health (chapter 4.1, 4.4 and 5.1). Moreover, a selection mechanism might be operative in the case of two other material factors, i.e. deprivation and financial problems: people in ill health probably might face more financial problems because of higher expenditures as a result of their illness. We argued, however, that this would not threaten the validity of our conclusions, as costs as a result of illness are rather high only for a small proportion of the chronically ill (van Agt et al. 1996). In addition, selection effects might occur in the case of behavioural factors such as smoking and drinking, as people may give up these habits because of health problems. We therefore systematically studied the association between behavioural factors and health (chapter 5.1). With some exceptions, the most obvious being the association between excessive drinking and health status, these associations were consistent with causal relationships as reported in other studies. Therefore overall we consider it to be unlikely that the results are severely biased

by selection processes. Data on health status as obtained in the follow-up of the LS-SEHD are necessary to check this, and to ensure that the association between explanatory factors and health reflects a causal effect.

Not only the association between explanatory factors and health, but also the association between two or more explanatory factors might be bidirectional. This could have biased the results of the studies on the background of behavioural factors. The association between behaviour and living conditions for example might reflect an effect of behaviour on living conditions rather than the reverse effect. We assumed for example that a lack of financial means might serve as a source of stress and as such induce people to smoke. If, however, the reverse mechanism is operative, i.e. if people have low available incomes because of high expenses on cigarettes (Marsh & McKay 1994), this would imply an overestimation of the contribution of living conditions. Whether this effect of behaviour on living conditions is sufficiently powerful to affect the conclusions of the studies in chapter 5, should be tested using longitudinal data.

Self-reported data
Relying on self-reported data with respect to health status and explanatory factors may also provide a potential source of bias. Firstly, we expect the *size* of differences in objective health problems (chronic conditions) to be biased. An additional study using cancer registry data has shown that the socio-economic gradient in the prevalence of cancer is underestimated when using data from the LS-SEHD postal questionnaire (Schrijvers et al. 1994). A comparison between data obtained from the postal questionnaire on other specific conditions (i.e. diabetes, heart and back complaints, and COPD) and data obtained from diagnostic questionnaires, supports this conclusion (Mackenbach et al. 1996). However, this bias in itself does not threaten our main conclusions, as this thesis is primarily concerned with the *explanation* of inequalities in health. Moreover, this bias may be removed in future analyses using follow-up data on hospital admissions.

The fact that we had to rely on self-reported data might have led to an *over*estimation of the contribution of some explanatory factors. Firstly, health problems might affect the reporting of an explanatory factor, for example in the case where a chronic illness affects a person's perception of his housing conditions. Secondly, the reporting of both variables might be affected by a third factor, such as the personality trait neuroticism which refers to the tendency to experience negative, distressing emotions. If this is the case the association between the explanatory factor and health would simply reflect the effect of a high neuroticism score of the persons reporting both factors. In both cases the contribution of an explanatory factor might have been overestimated. This is most likely for psychosocial conditions, as most of these conditions are formulated in subjective terms. As we had a measurement of neuroticism at our disposal, the contribution of psychosocial stressors could be assessed when taking differences in neuroticism into account (chapter 4.3). Their contribution was indeed found to decrease.

This potential bias might also occur in the case of material factors, other than deprivation, as some of them are formulated in subjective terms (problems with housing conditions e.g.). This suggests that the contribution of material factors as assessed in chapter 5.1, which did not include neuroticism, might have been upwardly biased too. As we expect that the reporting of behavioural factors is less affected by neuroticism, the overlap between material factors and behaviour might also have been overestimated. To examine the importance of this bias, we carried out an additional analysis, in which the contribution of material factors was assessed while taking differences in neuroticism into account. The analysis was carried out among the subpopulation that participated in the oral interview, as neuroticism was included in the interview only. Unfortunately, it was not possible to make a distinction between men and women due to the relatively small numbers, which complicates the comparison of the results of this additional analysis with the findings which were reported in chapter 5.1. In Table 6.1, the results of the model in which neuroticism was controlled for are compared with those of the model that did not include neuroticism. The results for less-than-"good" perceived health are presented as an example.

Table 6.2.1 Association between SES and the prevalence of less-than-"good" perceived health, controlling for behavioural and material factors separately and simultaneously[a] : Odds Ratios (OR) and reduction in Odds Ratios[a]

		confounders[b]		confounders + behavioural factors (model 1)		confounders + material factors (model 2)		confounders + behavioural and material factors (model 3)
educational level[l]		OR	OR	reduction OR behaviour, total (%)[c]	OR	reduction OR material total (%)[c]	OR	reduction OR behaviour indep. (%)[d]
neuroticism not included	1	1.00	1.00		1.00		1.00	
	2	2.09	1.81	26	1.82	25	1.58	22
	3	1.94	1.55	41	1.66	30	1.35	33
	4	2.84	2.23	33	2.31	29	1.86	24
	5	2.82	2.13	38	2.25	31	1.75	28
	6	4.78	3.13	44	3.15	43	2.23	24
	7	6.78	3.91	50	4.26	44	2.66	27
controlling for neuroticism	1	1.00			1.00		1.00	
	2	1.85	1.57	26	1.67	17	1.43	22
	3	1.82	1.44	40	1.60	23	1.30	32
	4	2.52	1.97	30	2.13	21	1.70	24
	5	2.39	1.78	34	2.04	19	1.57	26
	6	4.21	2.70	40	3.03	31	2.11	26
	7	5.41	3.02	41	3.73	29	2.26	35

l 1=high, 7=low (see Data & Methods chapter 5.1 for categories)

a Results of logistic regression models, based on subpopulation that participated in the oral interview (n=2266)

b confounders: age, sex, marital status, religious affiliation, degree of urbanization

c percentage reduction of the increased risk estimated in the confounder model

d percentage reduction of the increased risk estimated in model 2

As expected, the contribution of material factors as well as the overlap between material and behavioural factors decreased when differences in neuroticism were taken into account. For example when neuroticism had not been included, material factors accounted for 44 per cent of the increased risk of the lowest educational group. Their contribution decreased to 29 per cent after controlling for differences in neuroticism. This indicates that material factors had around 1/4 - 1/3 of their contribution in common with neuroticism, implying that the contribution for some part reflects the effect of a high neuroticism score in lower socio-economic groups. As a result, material factors now appeared to explain approximately 30-40 per cent of the increased risk of health problems in lower socio-economic groups, with their contribution being sometimes similar to and sometimes lower than that of behavioural factors.

This additional analysis suggests that the importance of material factors relative to that of behavioural factors as assessed in chapter 5.1, as well as the overlap between both groups of explanatory factors might have been overestimated. However, neuroticism might not only function as a common explanation for a high score on material circumstances and health problems, but probably also as an intermediary between adverse material conditions and health. The reason is that neuroticism is assumed to be closely connected to self-esteem, which might be negatively affected by adverse living conditions. If this is the case, the correction for differences in neuroticism for some part implies an overcorrection.

However, another possible bias might have led to an *under*estimation of the contribution of intermediary factors. This relates to the imprecision of the measurements. The measurements used here are not perfect markers for the individual's life-time exposure to risk factors. Smoking behaviour for example was indicated by current smoking status, thereby neglecting the smoking history. Since data on the latter are available in the LS-SEHD, future analyses should indicate whether accounting for smoking history alters the conclusions of this thesis. Whether this information bias has more severely affected the measurement of material conditions as compared to the measurement of behavioural factors, is of course difficult to say. Yet we expect material conditions to be less easily captured in a short questionnaire than behavioural factors, as physical health damaging aspects of living conditions (such as mould and damp in the house) can only be crudely indicated in a questionnaire. If underestimation is indeed more likely for material conditions than for behaviour, the relative contribution of material factors as well as the overlap between material factors and behaviour will be underestimated.

In conclusion, the use of self-reported data may have led to biases in different directions of the estimates of explanatory factors. We do not expect this bias to substantially alter our conclusions that psychosocial conditions are less important than behavioural and material factors. There is more uncertainty about the relative contribution of material *versus* behavioural factors. Both contribute substantially to inequalities in health, but it is uncertain which group carries more weight.

Selection of explanatory factors

Given the aim of assessing the relative contribution of living conditions and behaviour for inequalities in health, the selection of explanatory factors is of course of crucial importance. Smoking for example is an important determinant of most common diseases and causes of death. If it had not been included, this would have resulted in an underestimation of the contribution of behavioural factors. When planning the LS-SEHD, an inventory was made of the determinants of some specific chronic conditions and causes of death (heart disease, COPD, cancer), perceived health problems, and long-term disabilities, all end-points of the LS-SEHD. Those determinants that were known to be differentially distributed among socio-economic groups were measured at the baseline. This resulted in the inclusion of a rather broad range of explanatory factors, especially as compared to other studies in this field (see chapter 3).

Some variables which were measured in the LS-SEHD were omitted in this thesis however. This applies for example to dietary habits and the use of preventive services. Whether the selection of determinants in this thesis is still an appropriate representation of the relevant lifestyle factors and living conditions, is difficult to say. The reason is that all studies focus on rather general outcome measures such as 'reporting a chronic condition', or 'less-than-"good" perceived general health', for which a complete picture of the etiology cannot easily be obtained. In future analyses, the use of follow-up data on more specific outcome measures, where the determinants can be established with more certainty, as well as the inclusion of a broader set of intermediary factors, should enable us to obtain a more detailed picture of the background of socio-economic inequalities in health.

Conclusion

The overview of potential sources of bias as given above, indicates that the contribution of living conditions and behaviour as assessed here might be biased. Whether the sources of bias considered affect our final conclusions as to the *relative* importance of each set of explanatory factors, is difficult to say. With respect to psychosocial factors, we see no reason to seriously doubt the estimation of their importance relative to that of material and behavioural factors. However, the results indicating the relative importance of behavioural and material factors should be viewed cautiously, given the fact that they were found to be almost equally important and the discussion with respect to the direction of potential bias was inconclusive. The results should therefore be replicated using more powerful datasets. Yet despite this uncertainty, we may conclude that material factors play a substantial role in the generation of socio-economic inequalities in health. This conclusion is sufficiently important in itself given the lack of studies which have directly looked at this issue.

6.2.2 External validity

External validity refers to the extent to which the results of a study might be generalized to people who have explicitly not been included in the sample (Bouter & van Dongen 1988). We will explore the generalizabil-

ity of our results to the Dutch population as a whole as well as to other European countries. Finally, we will discuss a somewhat different issue related to the generalizability of the results, namely the extent to which the conclusions might apply to health indicators other than those considered here.

Generalizability to the Dutch population
Our conclusions cannot automatically be generalized to the Dutch population as a whole, given the omission of certain populations in the sample. This applies in particular to ethnic minorities and the institutionalized population. As the socio-economic distribution of intermediary factors among people with Dutch nationality is likely to differ from that among other ethnic groups, we do not expect the results to be necessarily applicable to ethnic minorities. The exclusion of the institutionalized population is far less likely to have affected our conclusions as the proportion of people who stay in institutions (in the age-group 15-74) is rather small (Eijkhout & Bieseman 1993).

The question which arises is whether our conclusions may be generalized to the whole population with Dutch nationality, given the fact that the study was carried out in one selected region of the Netherlands, i.e. Eindhoven and its surroundings. Specific characteristics of that region are the high percentage of Roman Catholics, as well as the presence of several industries (Philips, Volvo/Nedcar). These characteristics could threaten the generalizability of our conclusions if they affect the association between intermediary factors on the one hand and health and socio-economic status on the other. This is not likely however. Firstly, there is no reason to assume that the causal associations between intermediary factors and health in the study population differ from those observed in the rest of the Dutch population *after* confounders such as religious affiliation have been controlled for. Secondly, the comparison with the results of other Dutch studies (see chapter 6.1 and 6.3) shows that the socio-economic distribution of specific risk factors as observed here is comparable with that in other studies. We therefore expect our conclusions to apply to the total population with Dutch nationality.

Generalizability to other European countries
A similar argument might be applied to the issue of generalizability to other countries: our conclusions will only be valid in other countries if the socio-economic distribution of intermediary factors and the association between intermediary factors and health is similar in other countries. A recent study on the socio-economic pattern of intermediary factors shows clear differences between countries (Cavelaars et al. 1995). As the socio-economic pattern of some behavioural factors, for example smoking, in Southern European countries is the reverse from that in Western and Northern European countries, we do not expect our results to be generalizable to the former. Whether the results are applicable to other Western European and Scandinavian countries should be studied by making a detailed comparison of the socio-economic distribution of

intermediary factors in these countries as compared to the Netherlands. In addition, the possibility that the association between intermediary factors and health differs between countries should be considered. As self-perceived health might for example reflect opinions on the value of a good health, which might differ between countries, the determinants of the health indicators employed in this thesis are not necessarily the same in other countries.

Generalizability to other health indicators
Although the studies in this thesis include several indicators, they do not cover all health aspects. The emphasis was on perceived health problems as indicated by a single question on the perceived general health status, a questionnaire on health complaints, and the Nottingham Health Profile. In addition, the prevalence of chronic conditions was used as an indicator of health. We used factor analysis to examine which health aspects were covered by these health indicators (Joung 1996). Factor analysis yielded two factors which were interpreted as a physical and mental health dimension, analoguous to the results of a study among renal patients in which the same health indicators were employed (Essink-Bot 1996). The measure of chronic conditions, perceived general health and health complaints appeared to load highly on the physical dimension. The same was true for most subscales of the Nottingham Health Profile, namely physical mobility, pain, energy, and to a lesser extent, sleep. Thus the 'emotional reaction' scale was the only one to load highly on the mental health dimension. We may thus conclude that the health indicators employed here merely indicate physical health, in a rather general way.

Whether the results of our studies are applicable to other health indicators depends on the etiology of these problems. If for example, the determinants of specific health problems differ from those for the more general measures employed here, we expect this to result in different estimates of the importance of behavioural factors and living conditions. For example in the case of lung cancer, of which smoking is the single most important determinant, the contribution of behavioural factors might be larger than that found for general measures. This implies that the conclusions of this thesis are not necessarily applicable to *specific* physical or mental health problems.

6.3 The background of socio-economic inequalities in health: general discussion

Having discussed the limitations of the empirical analyses, we will draw final conclusions as to the first and second research question, relating to the relative importance of living conditions and behavioural factors (6.3.1). In the second part of this section (6.3.2) the conclusions are related to the conceptual framework that was specified in chapter 2.1.

A preliminary remark has to be made. The conceptual framework in chapter 2.1 was developed in preparation to the LS-SEHD and therefore based on the (international) literature that was published before 1990. Since then, empirical evidence on the relative importance of several explanations has accumulated rapidly. This implies that parts of the overview in chapter 2.1 are out of date. For example, a recent study confirmed the hypothesis that social mobility does not have a major effect on health inequalities (Power et al. 1996), whereas other studies have shed more light on the role of socio-economic conditions in childhood (Power et al. 1991, Lynch et al. 1994). Furthermore, since 1990 several studies have assessed the relative importance of risk factors involved in the causation mechanism. The findings of the latter studies will be discussed below.

In addition to this, new hypotheses regarding the explanation of socio-economic inequalities in health have been put forward. They include the idea of the cumulative effect of adverse living circumstances (Davey Smith et al. 1994, Carrol et al. 1996), the concept of 'control' as a common explanation for socio-economic inequalities in a broad range of health problems (Syme 1994), and the idea of a health effect of the relative position of an individual in the social stratification (Wilkinson 1992, 1994). Some of these will be dealt with in section 6.3.2.

6.3.1 The relative importance of living conditions and behavioural factors for socio-economic inequalities in health

Relative importance of behavioural factors

In accordance with the prominent role of behavioural risks in the etiology of most common diseases and causes of death, 30-40 per cent of the increased risk of health problems in lower socio-economic groups could be traced to the relatively high prevalence of unhealthy behaviour in these strata. Although the exact percentage might be different in other studies, depending on the outcome measure used and the set of behavioural factors considered, we may conclude from these results that a substantial part of inequalities in health are due to the fact that people from the lower socio-economic strata more frequently engage in unhealthy behaviour such as smoking. This corresponds with the results of other studies, most of which relate to inequalities in heart disease (Marmot et al. 1978, Pocock et al. 1987, Hoeymans et al. 1993). Although not tested, it is likely that smoking and overweight accounted for most of the contribution of behavioural factors, given their strong association with health as well as socio-economic status.

Whereas most previous studies on the contribution of behavioural factors included men only, here both sexes were considered. In accordance with the results of another study (Hoeymans et al. 1993), the socio-economic pattern of unhealthy behaviour in women appeared to be less consistently to the disadvantage of lower socio-economic groups than in men. This raises the question whether the more irregular behavioural pattern might account for the smaller health inequalities among women. This should be tested in future research. Another factor where the socio-economic distribution differed between both sexes was physical exercise. Our results indicate the potential importance of this factor for men, but it appeared less so for women. It should be mentioned, however, that physical exercise only in leisure time was considered. It might be hypothesized that the lack of physical exercise as observed in lower socio-economic groups among men in particular, is compensated for by the fact that they are more frequently employed in physically demanding work.

Background of behavioural differences

The studies in this thesis not only give support for a substantial contribution of behavioural factors, but also for the idea that behavioural factors cannot be separated from living circumstances. British authors especially have frequently stressed the interdependence between behaviour and living conditions (Macintyre 1986, Whitehead 1990, Graham 1993). A few qualitative studies have considered this issue by exploring the way material living conditions of people in lower socio-economic groups induce them to smoke (e.g. Graham 1993, 1994). The results of the *quantitative* analysis we carried out, suggest that this explanation accounts for a substantial proportion of the higher prevalence of smokers in lower socio-economic groups. Financial conditions were found to be more important than other material conditions (adverse housing and neighbourhood conditions and employment status) or psychosocial stress-related factors. Although the analysis relates to one specific behavioural factor, namely smoking, it seems likely that a similar mechanism is operative for other behavioural factors. This applies for example to excessive alcohol consumption. It might be hypothesized that stress leads to an increase in alcohol consumption, although available studies show inconsistent results (Romelsjö et al. 1991). Other behavioural factors such as lack of physical exercise and dietary habits might also be linked to the financial situation, but through a different mechanism: the choice for healthy food as well as for physical exercise might be *limited* by financial means. Future research should indicate whether the results we reported for smoking also hold for other behavioural factors.

We are not aware of studies which explore the interdependency between behaviour and living conditions in relation to inequalities in *health*. We however looked at this issue. We found evidence to suggest that a substantial part of the contribution of behavioural factors could actually be traced to the worse material conditions of the lower socio-economic strata. Due to this overlap the sum of the percentage of inequalities accounted for by each group of factors will exceed 100 per cent.

It should be mentioned that this result does not *diminish* the importance of behavioural factors: our conclusion that people in lower socio-economic strata are to a large extent less healthy because, for example, they smoke more frequently, is still valid. When considering this fact, however, one should realize that the higher prevalence of unhealthy behaviour leading to inequalities in health cannot be isolated from the conditions people live in. This has important consequences for policy which will be explored in section 6.4.

Direct contribution of material conditions
The previous conclusions regarding behavioural differences imply that the effect of *material* conditions is at least partly established through unhealthy behaviour. Apart from such an indirect link, we found evidence to suggest a direct contribution of material factors, i.e. independently of behaviour.

Firstly, the role of deprivation in the generation of income inequalities in health should be mentioned. Similar to the results of other studies (Engbersen et al. 1996), we found high levels of deprivation in the lowest income groups. As compared to previous studies, our analysis contains a new element in the sense that we studied the health effect of being deprived. We not only found evidence for an independent effect of income, but also for this effect to reflect high levels of basic and social deprivation. Other material conditions, i.e. conditions not so dependent on income, such as housing and working conditions and employment status, were also found to contribute to health inequalities independently of behavioural differences. Given the strong association with health as well as the steep socio-economic distribution, working conditions seem to be particularly important. These results reinforce the conclusions from other studies on the relevance of working conditions for socio-economic inequalities in health (Schroër & Bullinga 1990, Lundberg 1991). Additional evidence in support of this hypothesis is provided by the analyses on the background of the smaller socio-economic inequalities in health among women (chapter 4.4). The results suggest that the fact that inequalities in women are smaller is related to the relatively low prevalence of adverse working conditions in women in the lower socio-economic strata as compared to men.

The mechanisms by which material factors, independently of behavioural factors, affect health, were mostly unexplored in this thesis. The biological plausibility of a health effect of physical working and housing conditions probably needs no further discussion. Less is known however, about the way factors such as deprivation, neighbourhood conditions and employment status might affect health. As indicated in chapter 4.2, the health effects of deprivation seem to take place through a psychosocial or behavioural mechanism. This result might be biased however by the fact that the factors involved in a direct, "physiological" mechanism, such as inadequate diet, have not been adequately measured here. The psychosocial mechanism by which deprivation relates to ill health might involve,

for example, self-esteem. Future research studying the plausibility of such a mechanism will clearly benefit from the inclusion of more direct measurements of bodily responses indicating stress, and a more direct measurement of psychological factors such as self-esteem. Moreover, it should be studied whether the material factors considered here have a comparable effect on for example mortality or the incidence of diseases.

Relative importance of material conditions

In this thesis, material factors, affecting health status through a direct route or through behavioural factors, were found to account for around 30-50 per cent of the observed differences in health. This result should be interpreted with caution, however, given the potential sources of bias as discussed in section 6.2. For example, after controlling for one of these, namely the tendency to complain, the contribution diminished to around 30-40 per cent. The results nevertheless indicate that the material explanation is at least as important as the behavioural explanation when explaining socio-economic inequalities in health. Similar findings were reported in a previous Dutch study (Joosten 1995). This seems to support the conclusion of the Black Report in which material conditions were seen as the most likely cause of socio-economic inequalities in health (Townsend et al. 1988). It should be mentioned however, that in the Black Report, the material explanation was largely defined in terms of poverty (Vågerö & Illsley 1995), whereas our results are based on a wider definition.

Relative importance of psychosocial conditions

So far psychosocial stressors have received less attention than behavioural and material factors in the debate on socio-economic inequalities in health. Most empirical studies on the importance of psychosocial factors originate in the United States. They show that at least some of the inequalities in health are due to a higher exposure to stressful events and conditions in lower socio-economic groups, and to the fact that people from lower strata are more severely affected by stressful events (Kessler 1979, 1980, Adler et al. 1994).

In this thesis too, we found evidence to suggest that part of inequalities in health result from the higher exposure to stressful conditions in lower socio-economic groups. Stressful conditions, partly materially based, appeared to underlie 10-15 per cent of the socio-economic inequalities in self-perceived health problems. Stressors which should be conceived as non-material, such as difficulties in relationships or the death of a loved one, seem to contribute less to inequalities in health than materially based stressors. This lessens the importance of the psychosocial stress explanation as such. It suggests that the psychosocial explanation should be viewed as part of the material explanation rather than as a separate mechanism.

Given the fact that most factors which might negatively affect the way people cope with problems (such as lack of social support, external locus of control, and less effective coping styles) are more common among lower socio-economic groups (Sivera van der Sluijs et al. 1996, Ranchor

1994), we expected the health impact of stressors to be larger in these groups. Our results suggest otherwise however. A comparison with the results of other studies suggests that this so-called vulnerability hypothesis might be applicable to specific stressors only. Further studies should explore this issue in more detail.

Final remark

As we have previously stressed, the results of the studies in this thesis should not be considered as a final answer to the question of how socio-economic inequalities in health arise. Apart from methodological limitations as discussed in the previous section, the LS-SEHD is clearly limited in the degree of detail that can be obtained from it, due to the decision to study the *relative* importance of several explanations. This study aim necessitates the measurement of a very broad range of explanatory factors. This approach is one of the strengths of the LS-SEHD, as compared to other studies in this field (see chapter 3), but is also a source of limitation. In other words, it provides a general but rather crude picture of the background of socio-economic inequalities in health. Attempting to cover all the background variables relevant to inequalities in health prevents a more detailed study of one specific explanation. Using data from the LS-SEHD one could for example estimate the relative importance of working conditions. However if the aim is to explore *which* specific working conditions account for the higher prevalence of health problems, one should carry out a more detailed study focusing on the working population, and using data which give an in-depth picture of the exposure to dust, stressors etc.

Despite the relatively crude measures employed in the LS-SEHD, further analyses using data from this study could yield more information about the role of specific determinants than provided in this thesis. Future analyses should for example look at the importance of specific behaviours such as smoking, alcohol consumption and diet, as well as specific aspects of working and housing conditions.

6.3.2 Social stratification and health inequalities: some refinements to the conceptual model

In this section we will propose some refinements to the conceptual model underlying the empirical studies (chapter 2.1). These refinements reflect second thoughts which follow from the results of the empirical studies.

In the conceptual model the 'causation explanation' was represented as an effect of socio-economic status through the uneven distribution of specific risk factors. In this thesis, we have quantified the importance of some of these factors by assessing to what extent inequalities in health could be traced to the higher prevalence of unhealthy behaviour and adverse living conditions in lower socio-economic groups. This research strategy fits the epidemiological research tradition which studies the frequency of health problems as a function of determinants (Rothman 1986).

Since it is through the specific determinants that the influence of socio-economic status on health is decided, this conceptualization of the

causation mechanism is useful when trying to find indications for the reduction of socio-economic inequalities in health. The drawback of this conceptualization is, however, that we may neglect the determinant of primary interest, i.e. socio-economic status (Link & Phelan 1995). After all, the access to health-related resources such as material and cultural factors and knowledge is determined by a person's position in the social stratification. The occupational level of an individual for example determines the working conditions he is exposed to, whereas the financial means determine the access to housing conditions. Furthermore the social pattern of behaviour is rooted in socio-cultural differences.

The way social stratification determines the access to health-related resources has hardly been studied in this thesis. We did study however the way the proximate determinants are interrelated. This applies in particular to the interrelationship between living conditions and behaviour.

Behavioural factors

In the empirical studies the link between social stratification and the distribution of behaviour was examined by exploring how behaviour was embedded in living conditions. The findings of our studies indicate that the sharp contrast between a behavioural and material explanation is false. This contrast however is frequently made in the scientific and political debate (cf. for example the Black Report). Socio-economic differences in behaviour do reflect differences in individual *acting* and as such need to be distinguished from circumstances. However differences in acting do not necessarily reflect individual *choices* (Vågerö & Illsley 1995, Evans & Stoddart 1994). Instead, living conditions play a role in shaping behavioural differences, and both explanations therefore cannot be separated. This implies that, when studying the background of socio-economic inequalities in health, behavioural factors and living conditions should be examined in relation to each other.

Although in chapter 5 we were able to explain part of the higher prevalence of smoking in lower socio-economic groups, another part remained unexplained. In addressing this issue, we emphasized that future research should include more determinants. Basically however, it remained unclear how to interpret this 'unexplained part'. If other determinants had been included, would we have been able to explain *all* differences? Or does the 'unexplained part' indicate that differences in behaviour for some part reflect free choices, as suggested in the normative argument in chapter 2.2?

The fact that the prevalence of smokers differs according to socio-economic group, indicates that the choice to smoke is partly shaped by the social structure. If the choice to smoke had *not* been affected by the social structure, one would have expected the percentage of smokers to be randomly distributed, therefore equal in each socio-economic group. This implies that all differences in behaviour between socio-economic groups eventually are likely to be traceable to the effect of the social stratification, directly or through other proximate determinants. This does not

mean to deny that a certain behaviour may be based on individual choices independently of the social environment. For example, people within a certain socio-economic group do not all engage in the same behaviour. Both in lower and higher socio-economic groups some people smoke, whereas others do not. Yet differences in behaviour that are *systematically* related to the socio-economic position are likely to be caused by the social structure. This argument has important consequences for the arguments surrounding policy measures to reduce health inequalities. Does it for example imply that free choice does not play any role in the generation of socio-economic differences in behaviour? This issue will be discussed in section 6.4.

Living conditions

In contrast with behaviour, the background of the socio-economic distribution of living conditions has not been further explored. This might be justified by referring to the normative argument in chapter 2.2. It was argued that inequalities in health which follow from differences in behaviour are unjust to the extent that they are determined by factors which are beyond the control of the individual. The policy framework therefore prescribes exploring the background of behavioural differences. Inequalities in health that follow from living conditions were unconditionally considered to be unjust, implying that there was no need to further study the background to their distribution.

Yet exploring the way living conditions interact and cumulate during the life-course, might be useful to further increase our understanding of the generation of socio-economic health inequalities (Davey Smith et al. 1994). If, for example, an individual 'inherits' socio-economic features from his parents (Engbersen 1991), this will have important implications for policy measures to reduce health inequalities. Exploring these issues in empirical research is worthwhile, although it requires a further specification of the mechanisms by which socio-economic conditions might affect each other.

Health inequalities: inextricably bound up with social stratification

The above implies that we consider all proximate determinants explaining inequalities in health to be embedded in the social structure. Thus when concentrating on the proximate determinants in between socio-economic status and health, as was done in the empirical studies and the underlying conceptual model, it should be borne in mind that the distribution of these determinants is *caused* by the social structure.

The picture that emerges from this is one of health inequalities being inextricably bound up with social stratification. As long as society is divided into social strata, and health is a scarce and valued good, socio-economic inequalities in health will exist to a certain extent. This is not to suggest that there is one general factor underlying inequalities in health as some authors seem to suggest (Hertzman et al. 1994, Evans & Stoddart 1994). Instead, there are many mechanisms linking health to the social structure. Within these mechanisms, behavioural factors and living conditions and also attitudes and personality interact in a complex way.

Direct health effect of social stratification

A further refinement to the conceptual model relates to a probably direct effect of socio-economic status on health. In the conceptual model the socio-economic position is expected to affect health indirectly, that means through more specific health-related resources such as behaviour and living conditions. However, some of the empirical findings in this thesis also provide evidence to suggest a *direct* effect of socio-economic status on health. They relate to the role of income and to that of attitudes and personality.

Income was found to account for a substantial part of inequalities in health, both directly and through behaviour. Whereas in the case of for example, working and housing conditions, the *access* to these resources is determined by the socio-economic position of an individual, income is one of the elements that *constitute* the position of an individual in the social stratification (Tax et al. 1990).

Recently, the *relative* position of an individual within the income distribution framework, rather than low income in itself has been suggested to affect health, through psychosocial factors such as self-esteem and social support (Wilkinson 1992a, 1992b). Empirical studies on the association between income distribution and the average health status of the population seem to support this view (e.g. Kaplan et al. 1996). Obviously this hypothesis, and in particular the nature of the detrimental effects on health, has to be further explored before final conclusions as to the validity of this explanation can be drawn (Judge 1995, Davey Smith 1996). Yet if this mechanism appears to be operative, it will be social stratification itself which leads to inequalities in health.

Also our findings with respect to locus of control and neuroticism suggest that socio-economic status might have a direct effect on health. It is certain that the concept of socio-economic status carries with it a socio-cultural element. People from higher and lower socio-economic groups differ from each other with respect to what they do in leisure time, what clothes they wear, the communication styles they use, the food they like etc. Although cultural differences, in contrast with income, education and occupation, do not constitute the position of the individual in the socio-economic stratification, they are nevertheless closely linked to socio-economic positions. More specifically, unequal living conditions are hypothesized to lead to differences in dispositions, including personality and attitudes: "shared experiences associated with these positions are generalized by social learning and shaped into enduring dispositions" (Dimaggio 1994, p. 460). The shared experiences include, for example, material living conditions (House 1981). In particular, job conditions such as self-direction, seem to be a crucial factor in this respect (Kohn & Slomczynski 1990). Also poverty seems an important condition, as some of the poor have been shown to share a 'culture of poverty' (Lewis 1966).

Both personality factors and attitudes were distinguished in the original model. They were expected to play a role in the behavioural

explanation. In the studies in this thesis we found evidence to suggest the importance of two of these for inequalities in behaviour. Firstly, locus of control appeared to partly explain the relatively low percentage of people in lower socio-economic groups who had quit smoking. However, apart from its effect on health behaviour, it seems likely that the more external locus of control in lower socio-economic groups also contributes *directly* to the higher frequency of health problems in these groups as this factor has been shown to be an independent determinant of mortality (Seeman & Lewis 1995). Some authors even suggest that belief in lack of control over one's own life (i.e. powerlessness) plays a major role in the generation of socio-economic inequalities in health (Syme & Berkman 1976, Mirowsky & Ross 1986, Syme 1989). It is assumed to affect health by increasing the vulnerability to diseases *in general*, due to an effect on the body's defense system (Syme 1989). This therefore indicates a mechanism linking social stratification with *multiple* disease outcomes.

Besides locus of control, the higher neuroticism scores of lower socio-economic groups explained some of the higher smoking rates. Moreover, we found some evidence that neuroticism affects health directly. The chapter on psychosocial stressors (4.3) showed that part of their contribution was biased by the influence of neuroticism on reporting both stressors and health status. Although not studied directly, this indicates the importance of this personality trait for the explanation of socio-economic inequalities in self-perceived health. It suggests that part of the higher prevalence of perceived health problems in lower socio-economic groups is due to differences in *perception* between people from higher and lower socio-economic groups, independent of differences in objective health status. This may (partly) explain why we found the gap between higher and lower socio-economic groups to be smaller for more objective health problems than for subjective aspects of health. Therefore these and probably also other orientations that are closely linked to the socio-economic position, might play a role in the generation of socio-economic inequalities in health. This suggests another mechanism, not mentioned in the original conceptual model, by which social stratification affects health.

Finally, health itself might be part of the culture of a socio-economic group, for example the function of health and illness might differ between strata. Given the few opportunities for people in lower socio-economic groups to control their lives, illness might for example function here as a legitimation for release from social obligations such as work. Alternatively being in very good health might function as a status symbol for people in higher socio-economic groups. This might explain why people in lower socio-economic groups report worse health, but probably also plays a role in the demarcation of socio-economic groups as far as the socio-cultural dividing lines are concerned. Although an extensive discussion of these mechanisms is beyond the scope of this thesis, it reinforces the idea that health is also directly linked to social stratification.

6.4 Policy implications

This section deals with the third research question concerning the consequences of the results of the empirical analyses for health policy. The results will be related to the policy framework as specified in chapter 2.2, in order to determine how socio-economic inequalities in health are to be judged (6.4.1) as well as to explore the implications for policy (6.4.2).

6.4.1 Socio-economic inequalities in health: unjust and avoidable?

Starting from the principle of maximizing individual freedom of choice, in chapter 2.2 it was argued that society should strive for equal opportunities to be healthy. This implies that everyone should have an equal chance of living a long and healthy life. According to this line of reasoning, whether socio-economic inequalities in health are unjust or not depends on their origins. Inequalities in health which result from differences in living conditions that were not chosen nor controlled by the individual, are considered inequities and should be reduced. However, inequalities which result from free, individual choices are not to be considered unjust, and should in general be accepted, given the high value attached to individual freedom in this account.

Sometimes policy measures to reduce inequalities in health are justified on the basis of a public health argument (Mackenbach 1992, Gunning-Schepers 1994, Vågerö 1995). In this line of argument the underlying rationale of policy to reduce inequalities in health is the wish to improve public health. It is argued that differences in health point at a considerable potential improvement of the average health status of the population and should therefore be reduced. If for example, the prevalence of chronic conditions in lower and middle socio-economic groups were as low as in the highest group, the overall prevalence of chronic conditions theoretically would decrease with around 25 per cent (Stronks et al. 1993).

Although the public health argument gives the appearance of being morally neutral, it in fact is not. Because improving the *average* health status of the population is the target of this policy, it can be seen as a variant of the utilitarian principle of the 'greatest good for the greatest number'. This argument is therefore vulnerable to the critique directed at the utilitarian conception of justice, namely that the distribution of the 'good' is irrelevant as long as the average is optimal. An extensive discussion of this principle is beyond the scope of this thesis. To a certain extent however, the utilitarian argument and the liberal argument as defended here face similar moral questions, in particular with respect to the justification of interventions in private life.

Given the findings of the empirical studies on the background of socio-economic inequalities in health, how should inequalities in health be judged?

Living conditions

Material determinants appeared to be crucial in the generation of socio-economic inequalities in health. An important part of the inequalities

could be traced to inequalities in material conditions, including housing and working conditions, deprivation and employment status. These conditions clearly affect the opportunities of an individual to be healthy. Most people who work in health damaging working conditions for example, do not choose to do so, nor does the presence of financial problems in the lower income groups reflect a free choice. Theoretically, the distribution of these resources is amenable to interventions, as they are the (by-) product of social processes. Therefore a substantial part of inequalities in health as observed here are unjust.

Although of less importance, *psychosocial stressors* also explained a part of the observed inequalities in health. These factors were not considered in chapter 2.2, as the classification of determinants in that chapter was based on the traditional classification applied in a Dutch policy document (Tweede Kamer 1986), in which psychosocial stressors are absent.

The exposure to stressors affects the opportunity to be healthy. Inequalities in health which follow from a differential exposure therefore should be considered unjust. The extent to which society can actually influence the distribution of psychosocial stressors is a matter for discussion, however. On the one hand, it should be recognized that personal psychosocial conditions too might be shaped by the social structure, for example when the workplace generates stress. To the extent that the distribution of these factors are the (by-)product of social processes, they should be considered unjust. But, as far as psychosocial stressors are based on personal circumstances such as relationships with others, they hardly seem amenable to (government) interventions. This might probably explain why this set of determinants is not mentioned in government documents. This implies that the social distribution of psychosocial stressors seems less easily changed than that of material factors. Some of the inequalities in health that result from the higher exposure to psychosocial stressors are therefore probably unavoidable.

Behaviour

Whereas the moral judgement of inequalities in health which arise from unequal living conditions is relatively straightforward and the conviction that these inequalities should be reduced widely shared (Whitehead 1990, Gunning-Schepers 1994), the moral justification of a policy aimed at *behavioural determinants* is far more complex. In this thesis, differences in behaviour were found to underlie a substantial part of inequalities in health. Following the arguments developed in chapter 2.2, these inequalities are unjust if differences in behaviour are embedded in the social or physical environment or in other factors limiting individual choice. However, behavioural differences based on freely made choices do not reflect unequal chances. The question upon which the moral judgement of behavioural differences rests is thus the following: do differences in behaviour between socio-economic groups reflect freely made choices (Klein 1988, Pereira 1993)? To some extent this is an *empirical* question. Yet this question has a *normative* component too relating to the notion of 'free will'.

The empirical data presented in chapter 5 demonstrate that differences in behaviour such as smoking and alcohol consumption are partly shaped by material conditions. In addition in section 6.3.2 it was argued that all systematic differences in behaviour between socio-economic groups are likely to be embedded in the social structure. The issue here is the implication of this statement for the moral judgement of socio-economic inequalities in health. If all socio-economic differences in behaviour are shaped by the social structure, does this imply that none of these differences reflect freely made choices and that all inequalities in health due to differences in behaviour are considered to be unjust?

The answer to this question depends on the way 'free will' is conceived. The notion of free will should be placed in the context of the principle of positive freedom, introduced in chapter 2.2, and refers to the ability of an individual to choose his own life plan. It is obvious that there are many factors which might limit 'free will'. If, for example, someone's income is too low to afford a healthy diet, his dietary pattern is not freely chosen. The same applies to a situation in which someone is unaware of the health risks of his diet.

If, in this line of reasoning, all factors which affect health behaviour are seen as *constraints* of free choice thereby limiting free will, then *all* inequalities in health due to differences in behaviour are unjust. It follows logically from the normative argument that differences in health are acceptable only if they result from freely chosen behaviour. This might imply that a just distribution of health requires policy makers to promote, for example, the prevalence of smoking in low socio-economic groups to become as low as in high socio-economic groups.

However, it might also be argued that whether a certain behaviour reflects free will or not depends on the type of constraint on that behaviour. Consider the first example given above, in which someone's income is too low to afford a healthy diet. In that case the diet is almost completely determined by someone's financial means. Compare it with a person living on a high income who does not eat healthily because he has never learnt to do so. In the second case the dietary pattern seems to reflect a more autonomous choice than in the first situation. Philosophical literature provides ideas to further substantiate this argument.

Some philosophers argue that being a member of a certain *culture* does not limit individual choice but instead enables people to choose (Kymlicka 1991, Raz 1993). By being a member of a certain group, people will internalize that particular culture. The cultural norms which are common in that group will be transformed into individual preferences, and the norms contribute to who people are. The individual, in other words, might be said to partly derive his identity from that culture, and individual choices that are shaped by that culture might considered to be free choices. In this line of reasoning culture should not be conceived as a factor that limits free choice. On the contrary, the availability of options to choose from presupposes a culture.

Therefore from this point of view, inequalities in health which result from cultural differences reflect free choices and, given the normative ar-

gument outlined in chapter 2.2, should not be considered unjust. This probably applies to ethnic differences, for example Turkish people, a minority group living in the Netherlands. The culture that is common to this ethnic group will generally be seen as constituting their identity, as compared to that of Dutch people, and individual behaviour that is shaped by that culture might be said to reflect autonomous choices. As a result, inequalities in health between the Turkish and the Dutch which reflect differences in cultural identity will in general not be considered unjust.

What does this imply for health inequalities which follow from *socio*-cultural differences? As indicated previously, people in a certain socio-economic group share a certain lifestyle and cultural norms. Through these they distinguish themselves from other groups. The cultural norms might therefore be said to constitute the identity of people in different socio-economic groups as in the case of differences between ethnic groups. Behavioural choices that fit the culture which is common to a specific group might, in this line of reasoning, be considered free choices.

What complicates the moral judgement of socio-cultural differences, however, is the fact that these differences might have been shaped by material and other living conditions. Bourdieu (1984) for example has studied the way the dietary pattern of the 'bourgeoisie' differed from that of the 'working class'. He argues that the observed differences reflect the way people have adapted to their living conditions. A similar argument is provided by the 'culture of poverty' theory (Lewis 1966). As inequalities in health which arise from living conditions should be considered unjust, inequalities in health which arise from cultural differences that are shaped by material or other living conditions, are also unjust.

Furthermore, it might be argued that, partly as a consequence of the interaction between culture and socio-economic inequality, the behaviour of people in lower socio-economic groups is almost completely determined by the cultural norms that are common in these groups. If this is so, the claim that culture *enables* people to choose seems unjustified, as the individual has no option but to conform to that culture. Smoking in relation to locus of control might serve as an example. If people in the lower strata are less inclined to stop smoking because they more frequently have an external locus of control, and if we assume that this orientation is closely associated with a low socio-economic position, it seems hardly possible for an individual to depart from the common practice of smoking. This argument does not apply to all socio-cultural differences however. In the case of, for example, beliefs and attitudes that define what a valuable life would be like, or ideas about what to do in leisure time, or attitudes towards drinking behaviour, it seems reasonable to suppose that someone has the option to choose certain behaviour that does *not* fit the cultural norms that are common in his social class.

The above implies that if cultural differences exist *independently* of socio-economic disadvantage, and if it might reasonably be argued that an individual could have chosen otherwise, the resulting behavioural differences might be said to reflect free choices. This seems to apply to at least

some cultural differences between socio-economic groups, such as differences in dietary patterns or leisure activities. Differences in the pattern of alcohol consumption might serve as an example. The fact that it is more common in lower socio-economic groups to drink beer as compared to wine, is unlikely to be related to (actual) differences in living conditions. Moreover, it seems realistic to suppose that someone has the option to depart from that common practice. The resulting inequalities in health, if any, therefore do not seem to be unjust.

In order to draw a final conclusion as to the unjustice of inequalities in health that arise from cultural differences, we should have information about for example the extent to which these differences are associated with adverse circumstances in lower socio-economic groups. It is obvious that this question cannot easily be answered. In addition, the choice between different conceptions of free will is a normative one, and cannot be made on the basis of scientific reasoning alone. This implies that, so far, this discussion is inconclusive. Nevertheless, we may conclude that the higher prevalence of at least some unhealthy behaviour in lower socio-economic groups might be said to reflect free choices.

Justification of policy measures addressing individual behaviour

What does this imply for policy? Which measures should be taken to reduce socio-economic differences in behaviour?

Starting from the *a priori* of equal concern and respect, we should ensure that each person is equally able to work out the life plan he really wants. This implies that we should try to prevent socio-economic differences in behaviour that are rooted in unequal circumstances from arising. This requires the barriers for free choice, which are most prevalent in the lower socio-economic strata, to be removed. The government is not allowed, however, to impose a particular conception of the good life on people in a certain socio-economic group, such as living healthily, or to forbid behaviour that conflicts with that particular conception. Living healthily cannot be judged superior to engaging in unhealthy behaviour. The most government should do is *enabling* people in all socio-economic strata to adopt a healthy lifestyle. This implies that health promotion campaigns should be supportive but should not limit personal choice about what constitutes the good life. In the line of reasoning outlined above, differences in behaviour which are rooted in culture independently of living conditions should be conceived as freely chosen differences, implying that they should, in general, be accepted.

If follows from this that interventions aimed at improving health-related behaviour in lower socio-economic groups should be aimed at the determinants of behaviour that restrict free choice. This applies in the first place to a lack of knowledge of the health effects of certain behaviour. The principle of equal opportunities requires people in all social strata to be informed about the health effects of, say smoking, or a lack of physical exercise. Other obstacles to free choice which should be addressed include material and psychosocial stress-related constraints. Inequalities in behaviour resulting from living conditions have been argued to be unjust, and this holds independently of whether these

conditions directly affect health or affect health through behaviour. The same applies to a lack of personal skills as far as this is associated with socio-economic disadvantage. It might hinder people in lower socio-economic groups to alter their behaviour and should therefore be overcome, for example by providing social and practical support or by interventions aimed at building up self-esteem.

Given the wish to respect individual freedom, interventions that interfere with individual choices are, in general, not justified. In chapter 2.2 it was argued that the ideal of positive freedom requires that there is some area in which an individual is free to decide. Therefore, measures prohibiting or prescribing certain health-related behaviour for example, would be unacceptable to most of us, even if they address differences in behaviour which are not freely chosen. This is of course conditional. If individual behaviour harms the health of others, a restriction on individual freedom seems justified. This so-called 'harm principle' for example underlies the restriction of smoking in public places, in order to protect non-smokers from the health effects of passive smoking (Jackson 1995). In addition, in some cases interference with free choice can be justified on a paternalistic argument, i.e. interference for the individual's own good. The wish to show everyone equal respect allows for a so-called weak form of paternalism in which the individual freedom is only fairly limited (Beauchamp 1980). Examples are taxation on alcohol and tobacco, which might reduce the number of smokers and drinkers in lower strata in particular. Also restricting availability of cigarettes for people under 16 might be justified on the paternalistic argument.

Conclusion

To conclude, a substantial part of socio-economic inequalities in health should be considered unjust. This applies to inequalities arising as a result of material conditions, directly or through behaviour. The same applies to differences in psychosocial conditions, although part of the health inequalities which are rooted in psychosocial conditions are probably unavoidable. One should not however, be too optimistic about the possibilities to realise equality in material and psychosocial conditions. Differences in living conditions which are theoretically amenable to intervention, might in practice be less easily changed. It is naive for example to expect income differences as a whole to disappear. Morever, despite potential policy measures which reduce socio-economic differences, we know that there will always be an unequal distribution of natural resources, for example intelligence. Therefore socio-economic inequality, for example with respect to education, will always remain. This implies that we should strive for equal opportunities to attain health, in the knowledge that this ideal will never be fully realised.

Furthermore, inequalities in health which result from behavioural differences should be partly considered unjust. This applies in particular to differences which result from material barriers to free choice such as a low income. The extent to which inequalities in health that are rooted in culture independently of material inequalities are unjust, is a matter of discussion. If differences in behaviour which follow from differences in

culture are seen as reflecting freely made choices, inequalities in health arising from these behavioural differences cannot be considered unjust. If, however, all determinants of behaviour, including culture, are conceived as factors limiting free choice, then all inequalities in health which result from behavioural differences should be considered unjust. Some inequalities in health that arise as a result of behavioural differences should also be considered unavoidable. This is the consequence of, firstly, the fact that some of the underlying inequality in material conditions cannot be altered, and secondly, the wish to respect individual freedom.

6.4.2 Policy measures to reduce socio-economic inequalities in health

Improving the health status of people in the lower socio-economic strata is one of the central policy aims of the Dutch Ministry of Public Health (Tweede Kamer 1995). Given the results of the empirical studies (6.3) and the justification of health policy to reduce inequalities in health (6.4.1), how might this goal be achieved?

The conclusion that inequality in health is inextricably bound up with the social structure (section 6.3.2) might suggest that altering the social structure is the only way to reduce inequalities in health. This is not true. Some determinants might be changed without addressing the social structure itself. This applies in the first place to medical care. The minimum which could be expected from the Ministry of Public Health is to guarantee equal access to health care services and good quality services for all socio-economic groups. This issue is not further explored here as the use and quality of health care services were not considered in this thesis.

Housing and working conditions

Other determinants which might be changed without a reduction in the degree of underlying socio-economic inequality include housing and working conditions.

Although access to housing and working conditions is determined by someone's socio-economic position, the accompanying health risk might 'simply' be eliminated by for example improving the quality of housing, and improving the physical working conditions of people in lower status jobs. The importance of addressing these conditions has frequently been stressed (Townsend et al. 1988, Whitehead & Dahlgren 1991, Dahlgren & Whitehead 1992, WRR 1991, Mackenbach 1994a, Benzeval et al. 1995), and is supported by the empirical findings presented in this thesis. More specifically, our findings provide reasonable evidence to suggest that if we succeed in improving working and housing conditions, inequalities in health will substantially diminish.

The policy measures which have been suggested with respect to *working conditions* include the reduction of physical health hazards, increasing the possibilities for employees to have control over their work as well as for personal development (a.o. Balemans & van Vliet 1991, Dahlgren & Whitehead 1992). Although in the Netherlands a great deal of effort has been made to improve working conditions of lower occupational groups, there are clearly possibilities for further improvement, given for example

the high percentage of people who do not work because of work-related health problems (Balemans & van Vliet 1991).

The policy measures which have been recommended with respect to *housing conditions* focus on physical and social conditions (Dahlgren & Whitehead 1992, Best 1995). The importance of such measures is supported by the empirical findings presented in this thesis. For example we found neighbourhood conditions to account for inequalities in health. This supports the 'Healthy Cities' movement, aimed at for example improving the livability of a neighbourhood or guaranteeing playgrounds for children.

Behavioural factors

To a certain extent, differences in health-related *behaviour* might also be reduced without changing the underlying social structure, namely by means of health promotion. Available studies provide evidence to suggest that health promotion campaigns succeed in altering the health-related habits of lower socio-economic groups (van Limpt et al. 1990, Gepkens & Gunning-Schepers 1995, NHS/CRD 1995, Whitehead 1995). On the basis of a recent overview of health care interventions it is concluded that these studies do not allow for firm conclusions as to the elements which are necessary conditions for success (NHS/CRD 1995). The results of the empirical studies in this thesis give reasonable evidence to support the idea that interventions to reduce health-damaging behaviour should not neglect the social and physical environment (Schmid et al. 1995, Whitehead 1995). They showed that differences in behaviour generate from elements of the social position itself (e.g. income) or characteristics which are closely related to it (e.g. locus of control). The policy implications of these findings seem twofold.

Firstly, it seems reasonable to assume that health promotion will only be effective if it fits the orientations and knowledge of those people to whom the message is directed (Godin & Lagasse 1994). The findings presented here for example indicate that the more externally oriented locus of control of lower socio-economic groups makes it more difficult for them to stop smoking. This might explain why they will benefit less from health education than higher socio-economic groups. If someone does not believe he can influence his own health, or to give another example, if smoking behaviour is not health-motivated, providing information on the health effects of smoking does not make sense. Health promotion campaigns should therefore be tailored to the orientations which are common in lower socio-economic groups.

Secondly, our results provide evidence to support the opinion that health campaigns should be supplemented with society-level measures, aimed at an improvement of living conditions (Schmid et al. 1995). To inform people about a healthy diet for example, is useless if a lack of financial means hinder people to buy healthy food. Society-level measures might include interventions in the social structure itself, in particular with respect to the income distribution (Dahlgren & Whitehead 1992, Benzeval et al. 1995). Our results for example suggest that a substantial reduction of smokers might follow from an improvement of the financial situation

of lower socio-economic groups.

More fundamental measures addressing behaviour also include interventions with a so-called empowerment focus (Whitehead 1995). These are aimed at people learning skills which make it easier for them to adopt health promoting behaviour, and promoting feelings of self-esteem (NHS/CRD 1995, Whitehead 1995). The relevance of this strategy is supported by the finding that locus of control seems to account for part of the differences in the percentage of people that had quit smoking. As locus of control and other personality factors and attitudes underlying behaviour are partly shaped by education, educational policy might also be an instrument to change health-related behaviour (Mirowsky & Ross 1986, Syme 1989). Although equality of educational opportunities is a central aim of Dutch policy, this ideal has not yet been fully realised. Recent studies indicate that a person's social background is still an independent determinant of his educational level (Dronkers & de Graaf 1995).

Addressing the underlying causes of differences in behaviour (attitudes, material conditions) might not only increase the effectiveness of an intervention targeting a specific health-related habit, but might also help to remove differences in *other* behaviour. The social pattern of say smoking and lack of physical exercise is likely to share the same determinants. If we succeed in reducing the prevalence of smokers in lower socio-economic groups by addressing the underlying orientation for example, this might affect other behaviour too.

Conversely, an intervention targeting a *specific* health-related habit might lead to differences in other behaviour. Raising the price of cigarettes for example, will enforce people to engage in other health damaging behaviour if their smoking behaviour has been chosen as a way of coping with adverse circumstances. In that situation, the alternative behaviour should be considered as a 'competing risk factor', analoguous to the concept of 'competing causes of death' (Chiang 1991). Eliminating the underlying causes of the distribution of certain behaviour, for example by diminishing income differences, prevent other risk factors of gaining influence. In addition, taxation on cigarettes and alcohol might even have a reverse effect on the health status of lower socio-economic groups as it further worsens the financial situation of smokers and drinkers in these groups (Marsh & McKay 1994, Benzeval et al. 1995).

Income and deprivation

In this thesis, the income of people at the lower end of the income distribution has been shown to damage health. This finding stresses the importance of reducing the prevalence of deprivation in these groups and preventing them from falling below the social minimum if inequalities in health are to be reduced (Benzeval et al. 1995, Davey Smith 1996). What is in fact going on in our country is a policy acting contrary to this. As a consequence of current government policy the financial situation of certain groups is expected to worsen (Pommer & Ruitenberg 1995).

Others have made detailed recommendations to improve the income

situation of people at the lower end of the distribution (Quick & Wilkinson 1991, Benzeval et al. 1995). As unemployment is one of the causes of poverty, these recommendations also relate to employment measures (a.o. Dahlgren & Whitehead 1992, BMA 1994). Stimulating participation in the labour market is one of the central aims of the Dutch government. From the viewpoint of the wish to equalize opportunities for health, policy measures should not only focus on the average unemployment rate, but give special attention to the labour market position of lower socio-economic groups. This is not only important with respect to the level of income, but also in view of the adverse health effects of being unemployed itself. Apart from macro-economic measures, a less 'fundamental' approach might be chosen, aimed at decreasing the vulnerability of the unemployed from the health effects of unemployment, for example by providing social support (Gepkens & Gunning-Schepers 1995).

Intersectoral action

As stated in chapter 2.2, possibilities to reduce socio-economic inequalities in health are clearly limited by the fact that interventions on most determinants will have to come from other Ministries than the Ministry of Public Health. As 'equality of opportunities for health' is certainly not the primary goal of other policy fields, intersectoral action will face conflicts between policy aims. For example the health perspective is clearly not the dominant perspective when it comes to income distribution. Improving the income situation of lower socio-economic groups in order to reduce inequalities in health, might therefore conflict with the central aim of most governments in Western Europe to reduce the size of the public sector for example.

Now that the empirical studies have indicated that living conditions account for a substantial part of inequalities in health, directly or through behaviour, this limitation becomes even more prominent. The results reinforce the view that the possibilities for activities by the Ministry of Public Health relating to health promotion and the access to health care services, are limited. A substantial reduction of inequalities therefore is only to be expected if the Ministry succeeds in stimulating activities from other departments.

Excuse for not doing anything about inequalities in health?

Some comments given above could be read as a warning against far-reaching optimism about the possibilities to reduce inequalities in health. In combination with the complexity of the etiology of socio-economic inequalities and the need for further research, policy makers might use this as an excuse for not doing anything about inequalities in health: "if policy measures are expected to have limited success only, and knowledge on the explanation of socio-economic inequalities in health is still limited, why initiate policy measures to reduce them?". This reaction seems unjustified, for the following reasons.

Firstly, it was argued that inequalities in opportunities to achieve health is contrary to values which are widely shared in the Western

world: the wish to guarantee people freedom of choice, based on the ideal of equal concern and respect. Given the values attached to this principle, we should take *any* opportunity to equalize opportunities to attain health.

Secondly, it is a misunderstanding that we should have a complete picture on the background of inequalities in health before interventions can be implemented. After all, the proximate determinants through which the health effect of an individual's socio-economic position is settled are closely related to distinctive elements of that position. This implies that for example raising the income of the lower socio-economic groups might be expected to lead to better health for these groups, even if we do not have a complete picture on the causal pathway which links low income with ill health. This strategy has the additional advantage of simultaneously affecting a broad range of proximate determinants.

The above of course does not apply to *all* determinants of socio-economic inequalities in health. Interventions aimed at an improvement of the working conditions in a certain industry for example, should address exactly those elements from which the health problems arise. This clearly presupposes detailed knowledge on for example the exposure to a certain carcinogenic material, or the posture that causes back complaints. Overall, however, the need for more detailed knowledge should not prevent us from initiating policy measures to reduce inequalities in health.

6.5 Implications for research

In this chapter as well as in chapter 4 and 5, we have identified several pieces of missing information regarding the explanation of socio-economic inequalities in health. From these, the following key approaches for future research emerge.

Central to the empirical studies in this thesis was the so-called causation mechanism: the causal processes that link socio-economic status with health. It has been argued that, when studying proximate risk factors in between socio-economic status and health, we should not neglect the determinant of primary interest, i.e. socio-economic status. As all intermediary factors in between socio-economic status and health are eventually embedded in the social structure itself, health policy might benefit from knowledge of the link between proximate determinants and socio-economic status. Studying the contribution of smoking for example, thereby neglecting the mechanism linking smoking with socio-economic status, does not reveal sufficient information to design effective interventions to reduce smoking. This implies that, rather than concentrating on a specific explanation, different explanatory mechanisms and factors should be studied in relation to each other. The LS-SEHD provides good opportunities to unravel the mechanisms linking social stratification with health, as it includes a very broad range of explanatory factors and mechanism.

This general recommendation might be further specified as follows. The determinants of differences in behavioural patterns, including living conditions, psychological factors and orientations should be identified in the first place. In this thesis we studied the background of socio-economic differences in smoking. Future analyses within the LS-SEHD will consider differences in other behavioural factors such as alcohol consumption and physical exercise. In addition, future research should include more determinants than included here, in particular with respect to cultural differences. Finally, this research question might require the use of a qualitative methodology. Quantifying the role of material conditions obviously requires a quantitative methodology, as we used. If, however, the aim is to understand the mechanism by which smoking is linked to these conditions, a qualitative methodology might be more appropriate.

The complex interaction between material and psychosocial living conditions and individual characteristics (personality, attitudes etc.), hardly studied in this thesis, should also be the subject of future research. Several research question emerge which might be addressed within the LS-SEHD. Does psychosocial stress operate as an intermediary between material factors and health or as independent explanation? How do differences in orientations generate from differences in living conditions? and if they follow from living conditions, do they have an independent health effect, or does this effect simply reflect an effect of the living conditions?

Moreover, whereas in this thesis the proximate determinants of socio-economic inequalities in health were mainly dealt with as a group,

further analyses using LS-SEHD data will look at the contribution of specific proximate determinants such as working conditions, quality of housing, smoking and dietary habits.

In addition, the (direct) health effect of the socio-economic position itself needs further attention. This applies to the level of income in the first place, but also to education and occupational level, given their association with psychological factors and orientations such as powerlessness and control.

A following issue which deserves attention is the idea that the mechanisms which link socio-economic status and health differ between social strata (Anderson & Armstead 1995). Our analysis on deprivation provides some evidence to support this idea as deprivation accounted for the prevalence of health problems in the lower socio-economic strata only. The same might be true for other explanatory factors. It might be hypothesized for example, that differences in health-related behaviour between the middle and higher socio-economic groups are largely embedded in cultural factors whereas the higher prevalence of health-damaging behaviour in the lower strata is accounted for by material conditions (Hart 1986). This indicates two different explanatory models, i.e. one for the upper and one for the lower part of the social structure, which might have implications for health policy.

A final direction for future research relates to the issue of 'free will'. The justification of interventions relating to behaviour appeared to rest on the question of whether behaviour is freely chosen or not. The answer to that question is equivocal, and needs further explanation than that which could be achieved in this thesis. For example, in this thesis we studied the way individual behaviour is shaped by structural constraints such as income and culture. This approach has the advantage of revealing the fundamental *causes* of differences in behaviour between socio-economic groups. The drawback, however, is that we largely ignore the individual *motives and reasons* for a certain behaviour. In order to further increase our understanding of the issue of free choice in relation to socio-economic differences in behaviour, it might be useful to study this also from the perspective of the individual, by exploring the motives, reasons or barriers for a certain behaviour as the individual himself conceives them. Conversely, trying to map reality as the individual himself sees it might be misleading, as the social factors which structure the individual behaviour remain largely invisible (Williams 1995). These two approaches therefore are complementary.

Although there is clearly a need for further research on the background of socio-economic inequalities in health, this should never be an excuse for not using the knowledge which is already available. We think this thesis has contributed to the increase of that knowledge and identified opportunities for further reduction of socio-economic inequalities in health.

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Summary

Empirical studies in many countries show that people who are worst off as far as their socio-economic position is concerned are also worst off when it comes to health. Health problems for which the frequency rises with decreasing socio-economic position range from subjective health problems to specific chronic conditions and mortality.

The explanation of these differences is still largely unknown in the Netherlands (as it is in other countries), although the number of studies which not merely describe the inequalities but also investigate the determinants, is increasing. This thesis addresses the background of these so-called socio-economic inequalities in health as well as the consequences for health policy.

Several explanations have been put forward with regard to the origins of socio-economic inequalities in health. *Chapter 2.1* contains a review of the international literature and gives a description of the conceptual model on which the empirical analyses in this thesis are based. According to current scientific opinion both processes of 'selection' (health influences socio-economic position through health-related social mobility) and of 'causation' (socio-economic position influences health through the differential distribution of specific risk factors) play a role in socio-economic inequalities in health, although there is some evidence that 'causation' is the more important mechanism.

Specific risk factors which may be involved in the 'causation' mechanism can be grouped into health-related behavioural factors (e.g. smoking, nutrition), material factors (e.g. material deprivation, occupational exposures) and psychosocial stress-related factors (e.g. life events, lack of social support). The distribution of these risk factors across socio-economic groups in its turn probably is partly determined by childhood environment (e.g. socio-economic position of parents) and attitudes and personality (e.g. neuroticism, locus of control, orientation towards the future).

The focus of this thesis is on the 'causation mechanism'. The aim was to explore which specific risk factors account for the relationship between socio-economic status and health. In order to increase the relevance of the empirical studies for health policy, the research question was further structured by the policy framework as outlined in *chapter 2.2*. In that chapter it is argued that it is the government's responsibility to pursue equality in health, conceived as equal opportunities to achieve health. This principle is justified as part of the principle of maximizing individual freedom of choice, and requires that everyone has the opportunity to be as healthy as possible. According to this principle, socio-economic inequalities in health which are rooted in living conditions (material and psychosocial environment and health care) should be considered unjust. Inequalities in health arising as a result of differences in behaviour are considered as inequities if the behavioural differences are embedded in

the social or physical environment or in other factors limiting individual choice. Behavioural differences based on freely made choices do not reflect unequal chances, and should therefore not be seen as unjust.

Hence from a policy perspective it appears to be crucial to make a distinction between behavioural factors on the one hand, and living conditions, which are not chosen or controlled by the individual, on the other. Moreover, it follows from the policy framework that the background of the uneven distribution of behavioural factors should be explored. If differences in behaviour do not reflect *free* choices, the resulting inequalities in health should be seen as unjust.

Given this normative argument the general study aim of this thesis of 'exploring which specific risk factors account for the relationship between socio-economic status and health' can be further specified as follows (*chapter 2.3*):

1. To assess the relative importance of socio-economic differences in material and psychosocial *living conditions* for the explanation of socio-economic inequalities in health.
2. To assess the relative importance of socio-economic differences in *behaviour* for the explanation of socio-economic inequalities in health and to explore the living conditions in which differences in behaviour are embedded.
3. To explore the policy measures which should be taken to reduce socio-economic inequalities in health given the indications for the explanation of inequalities which were offered by the empirical studies in this thesis.

The health indicators used relate to objective (chronic conditions) as well as subjective health problems (health complaints, perceived health problems and perceived general health). All were based on self-report.

All empirical analyses in this thesis are based on the baseline data collection of the Longitudinal Study on Socio-Economic Differences in Health (LS-SEHD). This is a large prospective cohort study in the Netherlands. It started in 1991. In *chapter 3* the *design and data collection* of the LS-SEHD are described.

In chapter 4 the importance of *living conditions* for socio-economic inequalities in health is assessed. Studies which actually address the relevance of such factors directly, are scarce. Instead, the evidence which is frequently cited as supporting the importance of these factors for the generation of socio-economic inequalities in health, is rather indirect. One example of such indirect evidence is the observation that the association between *income* and health is stronger than that between other indicators of socio-economic status and health. As level of income is considered to be the most appropriate indicator of the material component of socio-economic status, this finding might indicate the importance of the material explanation. The analysis in *chapter 4.1* critically assesses this piece of evidence. It was explored whether the association between income and health might be disturbed by a third factor, i.e. employment status. As job

loss often implies a lowering of income, we expected the association between income and health at least partly to reflect an association between employment status and health. Our results show that this is indeed the case. Especially the uneven distribution of the long-term disabled was found to underlie the strong association between income and health. As the disabled mainly are out of paid employment because of health problems, we concluded that the relationship between income and health at least partly reflects a selection effect: an effect of health on income through employment status. Hence the relatively large differences in health between income groups do not necessarily indicate the relative importance of material factors for inequalities in health.

The other analyses presented in chapter 4 address the issue of the relative contribution of living conditions more directly. *Chapter 4.2* deals with the effect of income on health through deprivation. It examines, firstly, whether income is independently associated with health, and secondly, to what extent this association reflects high levels of deprivation in low income groups. Large inequalities in health by (equivalent) income were observed after differences in other socio-economic indicators had been controlled for. A substantial part of the increased health risks of the lowest income groups could statistically be accounted for by the prevalence of material and social deprivation in these groups. The results provide evidence in support of an indirect link between deprivation and health involving psychological or behavioural factors.

The focus of *chapter 4.3* is on the relative importance of psychosocial stressors such as life-events and long-term difficulties. Socio-economic differences in neuroticism were controlled for in order to eliminate any bias which might arise from the fact that people in lower socio-economic groups are more inclined to report both stressors and health problems. The higher exposure to stressors was found to contribute to the increased risk of perceived health problems, even after differences in neuroticism were taken into account. Approximately 10-15 per cent of the inequalities in health problems could be traced to the higher prevalence of stressors in lower socio-economic groups. Long-term difficulties, especially those related to material conditions, account for most of the effect. The impact of stress on health was hardly found to be moderated by socio-economic status. This means that our analysis did not yield evidence as to support the view that people from lower socio-economic groups are more affected by stressful events and conditions.

The analysis presented in *chapter 4.4* focuses on one specific living condition, i.e. employment status, in relation to differences in the size of socio-economic inequalities in health between men and women. In general, socio-economic inequalities in health are smaller among women than among men. We assessed whether the smaller inequalities in health among women might be due to a gender difference in employment status. Our results show that this is indeed the case. The smaller socio-economic inequalities in health among women were partly due to a less pronounced concentration in women than in men of relatively unhealthy employment status categories without a paid job (unemployed, long-term work disabled) in lower socio-economic groups. As at least a substantial part of

the long-term disabled do not work because of work-related health problems, this result also points at the importance of working conditions for socio-economic inequalities in health among men.

The relative contribution of *behavioural factors* in relation to living conditions is assessed in chapter 5. *Chapter 5.1* examines the relative importance of behavioural versus material factors and the extent to which differences in behaviour are embedded in material conditions. When analysed separately, both behavioural and material factors contributed substantially to observed inequalities in health. Behavioural factors accounted for approximately 30-40 per cent of the observed differences, whereas 30-50 per cent of the inequalities in health could be traced to the uneven distribution of material factors. In a simultaneous analysis, both groups of factors had a substantial part of their contribution in common. We consider it to be more likely that behaviour is embedded in material conditions than vice versa. We therefore defined the overlap between both explanations as an indirect contribution of material conditions, through behaviour. In our analysis, the total (direct plus indirect) contribution of material factors is larger than that of behavioural factors.

Chapter 5.2 addresses differences in smoking between socio-economic groups. It examines the cultural, material and psychosocial correlates of the socio-economic gradient in smoking behaviour among adults. Current smokers were compared with former and never smokers respectively. A substantial part (20-40 per cent) of the increased risk of being a smoker in lower socio-economic groups appeared to be associated with adverse material conditions. The financial situation especially accounted for the effect. Locus of control was found to be a correlate of the educational gradient in the case that smokers were compared with former smokers. It accounted for approximately 30 per cent of the socio-economic gradient. Psychosocial factors accounted for less of the socio-economic gradient in smoking than cultural and material determinants.

Chapter 6 summarises and discusses the results of the empirical analyses.

Given the central aims of this thesis, and taking into account the potential sources of bias which could threaten the validity of the results of the empirical analyses *(chapter 6.2)*, the empirical findings might be summarised as follows *(chapter 6.3.1)*. In accordance with the prominent role of behavioural risks in the etiology of most common diseases and causes of death, 30-40 per cent of the increased risk of health problems in lower socio-economic groups could be traced to the relatively high prevalence of unhealthy behaviour in these strata. In addition, a substantial part of the contribution of behavioural factors could actually be traced to the worse material conditions of the lower socio-economic strata. Apart from such an indirect link, we found evidence to suggest a direct contribution of material factors, i.e. independently of behaviour. In this thesis, material factors, affecting health status through a direct route or through behavioural factors, were found to account for 30-50 per cent of the observed differences in health. This result should be interpreted with caution, however, given the fact that both the measurement of health

status and living conditions are based on self-report. For example, after controlling for neuroticism, as an indicator of the tendency to complain, the contribution of material factors diminished to around 30-40 per cent. The contribution of psychosocial factors appeared to be smaller than that of behavioural factors and material living conditions. Stressful conditions, partly materially based, were found to underlie 10-15 per cent of the socio-economic inequalities in self-perceived health problems, directly, or through behaviour.

In *chapter 6.3.2* the conclusions of the empirical analyses are related to the conceptual framework outlined in chapter 2.1, and some refinements to the conceptual model are proposed.

In the conceptual model the 'causation explanation' was represented as an effect of socio-economic status through the uneven distribution of specific risk factors. In the empirical analyses, the importance of some of these factors have been quantified. Since it is through the specific determinants that the influence of socio-economic status on health is decided, this conceptualization of the causation mechanism is useful when trying to find indications for the reduction of socio-economic inequalities in health. The drawback of this conceptualization is, however, that we may neglect the determinant of primary interest, i.e. socio-economic status. After all, the distribution of these determinants is *caused* by the social structure.

In the empirical analyses we examined the link between social stratification and the distribution of behaviour by exploring how behaviour was embedded in living conditions. The findings of our analyses indicate that the sharp contrast between a behavioural and material explanation is false. *All* differences in behaviour that are systematically related to the socio-economic position are likely to be traced to the effect of the social stratification, directly or through other proximate determinants. The distribution of living conditions also follows from distinctive features of the position of an individual in the social stratification. The occupational level of an individual for example determines the working conditions he is exposed to, whereas the financial means determine the access to housing conditions. In contrast with behaviour, however, the way living conditions are related to social stratification has not been explored in this thesis.

The picture that emerges from this is one of health inequalities being inextricably bound up with social stratification. As long as society is divided into social strata, and health is a scarce and valued good, socio-economic inequalities in health will exist to a certain extent. Within the mechanisms linking social stratification with health, behavioural factors and living conditions and also attitudes and personality interact in a complex way.

In addition, some elements of the socio-economic position might have a direct effect on health. Some of the empirical findings in this thesis provide evidence to suggest such a mechanism. They relate to the role of income and to that of attitudes/personality, and are discussed in chapter 6.3.2.

Finally, the implications for policy are discussed. We first discussed to what extent socio-economic inequalities in health should be considered unjust, given the results of the empirical analyses in this thesis *(chapter 6.4.1)*. As unequal material and psychosocial living conditions were found to underly part of the socio-economic inequalities in health, a substantial part of the inequalities in health as observed here should be considered unjust. Some of them are probably unavoidable however, as they are not amenable to interventions. In addition, differences in living conditions which are theoretically amenable to intervention might in practice be less easily changed.

The moral judgement of socio-economic inequalities in health which are caused by differences in behaviour appeared to be complex. The question upon which this judgement rests is whether differences in behaviour between socio-economic groups reflect freely made choices. Inequalities in health which result from differences in behaviour should be partly considered unjust. This applies in particular to differences which result from material barriers to free choice such as a low income. The extent to which differences in behaviour that are rooted in cultural differences are unjust, is a matter of discussion. On the one hand, it might be argued that the individual partly derives his identity from the culture that is common to that specific social class. In this line of reasoning, individual choices that are shaped by that culture might be said to be autonomous choices. But, as cultural differences between socio-economic groups might have been shaped by material or other living conditions, inequalities in health which arise from cultural differences should also partly be considered unjust.

In order to draw a final conclusion as to the unjustice of socio-economic inequalities in health that arise from cultural differences, we should have information about the extent to which these differences are associated with adverse circumstances in lower socio-economic groups. It is obvious that this question cannot easily be answered. In addition, the choice between the different conceptions of free will is a normative one, and cannot be made on the basis of scientific reasoning alone. This implies that, so far, this discussion is inconclusive.

The aim of policy measures to reduce socio-economic differences in behaviour should be to *enable* people in all socio-economic strata to adopt a healthy lifestyle. The government is not allowed, however, to impose a particular conception of the good life on people in certain socio-economic groups, or to forbid certain behaviour that conflicts with that particular conception. Furthermore, interventions aimed at altering health-related behaviour in lower socio-economic groups should be critically assessed with respect to conflicts with the wish to respect individual freedom. If individual behaviour harms the health of others, a restriction of individual freedom seems justified. This so-called 'harm principle' for example underlies the restriction of smoking in public places, in order to protect non-smokers for the health effects of passive smoking. In addition, in some cases interferences with free choice can be justified on a paternalistic argument, i.e. interference for the individual's own good. Taxation on tobacco might serve as an example.

Some inequalities in health that arise as a result of behavioural differences should be considered unavoidable. This is the consequence of, firstly, the fact that some of the underlying inequality in material conditions cannot always be altered, and secondly, the wish to respect individual freedom.

The conclusion that inequality in health is inextricably bound up with the social structure suggests that altering the social structure is the only way to reduce inequalities in health. This is true for at least some determinants of socio-economic inequalities in health. It applies for example to income and to determinants that are closely related to socio-economic position such as personality and attitudes. In view of the results of the empirical studies, *chapter 6.4.2* discusses some policy measures which could be taken in this respect.

Other conditions might be changed *without* a reduction in the degree of socio-economic inequality, however. This applies in particular to housing and working conditions, and access to health care. Access to housing and working conditions, for example, is determined by someone's socio-economic position, but the accompanying health risk might 'simply' be eliminated by improving the quality of housing and the physical working conditions of people in lower status jobs. As the results of the empirical studies in this thesis suggest that these living conditions account for a relatively large part of socio-economic inequalities, it seems reasonable to expect that if we succeed in improving working and housing conditions inequalities in health will substantially diminish.

The socio-economic gradient in behavioural factors might also be changed without addressing the underlying social structure. It should be borne in mind, however, that an intervention targeting a specific health-related habit might lead to differences in other behaviour. Raising the price of cigarettes for example, will enforce people to engage in other health damaging behaviour if their smoking behaviour has been chosen as a way of coping with adverse circumstances. In that situation, the alternative behaviour should be considered as a 'competing risk factor', analoguous to the concept of 'competing causes of death'. This suggest that interventions aimed at behavioural differences should include health promotion campaigns as well as society-level measures, aimed at an improvement of living conditions.

Some comments given above could be read as a warning against far-reaching optimism about the possibilities to reduce inequalities in health. In combination with the complexity of the etiology of socio-economic inequalities and the need for further research, policy makers might use this as an excuse for not doing anything about inequalities in health. It is, however, a misunderstanding that we should have a complete picture on the background of inequalities in health before interventions can be implemented. After all, the proximate determinants through which the health effect of an individual's socio-economic position is settled are closely related to distinctive elements of that position. This implies that for example raising the income of the lower socio-economic groups might

be expected to lead to better health for these groups, even if we do not have a complete picture on the causal pathway which links low income with ill health.

Although the studies in this thesis have contributed to our knowledge on the background to socio-economic inequalities in health, many questions remained. Some of these are discussed in *chapter 6.5*. They for example relate to the contribution of specific risk factors (such as smoking or specific working conditions), as well as to the way behavioural factors, living conditions and individual characteristics interact. Future analyses using data from the Longitudinal Study on Socio-Economic Health Differences will address some of these questions.

Samenvatting

Empirisch onderzoek heeft inmiddels veelvuldig aangetoond dat laag opgeleiden, mensen met een laag inkomen en/of een beroep met een laag aanzien, in het algemeen ongezonder zijn dan mensen met een hogere sociaal-economische status. Deze zgn. sociaal-economische gezondheidsverschillen zijn voor veel verschillende aspecten van de gezondheid aangetoond: voor subjectieve gezondheidsproblemen en ervaren gezondheidstoestand, maar ook voor sterfte en chronische aandoeningen.

Hoe die verschillen in gezondheid ontstaan, is voor een groot deel onbekend. Dit geldt zowel voor Nederland als voor de ons omringende landen. Het aantal studies waarin deze verschillen niet alleen worden beschreven, maar waarin ook de verklaring ervan wordt onderzocht, neemt echter de laatste jaren toe. In dit proefschrift staat de verklaring van sociaal-economische gezondheidsverschillen centraal. In een aantal empirische analyses is het belang van verschillende determinanten van die gezondheidsverschillen onderzocht. Bovendien worden de implicaties van de resultaten van deze studies voor gezondheidsbeleid bediscussieerd.

In de (internationale) literatuur zijn verschillende mechanismen ter verklaring van sociaal-economische gezondheidsverschillen beschreven. *Hoofdstuk 2.1* geeft een overzicht van die literatuur, en beschrijft het conceptuele model waarop de empirische studies gebaseerd zijn. Volgens de heersende opvattingen spelen zowel processen van 'selectie' (gezondheid beïnvloedt de sociaal-economische positie via gezondheidsgerelateerde sociale mobiliteit) als 'causatie' (sociaal-economische positie beïnvloedt de gezondheid via de 'scheve' verdeling van specifieke risicofactoren) een rol bij het ontstaan van sociaal-economische gezondheidsverschillen. Er zijn aanwijzingen dat het causatiemechanisme belangrijker is dan het selectiemechanisme.

De specifieke risicofactoren die mogelijk een rol spelen in het causatiemechanisme, kunnen worden onderverdeeld in gedragsfactoren (roken, voeding etc.), materiële factoren (materiële deprivatie, expositie aan arbeidsrisico's etc.), en psychosociale stress factoren (life-events, gebrek aan sociale steun etc.). De verdeling van deze factoren over sociaal-economische groepen wordt gedeeltelijk bepaald door uiteenlopende omstandigheden tijdens de jeugd (sociaal-economische positie van de ouders bijv.), en attitudes en persoonlijkheid (neuroticisme, beheersingsoriëntatie, toekomstgerichtheid etc.).

In dit proefschrift staat de verklaring van sociaal-economische gezondheidsverschillen vanuit het 'causatie-mechanisme' centraal. Het doel was te onderzoeken welke specifieke risicofactoren de relatie tussen sociaal-economische status en gezondheid kunnen verklaren. Met het oog op de bruikbaarheid van de empirische studies voor beleid, is deze in algemene termen geformuleerde onderzoeksvraag verder gestructureerd aan de hand van de normatieve analyse in *hoofdstuk 2.2*. In dat hoofdstuk is beargumenteerd waarom het de verantwoordelijkheid van de overheid is naar gelijkheid in gezondheid te streven, ingevuld als gelijke kansen op ge-

zondheid. Dit principe is onderdeel van het bredere principe van het maximaliseren van individuele vrijheid, en vereist dat iedereen zo gezond mogelijk is. Uitgaande van dit beginsel moeten sociaal-economische gezondheidsverschillen die geworteld zijn in levensomstandigheden (materiële en psychosociale omgeving en gezondheidszorg), als onrechtvaardig worden beschouwd. Verschillen in gezondheid die voortkomen uit verschillen in gedrag, zijn onrechtvaardig voor zover die gedragsverschillen ingebed zijn in materiële en psychosociale omgevingsfactoren of in andere factoren die de individuele keuzevrijheid beperken. Echter, verschillen in gezondheid die voortkomen uit in vrijheid gekozen gedrag, reflecteren geen ongelijke kansen op gezondheid, en kunnen derhalve niet als onrechtvaardig betiteld worden.

Gegeven deze normatieve argumentatie is het vanuit beleidsperspectief relevant een onderscheid te maken tussen gedragsfactoren aan de ene kant, en levensomstandigheden, welke voor het individu niet beheersbaar zijn, aan de andere kant. Bovendien vloeit uit de normatieve argumentatie voort dat het belangrijk is de achtergronden van verschillen in gedrag te analyseren. Immers, als gedrag niet op een vrije keuze berust, moeten de resulterende verschillen in gezondheid als onrechtvaardig beschouwd worden.

Vanuit deze normatieve argumentatie kan de algemene doelstelling te 'onderzoeken welke specifieke risicofactoren de relatie tussen sociaal-economische status en gezondheid verklaren' als volgt gespecificeerd worden *(hoofdstuk 2.3)*:

1. Het schatten van de relatieve bijdrage van sociaal-economische verschillen in materiële en psychosociale *levensomstandigheden* voor de verklaring van sociaal-economische verschillen in gezondheid.
2. Het schatten van de relatieve bijdrage van sociaal-economische verschillen in *gedrag* voor de verklaring van sociaal-economische verschillen in gezondheid, en het exploreren van de omstandigheden waarin verschillen in gedrag zijn ingebed.
3. Het analyseren van de beleidsconsequenties van de resultaten van de empirische analyses.

In de empirische analyses is zowel van indicatoren voor objectieve gezondheid (chronische aandoeningen) als van indicatoren voor subjectieve gezondheid (gezondheidsklachten, ervaren gezondheidsproblemen en algemene beoordeling eigen gezondheid) gebruik gemaakt. Deze zijn alle gebaseerd op zelf-rapportage.

Alle empirische studies in dit proefschrift zijn gebaseerd op de eerste-ronde dataverzameling van de Longitudinale Studie naar Sociaal-Economische Gezondheidsverschillen (LS-SEGV). Dit is een groot prospectief cohort onderzoek. De baseline meting vond in 1991 plaats. In *hoofdstuk 3* wordt de *dataverzameling en de onderzoeksopzet* van de LS-SEGV besproken.

In hoofdstuk 4 is onderzocht in hoeverre *levensomstandigheden* een rol spelen in het ontstaan van sociaal-economische gezondheidsverschillen. Er is weinig onderzoek bekend waarin het relatieve belang van levensomstandigheden op directe wijze is geschat. De bewijsvoering is daarentegen veelal indirect. Zo wordt wel als bewijs voor het belang van de materiële verklaring aangevoerd dat de samenhang tussen inkomen en gezondheid sterker is dan die tussen andere sociaal-economische indicatoren en gezondheid, aannemende dat inkomen met name de materiële component van sociaal-economische status indiceert. In *hoofdstuk 4.1* wordt onderzocht of dit een valide redenering is. Een reden om aan de juistheid ervan te twijfelen is dat de relatie tussen inkomen en gezondheid mogelijk 'verstoord' wordt door een derde factor, te weten positie op de arbeidsmarkt. Omdat het verlies van betaald werk vaak gepaard gaat met een daling van het inkomen, is het aannemelijk dat de relatie tussen inkomen en gezondheid tenminste gedeeltelijk een reflectie is van de samenhang tussen positie op de arbeidsmarkt en gezondheid. De resultaten van de empirische analyse in hoofdstuk 4.1 bevestigen deze hypothese. De relatief sterke relatie tussen inkomen en gezondheid bleek voor een belangrijk deel terug te voeren op de sterke concentratie van arbeidsongeschikten in de laagste inkomensgroepen. Omdat arbeidsongeschikten als gevolg van hun gezondheid een daling in inkomen hebben ondergaan (via verlies van betaald werk), wijst dit resultaat erop dat de relatie tussen inkomen en gezondheid voor tenminste een deel op het 'selectie-mechanisme' berust: een effect van gezondheid op het inkomen. Dit betekent dat de sterke relatie tussen inkomen en gezondheid niet zonder meer als bewijs aangevoerd mag worden voor het relatieve belang van materiële factoren in het ontstaan van sociaal-economische gezondheidsverschillen.

In de overige empirische analyses in hoofdstuk 4 is het relatieve belang van levensomstandigheden op een meer directe manier bestudeerd. In *hoofdstuk 4.2* staat het effect van inkomen op gezondheid via relatieve deprivatie centraal. Onderzocht is of inkomen een onafhankelijk effect op gezondheid heeft, dat wil zeggen onafhankelijk van het effect van andere sociaal-economische indicatoren. Bovendien is nagegaan in welke mate dat onafhankelijke effect een reflectie is van het feit dat een groot deel van degenen met een laag inkomen gedepriveerd is. Uit deze analyse bleek dat de verschillen in gezondheid naar equivalent inkomen groot zijn, ook nadat voor andere sociaal-economische indicatoren gecontroleerd is. Een groot deel van het verhoogde risico van de laagste inkomensgroepen kon in statistische zin teruggevoerd worden op de hoge prevalentie van materiële en sociale deprivatie in deze groepen. De gegevens leveren aanwijzingen voor het belang van een indirect effect van deprivatie op gezondheid, via psychologische - en mogelijk ook gedragsfactoren.

In *hoofdstuk 4.3* is de bijdrage van psychosociale stressoren onderzocht. Deze vallen uiteen in life-events en langdurige levensmoeilijkheden. De bijdrage van deze factoren is geschat onder controle voor verschillen in neuroticisme. Doel van deze controle is de bias te elimineren die zou kunnen ontstaan doordat personen in lagere sociaal-economische groepen, meer dan degenen uit hogere groepen geneigd zijn stressoren èn gezondheidsproblemen te rapporteren. Uit deze studie bleek dat de

'scheve' verdeling van stressoren een deel van de gezondheidsverschillen kon verklaren, ook nadat voor verschillen in neuroticisme gecontroleerd was. Ongeveer 10-15 procent van de verschillen in gezondheid kon in statistische zin worden verklaard uit het feit dat personen uit lagere sociaal-economische groepen vaker aan stressoren zijn blootgesteld. Langdurige levensmoeilijkheden bleken in dit opzicht belangrijker dan life-events. De studie leverde echter nauwelijks aanwijzingen voor het idee dat het effect van stressoren op gezondheid gemodificeerd wordt onder invloed van sociaal-economische status. Dit betekent dat de hypothese dat de negatieve gezondheidseffecten van stressoren sterker merkbaar zijn onder personen in lagere sociaal-economische groepen, omdat deze er minder goed mee om zouden gaan, in dit onderzoek niet bevestigd is.

De studie in *hoofdstuk 4.4* gaat in op één specifiek element van de materiële verklaring, te weten positie op de arbeidsmarkt. Deze factor is onderzocht in relatie tot de relatief kleine verschillen in gezondheid onder vrouwen in vergelijking met mannen. Nagegaan is in hoeverre de kleinere verschillen in gezondheid onder vrouwen het gevolg zijn van het feit dat vrouwen een andere positie op de arbeidsmarkt hebben dan mannen. De analyse die in dat hoofdstuk is gepresenteerd laat zien dat dit inderdaad het geval is. Dat de verschillen in gezondheid onder vrouwen kleiner waren, kon voor een deel verklaard worden uit het feit dat groepen zonder betaald werk met een relatief slechte gezondheid (werklozen, arbeidsongeschikten) onder vrouwen veel minder sterk in de lagere sociaal-economische groepen geclusterd waren dan onder mannen. Omdat tenminste een deel van de arbeidsongeschikten geen werk meer heeft vanwege aan het werk gerelateerde gezondheidsproblemen, leveren deze resultaten ook aanwijzingen voor het belang van arbeidsomstandigheden ter verklaring van sociaal-economische gezondheidsverschillen onder mannen.

In hoofdstuk 5 is de relatieve bijdrage van *gedragsfactoren* onderzocht, in relatie tot levensomstandigheden. In *hoofdstuk 5.1* is allereerst de relatieve bijdrage van gedrags- versus materiële factoren bestudeerd, alsmede de mate waarin verschillen in gedrag in materiële omstandigheden zijn ingebed. Wanneer het belang van beide groepen factoren apart geanalyseerd werd, bleken ze beide in hoge mate bij te dragen aan de geobserveerde verschillen in gezondheid. Voor gedragsfactoren is die bijdrage op ongeveer 30-40 procent geschat, en voor materiële factoren op ongeveer 30-50 procent. Wanneer beide groepen factoren gezamenlijk in de analyse werden betrokken, bleken ze een deel van hun bijdrage gemeenschappelijk te hebben. Omdat het waarschijnlijker is dat gedragsfactoren in materiële factoren zijn ingebed dan andersom, is de overlap tussen beide groepen factoren gedefinieerd als een indirecte bijdrage van materiële factoren via gedrag. In de empirische analyse in hoofdstuk 5.1 bleek de totale bijdrage van materiële factoren groter dan die van gedragsfactoren.

In *hoofdstuk 5.2* staan verschillen in rookgedrag tussen sociaal-economische groepen centraal. In dit hoofdstuk is onderzocht in hoeverre culturele, materiële en psychosociale factoren met de sociaal-economische

gradiënt in rookgedrag onder volwassenen samenhangen. De rokers (op het moment van het onderzoek) zijn vergeleken met ex-rokers en nooit-rokers, in twee aparte analyses. Een belangrijk deel (20-40 procent) van het verhoogde risico op roken in lagere sociaal-economische groepen bleek geassocieerd te zijn met de relatief slechte materiële omstandigheden in die groepen. Met name de financiële situatie bleek in dit opzicht belangrijk. Ook de meer externe beheersingsoriëntatie van lagere sociaal-economische groepen kon een deel van de opleidingsgradiënt in statistische zin verklaren, in het geval rokers met ex-rokers werden vergeleken. 30 procent van het verhoogde risico onder lagere sociaal-economische groepen bleek op deze factor terug te voeren, wat erop wijst dat de meer externe beheersingsoriëntatie van personen in lagere sociaal-economische groepen het hen bemoeilijkt met roken te stoppen. Psychosociale factoren bleken minder belangrijk voor de verklaring van verschillen in rookgedrag dan culturele en materiële factoren.

In hoofdstuk 6 zijn de resultaten van dit proefschrift samengevat en bediscussieerd.

Gegeven de centrale doelstellingen van dit proefschrift, en rekening houdend met de wijze waarop de resultaten vertekend kunnen zijn *(hoofdstuk 6.2)*, kunnen de resultaten van de empirische analyses als volgt worden samengevat *(hoofdstuk 6.3.1)*. In overeenstemming met de prominente rol van gedragsfactoren in de etiologie van de meest voorkomende ziekten en doodsoorzaken, bleek ongeveer 30-40 procent van het verhoogde risico op gezondheidsproblemen in de lagere sociaal-economische groepen terug te voeren op gedragsfactoren. Een belangrijk deel van die bijdrage bleek ingebed in de slechtere materiële levensomstandigheden van lagere sociaal-economische groepen. Daarnaast kon een deel van de geobserveerde verschillen in gezondheid uit de directe invloed van materiële factoren verklaard worden. In totaal bleek ongeveer 30-50 procent van de gezondheidsverschillen in statistische zin met de ongelijke verdeling van materiële factoren samen te hangen. Dit resultaat moet echter met de nodige voorzichtigheid geïnterpreteerd worden, gezien de mogelijke vertekening als gevolg van het feit dat de meting van zowel materiële factoren als gezondheid in deze analyse op zelf-rapportage berust. Zo bleek de bijdrage na controle voor neuroticisme, als indicator voor klaaggeneigdheid, tot ongeveer 30-40 procent te zijn afgenomen. Tenslotte, het belang van psychosociale factoren voor het ontstaan van sociaal-economische gezondheidsverschillen bleek kleiner dan dat van gedrag en materiële levensomstandigheden. Ongeveer 10-15 procent van de verschillen in gezondheid bleek met de verdeling van stressoren en life-events samen te hangen. De empirische studies leveren aanwijzingen dat ook het effect van psychosociale factoren deels via gedrag verloopt.

In *hoofdstuk 6.3.2* zijn de conclusies van de empirische analyses teruggekoppeld naar het conceptuele model dat in hoofdstuk 2.1 gepresenteerd is. Op basis hiervan zijn enkele verfijningen van dat model voorgesteld.

In het conceptuele model is de 'causatie verklaring' voorgesteld als een verklaring vanuit de 'scheve' verdeling van specifieke risicofactoren.

In de empirische analyses is het belang van een aantal van die specifieke risicofactoren gekwantificeerd. Omdat het gezondheidseffect van sociaal-economische status feitelijk via die risicofactoren verloopt, is dit een bruikbare conceptualisatie bij het uitdenken van strategieën ter verkleining van sociaal-economische gezondheidsverschillen. Het nadeel van deze conceptualisatie is echter dat de determinant waarnaar de primaire interesse uitging, sociaal-economische status, uit beeld verdwijnt. Terwijl de verdeling van de specifieke risicofactoren toch uiteindelijk door de sociale stratificatie bepaald wordt.

In de empirische studies is geprobeerd meer zicht te krijgen op de relatie tussen sociale stratificatie en gedrag, door na te gaan hoe gedrag is ingebed in levensomstandigheden. De resultaten van deze studies laten zien dat een scherp contrast tussen de verklaring van sociaal-economische gezondheidsverschillen uit gedragsfactoren en die uit levensomstandigheden, niet gerechtvaardigd is. Uiteindelijk zijn alle verschillen in gedrag die systematisch met sociaal-economische status samenhangen, terug te voeren op de sociale stratificatie, direct of via meer specifieke determinanten. Ook de verdeling van levensomstandigheden kan verklaard worden uit onderscheidende kenmerken van iemands sociaal-economische positie. Zo is iemands beroepsniveau bepalend voor de arbeidsomstandigheden waaraan hij is blootgesteld, en bepalen financiële middelen voor een belangrijk deel hoe iemand woont. Hoe levensomstandigheden en sociale stratificatie samenhangen, is in dit proefschrift echter niet onderzocht.

Het beeld dat hieruit opdoemt, is er één van een bijna onlosmakelijke verbondenheid tussen sociale stratificatie en gezondheidsverschillen. Zolang de maatschappij in sociale lagen is verdeeld, en zolang gezondheid een schaars en hoog gewaardeerd goed is, zullen er vermoedelijk sociaal-economische gezondheidsverschillen bestaan. In de vele mechanismen die sociale stratificatie met gezondheid verbinden, spelen gedragsfactoren en levensomstandigheden een rol, maar ook attitudes en persoonlijkheid.

Daarnaast hebben elementen van de sociale positie mogelijk ook een 'zelfstandig' effect op de gezondheid. Enkele resultaten van de empirische analyses leveren hiervoor aanwijzingen. Hoofdstuk 6.3.2 bespreekt enkele van die bevindingen. Ze hebben betrekking op de rol van inkomen en die van attitudes/persoonlijkheid.

Tenslotte zijn de implicaties van de empirische bevindingen voor beleid geanalyseerd. Allereerst is een analyse gemaakt van de onrechtvaardigheid van die verschillen, in het licht van de resultaten van de empirische analyses *(hoofdstuk 6.4.1)*. Omdat een groot deel van de geobserveerde verschillen in gezondheid voort bleek te komen uit de ongelijke verdeling van materiële en psychosociale levensomstandigheden, moeten bestaande gezondheidsverschillen voor een belangrijk deel als onrechtvaardig beschouwd worden. Daarnaast is een deel van die verschillen echter ook onvermijdbaar, namelijk voor zover de verdeling van levensomstandigheden niet te veranderen is. Sommige omstandigheden zijn niet door menselijk ingrijpen te veranderen (bijv. de verdeling van genetische kenmer-

ken), andere zijn misschien in principe wel veranderbaar, maar kunnen in de praktijk moeilijk aangepakt worden.

De morele beoordeling van gezondheidsverschillen die uit verschillen in gedrag voortkomen, bleek gecompliceerd. Cruciaal is de vraag of verschillen in gedrag op keuzen berusten die in vrijheid zijn gemaakt. Voor gedragsverschillen die voortkomen uit materiële factoren, zoals een (te) laag inkomen, geldt dit zeker niet. Tenminste een deel van de verschillen in gezondheid die voortkomen uit gedragsverschillen moet daarom als onrechtvaardig beschouwd worden. Op de vraag of gedragsverschillen die met culturele verschillen samenhangen onrechtvaardig zijn, is geen eenduidig antwoord mogelijk. Aan de ene kant kan betoogd worden dat een individu een deel van zijn identiteit ontleent aan de cultuur van de groep waartoe hij behoort, en dat individuele keuzen die bij die cultuur 'passen' als autonome of vrije keuzen gezien kunnen worden. Deze redenering volgend zijn verschillen in gezondheid die uit culturele verschillen voortkomen niet onrechtvaardig. Daar staat tegenover dat de cultuur van een bepaalde sociaal-economische groep deels gevormd wordt onder invloed van levensomstandigheden. In dit licht bezien zijn verschillen in gezondheid die met culturele verschillen samenhangen ook deels onrechtvaardig. Om op dit punt een definitieve conclusie te kunnen trekken, is meer informatie nodig over bijvoorbeeld de mate waarin culturele verschillen door levensomstandigheden gevormd zijn. Het moge duidelijk zijn dat dit geen eenvoudige opgave is. De vraag of individuele keuzen vrije keuzen zijn, kan bovendien niet alleen op basis van wetenschappelijke kennis beantwoord worden. Deze discussie resulteert derhalve niet in een eenduidig antwoord.

Uit het principe van gelijke kansen op gezondheid volgt dat interventies ter vermindering van ongezond gedrag in lagere sociaal-economische groepen, vooral zouden moeten ingrijpen op factoren die een vrije keuze voor bepaald gedrag verhinderen. Het moet als het ware voor iedereen, ongeacht sociaal-economische positie, *mogelijk* zijn voor een gezonde leefstijl te kiezen. Gegeven het a priori van 'equal concern and respect' is het niet gerechtvaardigd iemand een bepaalde conceptie van 'het goede leven' - bijvoorbeeld gezond leven - op te leggen, of om gedrag dat conflicteert met die conceptie te verbieden. Interventies gericht op verandering van gezondheidsgerelateerd gedrag moeten bovendien kritisch bekeken worden op de mate waarin ze conflicteren met de wens de individuele vrijheid te respecteren. Inbreuk op de individuele vrijheid lijkt gerechtvaardigd in een situatie waarin iemand door zijn gedrag de gezondheid van derden schaadt. Het rookverbod in openbare gebouwen kan op basis van dit zgn. harm-principle verdedigd worden. Ook kan voor ingrijpen in individueel gedrag een paternalistische argumentatie worden aangevoerd - bescherming van het individu voor zijn eigen bestwil. Dit is onder meer van toepassing op accijns op tabak.

Een deel van de verschillen in gezondheid die voortkomen uit gedragsverschillen moet zeker ook als onvermijdbaar gezien worden. Dit is de consequentie van, ten eerste, het feit dat sommige van de onderliggende materiële omstandigheden niet veranderd kunnen worden, en ten tweede, de wens de individuele vrijheid te respecteren.

De conclusie dat ongelijkheid in gezondheid tot op zekere hoogte onlosmakelijk verbonden is met de sociale gelaagdheid van de maatschappij, wekt de suggestie dat een reductie van gezondheidsverschillen alleen mogelijk is door in de sociale structuur in te grijpen. Deze suggestie is voor een aantal determinanten van sociaal-economische gezondheidsverschillen zeker juist. Het geldt bijvoorbeeld voor inkomen, en voor determinanten die zeer sterk met sociaal-economische positie gelieerd zijn, zoals persoonlijkheidsfactoren en attitudes. In *hoofdstuk 6.4.2* is een aantal beleidsopties op dit terrein besproken, in het licht van de bevindingen van de empirische analyses.

Aan de andere kant zijn er ook omstandigheden die veranderd kunnen worden *zonder* dat in de sociale structuur ingegrepen hoeft te worden. Dit geldt met name voor woon- en arbeidsomstandigheden, en de toegang tot gezondheidszorg. Zo wordt bijvoorbeeld de toegang tot woon- en arbeidsomstandigheden in hoge mate bepaald door iemands sociaal-economische positie, maar tegelijkertijd kunnen de gezondheidsrisico's die daarmee verbonden zijn 'simpelweg' geëlimineerd worden door de kwaliteit van de woningen en de arbeidsomstandigheden te verbeteren. Het feit dat uit de empirische analyses bleek dat beide groepen factoren een belangrijk deel van de bestaande sociaal-economische gezondheidsverschillen verklaren, wijst erop dat een verbetering van woon- en arbeidsomstandigheden tot een aanzienlijke reductie van sociaal-economische gezondheidsverschillen kan leiden.

Ook de sociaal-economische gradiënt in gedragsfactoren kan in beginsel veranderd worden zonder ingrijpen in de sociale structuur, bijvoorbeeld via voorlichtingscampagnes. Maar daarbij moet wel bedacht worden dat een interventie gericht op één bepaalde gedragsfactor gevolgen kan hebben voor de spreiding van andere gedragsfactoren. Een verhoging van de prijs van sigaretten kan er bijvoorbeeld toe leiden dat meer mensen in lagere sociaal-economische groepen stoppen met roken. Maar wanneer in die groepen (deels) gerookt wordt als een manier om de relatief slechte levensomstandigheden het hoofd te bieden - de empirische analyses in dit proefschrift leveren aanwijzingen voor het belang van dit mechanisme - dan is het aannemelijk dat sommigen vervolgens voor ander (gezondheidsschadend) gedrag kiezen. Dit alternatieve gedrag kan dan als een 'concurrerende risicofactor' beschouwd worden, analoog aan het concept van 'concurrerende doodsoorzaken'. Dit pleit ervoor dat interventies ter verbetering van gezondheidsgedrag in lagere sociaal-economische groepen, ook maatregelen omvatten ter verbetering van de levensomstandigheden in die groepen.

Sommige van bovenstaande opmerkingen kunnen gelezen worden als een waarschuwing tegen een vergaand optimisme over de mogelijkheden sociaal-economische gezondheidsverschillen te verkleinen. In combinatie met de complexiteit van de verklaring van die gezondheidsverschillen en de noodzaak tot verder onderzoek, kan dit mogelijk voor beleidsmakers aanleiding zijn niets aan het bestaan van die verschillen te doen. Echter, het is een misvatting te denken dat ingrijpen onmogelijk is zolang onze kennis over het ontstaan van sociaal-economische beperkt is. Juist omdat

de verdeling van specifieke determinanten zo sterk met de sociale structuur gelieerd is, is te verwachten dat een ingrijpen in de sociale structuur, bijvoorbeeld in de inkomensverdeling of de opleidingskansen, tot een verkleining van sociaal-economische gezondheidsverschillen zal leiden. Ook zonder dat we precies weten hoe het effect van de sociaal-economische positie op gezondheid verloopt.

Hoewel de studies in dit proefschrift onze kennis over het ontstaan van sociaal-economische gezondheidsverschillen vergroot hebben, blijven nog vele vragen onbeantwoord. In *hoofdstuk 6.5* worden enkele hiervan kort besproken. Deze betreffen onder meer de relatieve bijdrage van specifieke risicofactoren (bijv. roken, specifieke arbeidsomstandigheden), alsmede de interactie tussen gedrags- en omgevingsfactoren, en individuele kenmerken. In toekomstige analyses in het kader van de Longitudinale Studie Sociaal-Economische Gezondheidsverschillen zal een deel van die onbeantwoorde vragen zeker aan de orde komen.

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