General introduction

SOCIOECONOMIC INEQUALITIES IN HEALTH

Social inequality is one of the most distinct commonalities of human civilizations. Irrespective of the political, economic, or geographical context of a society or country, there is always a particular hierarchy within the population of that society. This hierarchy is traditionally referred to as 'social stratification', where those in a more privileged position are assigned to a higher 'strata' than those in a less privileged position. In current Western societies, social stratification is usually related to the 'socioeconomic' layering of different groups within populations. These socioeconomic layers are referred to as socioeconomic position (SEP) or socioeconomic status (SES) and constitute of a combination of education, occupation, income, wealth and social status [1].[1]

Socioeconomic position and health are inextricably linked to each other. Data on the distribution of health within Western societies has consistently shown that lower socioeconomic groups (usually measured by education, occupation or income) have a substantially higher mortality rate than higher socioeconomic groups [2-10]. Moreover, of this already shorter life, lower socioeconomic groups also live more years in poorer health (i.e. with disabilities or disease) [11-14]. For example, life-expectancy (2011-2014) of individuals with a primary education or less is six years lower than that of individuals with a master or bachelor degree in The Netherlands; the difference in disability-free life-expectancy is almost 19 years [15]. These differences in health are not just observed between the highest and lowest socioeconomic groups, but an almost linear relationship between socioeconomic position and health is usually observed. This relationship – or 'gradient' – has been observed for several health outcomes (e.g. mortality [3, 8, 9], life-expectancy [11, 13, 16, 17], self-assessed health [12, 18-20], quality of life [11, 21]), and is found in many countries and across varying time-periods [4-10, 22-29]. The persistence – and widening – of socioeconomic inequalities in health, even in countries with high economic prosperity or generous welfare programs, has therefore been called one of the great disappointments of public health [30].

1 In this thesis – following the arguments of Krieger et al. [1] – we use the term socioeconomic position rather than socioeconomic status to emphasize that the socioeconomic layering of populations is not merely a matter of differences in resources (e.g. differences in educational attainment or income), but also of characteristics that pertain to relative positions in socially ranked societies (e.g. social status).

TRADITIONAL EXPLANATIONS FOR SOCIOECONOMIC INEQUALITIES IN HEALTH

Although evidence of the differential distribution of health across the dimensions of socioeconomic position has been available for more than a century, research that aims to explain the strong socioeconomic gradient in health has steadily increased after publication of the Black Report in 1980 [31, 32]. In this landmark publication, four potential explanations were mentioned: artefact, natural/social selection, materialist/structural and cultural/behavioral. The artefact explanation states that the observed association between socioeconomic position and health is an artefact of the way socioeconomic position and health are measured (e.g. inaccurate measures of socioeconomic position and health or measurement error). The natural/social selection explanation can be divided into 'direct selection' and 'indirect selection'. Direct selection refers to a direct effect of health on socioeconomic position. For example, children may suffer from an illness and, as a result, have a less successful educational trajectory, which may lead to a less successful occupational trajectory later in life; adults may turn ill and subsequently move down the socioeconomic hierarchy by losing their job or income. Indirect selection refers to health determinants that affect both socioeconomic position and health. For example, personal characteristics, such as cognitive ability and personality profiles, may make it more likely to reach a higher educational or occupational level, and the same characteristics may also positively affect health. The materialist/structural and cultural/behavioral explanations are both part of the 'causation' mechanism, which states that socioeconomic position affects health. Both explanations identify a set of intermediary factors that could explain the effect of socioeconomic position on health. The materialist/structural explanation states that the physical, material conditions of life (e.g. working and housing conditions, neighborhood environment, material deprivation and economic resources), as well as psychosocial factors (e.g. job security and stability, job satisfaction and physical and mental strain) are determined by socioeconomic position and influence health. The cultural/behavioral explanation states that differences in health-related behaviors between different socioeconomic groups lead to differences in health. The Black Report concluded that while all explanations may contribute to some extent to socioeconomic inequalities in health, the materialist/structuralist explanation provided the best answer: *"Intellectual honesty demands that we make clear our belief that it is in some form or forms of the 'materialist' approach that the best answer lies. But there can be little doubt that amongst all the evidence there is much that is more convincingly explained in other terms: cultural, social selection and so on." (Black Report, 1980, p. 115)*

From 1980 onwards, much attention has been given to further examination of the explanations provided by the Black Report. Whereas the artefact explanation was quickly dismissed for being insufficiently able to explain the strong socioeconomic gra-

dient in health [33, 34], the selection and causation mechanisms have received ample attention. Although discussions are still ongoing, most studies concluded that, overall, there is a strong effect of socioeconomic position on health [35, 36]. At the same time, studies have also tried to uncover what intermediary factors contribute to the effect of socioeconomic position on health. These studies generally examined similar risk factors as described by the Black Report, but differentiated more explicitly between material risk factors, psychosocial risk factors, and behavioral risk factors. The psychosocial risk factors were seen as a separate group of stress-inducing risk factors (e.g. stressful living conditions, relative deprivation, less adequate coping strategies and a lower quality of social and interpersonal relationships) [32, 37, 38]. In the next three decades, several studies found that a higher exposure to adverse material conditions, psychosocial risk factors and unhealthy behaviors among those in a lower socioeconomic position, could, to a large extent, explain why people in lower socioeconomic groups had worse health than people in higher socioeconomic groups [39-48]. Moreover, these different sets of risk factors are likely interrelated: some risk factors may act upon health through other risk factors. For example, psychosocial risk factors may be affected by adverse material conditions, and unhealthy behaviors may be induced by both material and psychosocial risk factors [43, 48].

Studies that investigated explanations of socioeconomic inequalities in health usually measure socioeconomic position and intermediary risk factors once (often at baseline) and subsequently link these to mortality or health after a certain period of follow-up time [43, 45, 48]. These studies assume that risk factors remain fairly stable over the life-course and that the initial baseline measurement is a good indicator for life-long exposure. However, this overlooks the dynamic nature of the risk factors, i.e. they are likely to change over the life-course. For example, people may quit smoking, increase/decrease their level of physical activity or experience more/less material deprivation. Moreover, changes in risk factors are probably different across socioeconomic groups, resulting in changing socioeconomic gradients in risk factors over time. Obviously, this may also affect the contribution of these risk factors to socioeconomic inequalities in health. Studies should therefore apply methods that allow for the modelling of 'time-varying' risk factors that are able to take changes in intermediary risk factors into account. Although some studies have applied these methods to investigate the contribution of time-varying health behaviors to socioeconomic inequalities in mortality [49-53], no study has yet investigated the contribution of both material and behavioral risk factors measured multiple times over the life-course to socioeconomic inequalities in mortality.

SOCIOECONOMIC INEQUALITIES IN HEALTH-RELATED BEHAVIORS

In response to the accumulated body of evidence that identifies health-related behaviors as important intermediary risk factors of health inequalities, research has increasingly started to investigate socioeconomic inequalities in health-related behaviors themselves. Because knowing that health-related behaviors contribute to socioeconomic inequalities in health raises the question 'why are lower socioeconomic groups more likely to behave unhealthily than higher socioeconomic groups?'. Furthermore, due to a continued transition in the burden of disease in Western countries towards non-communicable diseases that are highly affected by health-related behaviors, public health attention has increasingly shifted to understanding and targeting the determinants of healthy behavior [54].

Socioeconomic inequalities are observed for many different health-related behaviors, most notably for smoking [55-59], physical activity [60-63] and healthy dietary patterns [64-71]. For smoking, socioeconomic inequalities emerge in early adolescence and continue to widen over time. Children attending lower educational levels are more likely to start smoking than children attending higher educational levels and those from lower socioeconomic groups have a lower likelihood of smoking cessation in adulthood [72]. In The Netherlands, the prevalence of daily smoking ranges from 27% among the lowest educated to 10% among the highest educated [73]. For physical activity, socioeconomic inequalities are predominantly found for leisure time physical activity [60]. For example, those with a lower socioeconomic position are less likely to participate in sports or to walk or cycle in leisure time. In The Netherlands, sports participation among adults aged 25 years and older ranges from 33% among the lowest educated to 67% among the highest educated [73]. For healthy dietary patterns, the largest socioeconomic inequalities are found for fruit and vegetable consumption [64]. In addition, lower socioeconomic groups are more likely to consume more saturated fat and less fiber than higher socioeconomic groups [64]. As a result of less leisure time physical activity and more unhealthy dietary patterns, lower socioeconomic groups also suffer from a higher prevalence of overweight and obesity [74-80]. In The Netherlands, the prevalence of overweight ranges from 64% among the lowest educated to 41% among the highest educated; the prevalence of obesity ranges from 24% among the lowest educated to 9% among the highest educated [73].

UNDERSTANDING SOCIOECONOMIC INEQUALITIES IN HEALTH-RELATED BEHAVIORS

Smoking, physical activity and dietary patterns are dynamic and modifiable risk factors that offer possibilities for interventions and policies to reduce socioeconomic inequalities in health. In order to change these behaviors, relevant determinants (factors that are predictive of health-related behaviors) need to be identified, because they can be targeted to induce behavioral changes. Identification of determinants that contribute to socioeconomic inequalities in health-related behaviors requires answering two questions: 1) why are these determinants predictive of health-related behaviors, and 2) why are these determinants differentially distributed between socioeconomic groups. Moreover, these determinants should be able to explain the marked socioeconomic *gradient* in health-related behaviors: the association between socioeconomic position and smoking, physical activity, healthy dietary patterns and overweight/obesity – similar to the socioeconomic gradient in health – follows an almost linear pattern.

Determinants that are predictive of health-related behaviors can broadly be divided into two groups: individual determinants and environmental determinants. Individual determinants are individual resources (e.g. intelligence or acquired skills) and psychological (e.g. self-efficacy) or biological characteristics (e.g. addiction susceptibility). Environmental determinants are related to conditions and characteristics of the environment in which the individual lives, for example neighborhood characteristics (e.g. safety, availability of facilities), psychosocial risk factors (e.g. external stressors) and social environment characteristics (e.g. social support).

Several studies have adopted (social) psychological behavioral theories to identify important determinants of health-related behaviors. Two commonly used theories are the Theory of Planned Behavior (TPB) [81] and the Social Cognitive Theory (SCT) [82]. The TPB identifies intention as the core predictor of behavior, and states that intention is an outcome of three main determinants: attitudes, subjective norms and perceived behavioral control [81]. The SCT explains behavior as an interplay between personal factors, environmental factors and attributes of behaviors itself [82]. Behavioral theories such as the TPB and the SCT have had some success in explaining health-related behaviors and informing health behavior interventions [83-86]. However, they are less able to explain why these determinants are differentially distributed between socioeconomic groups in the first place. For example, observing that higher socioeconomic groups have more positive attitudes towards healthy behavior, or that the subjective norms in their environment is more in favor of healthy behavior, does not address the underlying reasons for this relationship. Moreover, these behavioral theories often focus on individual cognition and motivation, while overlooking environmental determinants that are beyond the individuals control.

In order to better contextualize health-related behaviors, studies have increasingly adopted 'socioecological' models to explain socioeconomic inequalities in health-related behaviors [87-90]. Socioecological models encompass different 'levels' ranging from individual characteristics (e.g. preferences, skills, biological characteristics), family and community characteristics (e.g. social networks, neighborhood characteristics) to social-structural conditions (e.g. national or global policies, unemployment rates, income inequality) [91]. The 'multilevel' perspective of socioecological models helps to better understand the socioeconomic gradient in health-related behaviors as well as the clustering of several unhealthy behaviors within the same groups [87-90].

CURRENT EXPLANATIONS OF SOCIOECONOMIC INEQUALITIES IN HEALTH-RELATED BEHAVIORS

Two frequently mentioned explanations for socioeconomic inequalities in health-related behaviors are the economic environment and the physical (or built) environment [92-107]. The economic environment (e.g. costs and affordability) seems to provide a straightforward explanation for socioeconomic inequalities in health-related behaviors: healthy behaviors (e.g. sports or healthy foods) are more expensive and therefore less often adopted by lower socioeconomic groups. However, empirical research shows that economic resources can only explain part of the association between socioeconomic position and health-related behaviors [98, 105]. Moreover, it also doesn't explain why expensive behaviors (e.g. smoking) are more prevalent among lower socioeconomic groups or why low-cost health behaviors (e.g. walking or cycling) are more prevalent among higher socioeconomic groups. Lastly, economic determinants are not able to provide a satisfactory explanation of the trends in health-related behaviors over time. The socioeconomic gradients in smoking, physical inactivity and obesity have reversed over a period of fifty years (they were previously more prevalent among higher socioeconomic groups, whereas nowadays they are more prevalent among lower socioeconomic groups), even though the lowest socioeconomic groups have always been poorest [108-111].

The physical neighborhood environment (e.g. availability of facilities to buy healthy foods, neighborhood walkability) has also been extensively investigated as a potential determinant for socioeconomic inequalities in health-related behaviors, especially in the last decade [64, 67, 96, 104-106, 112, 113]. Most of these studies however, show limited evidence that the physical environment actually contributes to socioeconomic inequalities in health-related behaviors. Especially in a relatively small and densely populated country like The Netherlands, where distances to facilities are mostly short and the

physical lay-out of neighborhoods facilitate walking and cycling, the physical environment cannot account for the socioeconomic gradient in health-related behaviors [114].

Limited evidence on the contribution of the economic and the physical environment to socioeconomic inequalities in health-related behaviors signifies a need for different explanations. Such an explanation should not only be able to account for the socioeconomic gradient in health-related behaviors, but also help explain the intergenerational transmission of health inequalities. Research has shown that parental socioeconomic position is directly related to health and health-related behaviors, net of own socioeconomic position [115-125]. This intergenerational transmission of inequalities requires additional scrutiny in the explanation of socioeconomic inequalities in health, because it shows that explanations should not only identify determinants of individual health-related behaviors, but also those that explain the reproduction of health inequalities.

A lack of effective behavioral interventions among lower socioeconomic group also points towards an incompleteness of current explanations. Despite increasingly complex models and research on a range of determinants that may contribute to socioeconomic inequalities in health-related behaviors, interventions aimed at reducing these inequalities have been unsuccessful [126-135]. Although interventions that are targeted at a larger population often do not examine effectiveness among socioeconomic subgroups, those who do examine the effectiveness of behavioral interventions among people in lower socioeconomic groups suggest that, especially in these groups, interventions are often not effective [126]. Moreover, to the extent that interventions are effective in higher socioeconomic groups, behavioral interventions may actually increase socioeconomic inequalities in health-related behaviors.

SOCIAL STATUS, CULTURAL CAPITAL AND HEALTH-RELATED BEHAVIORS

The lack of effectiveness of many health behavior interventions among lower socioeconomic groups and the persistence of health inequalities in almost all Western countries suggests that the mechanisms behind the association between socioeconomic position and health-related behaviors are likely more complex than currently acknowledged, and require a different perspective. Such a perspective should take into account that differences in health-related behaviors are not just a consequence of 'social class', but also of 'social status'. This distinction takes into account that social stratification has more than one dimension, and stems from landmark sociological theories on social inequality.

The sociologist Max Weber (1864–1920) was among the first to state that social inequalities do not only manifest across economic dimensions (class differences), but also across cultural dimensions (status differences). Whereas class differences refer to inequalities in economic resources, status differences refer to inequalities in prestige,

which are accompanied by strong differences in lifestyles that symbolizes one's status position [136]. Importantly, these two forms of stratification can be mutually exclusive (i.e. those with a high level of social class may still have a low level of social status and vice versa).

The sociologist Pierre Bourdieu (1930–2002) further developed how social inequalities are the result of unequal distributions of several capitals, and conceptualized the notion of 'cultural capital' to symbolize the hierarchy in the cultural dimension [137-139]. Bourdieu distinguished three different forms of cultural capital: institutionalized, objectified and embodied cultural capital [137]. Institutionalized cultural capital refers to the institutionalization of capital into official credentials such as educational degrees and professional titles. Objectified cultural capital refers to cultural goods such as the possessions of artwork or books. Embodied (or incorporated) cultural capital refers to internalized resources, such as linguistic styles, skills, tastes, and values and norms that one acquires through lifelong socialization. Bourdieu argued that those with high levels of cultural capital use this capital to develop exclusive lifestyles that symbolize their high status position, and that are used for distinction and exclusion [139, 140].

Especially embodied cultural capital may be highly relevant in the formation of healthy lifestyles [141-145]. Embodied cultural capital accumulates during a lifelong socialization process and is learned, shared and transmitted among social groups and across generations [146, 147]. Bourdieu argued that socialization generates a 'habitus' which constrains and guides behavior. Tastes and attitudes are internalized within the habitus and converted into dispositions. These long lasting dispositions may later appear as voluntary choices and preferences, but are actually embedded within the habitus. Via this socialization process individuals 'habitualize' behaviors in ways that fit with and symbolize their socio-cultural environment. The formation of health-related behaviors is thus structured by one's level of cultural capital, which is itself related to the socioeconomic conditions and socio-cultural context of the environment in which one lives.

The acknowledgement of the importance of cultural determinants for socioeconomic inequalities in health is not novel in the field of social epidemiology. For example, the Black Report already mentioned the importance of culture and distinction: "*Others see behaviour which is conducive to good or bad health as embedded more within social structures; as illustrative of socially distinguishable styles of life, associated with, and reinforced by, class [40] (p. 110).*" However, the cultural environment is still the most understudied type of environment in relation to socioeconomic inequalities in health behaviors.

CULTURAL CAPITAL AND SOCIOECONOMIC INEQUALITIES IN HEALTH-RELATED BEHAVIORS

Empirical studies focusing on the importance of cultural capital and social distinction for socioeconomic inequalities in health-related behaviors are scarce. Bourdieu himself was the first to investigate the relationship between cultural capital and several health-related behaviors, including dietary patterns and sports preferences [139]. Bourdieu found that those with a higher level of cultural capital were more likely to consume aesthetic, exotic and diverse food products, those with higher levels of economic capital more often preferred expensive and traditional foods, and those with low levels of cultural and economic capital were more inclined to eat traditional, heavier and cheaper foods. Bourdieu also showed that different social groups participate in different types of sport. Those with a high level of cultural capital were more likely to participate in 'high status' sports like golf or tennis, but avoided sports that stress physical domination, like boxing or bodybuilding [139].

Bourdieu's findings on socially patterned lifestyles have to some extent been corroborated in later research. However, with some notable exceptions, research on cultural capital and its relation to health inequalities has not yet permeated into social epidemiology. The few studies that have adopted this perspective suggest that cultural capital may be an important determinant of healthy lifestyles and may contribute to socioeconomic inequalities in health-related behaviors [142, 148-158]. First, in addition to a preference for specific sports, higher levels of cultural capital have also been linked to higher sports involvement and more leisure time physical activity [157, 159, 160]. Second, the different food preferences across socioeconomic groups coincide with more healthy dietary patterns among higher status groups and less healthy dietary patterns among lower status groups [152, 161-163]. For example, a Dutch study found that food preferences of lower socioeconomic groups could be characterized by a regime of 'much, fat and sweet', whereas higher socioeconomic groups paid more attention to the healthiness of their nutritional patterns [161]. Third, a lower level of BMI among higher socioeconomic groups has also been shown to be associated with their higher levels of cultural capital [80, 157, 164].

Although the described studies point toward the importance of cultural capital as a determinant of socioeconomic inequalities in health, there is still little research exploring the relationship between cultural capital and health-related behaviors. Most studies that have explored this relationship are confined to sociological and anthropological literature [159, 160, 164-174]. Within the field of social epidemiology (and public health and epidemiology in general) however, it has mostly been ignored. Moreover, the few quantitative studies that have examined the relationship between cultural capital and health-related behaviors have not tried to explore the specific pathways that relate high

cultural capital to healthier behavior. Elucidating such pathways, however, is critical to understand how cultural capital affects health and health behaviors.

OUTLINE THESIS AND RESEARCH QUESTIONS

The ultimate aim of this thesis is to explore the importance of cultural capital in the understanding of socioeconomic inequalities in health-related behaviors. This is accomplished by a stepwise approach in which the importance of social stratification, health-related behaviors, early-life environment and cultural capital in the distribution of health is successively explored. The first part examines the relationship between socioeconomic position and mortality, and the contribution of health-related behaviors to socioeconomic inequalities in mortality. The second part investigates whether early-life environments have long lasting effects on health and health-related behaviors of adults.[2] The third part explores whether cultural capital contributes to socioeconomic inequalities in health-related behaviors. And finally, the fourth part explores potential pathways in the relationship between cultural capital and health-related behaviors. The four sections will address the following research questions:

1) To what extent do material risk factors and health-related behaviors contribute to socioeconomic inequalities in mortality?
   a. Do material and behavioral risk factors measured multiple times during adulthood contribute differently to the explanation of socioeconomic inequalities in mortality compared to single baseline measurements of the risk factors?
   b. What are the underlying mechanisms that cause differences between time-varying models and time-fixed models examining socioeconomic inequalities in mortality?

2) Is early-life environment related to health-related outcomes in later life?
   a. Does early-life rural residence have an effect on health-related outcomes in adulthood, net of adult rural residence?

2 Since the effects of early-life environment and socialization processes are an important part of the theoretical background regarding the intergenerational transmission of cultural capital, it is important to explore the effects of early-life environments. However, there exists very little data on childhood measures of cultural capital in combination with adult health and health behavior outcomes. This study therefore used US data on early-life place of residence and later life health outcomes, whereas all other studies used Dutch data.

b. Is the effect of early-life rural residence on health-related outcomes different for individuals who remain in rural communities through adulthood compared to individuals who migrate to non-rural communities?

3) To what extent do inequalities in cultural capital contribute to socioeconomic inequalities in health-related behaviors?
   a. Does cultural capital contribute to socioeconomic inequalities in dietary patterns over and above social and economic capital?
   b. Does social distinction contribute to socioeconomic inequalities in health-related behaviors?

4) Via which pathways is high cultural capital related to health-related behaviors?
   a. Which high cultural capital dispositions that may contribute to higher body weight can be theoretically identified and measured as empirically distinct instruments?
   b. Do the identified dispositions explain the relationship between cultural capital and body mass index?

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