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Improving Health Related Behavior in Deprived Neighborhoods



**Improving Health Related Behavior
in Deprived Neighborhoods**

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in achterstandsbuurten**

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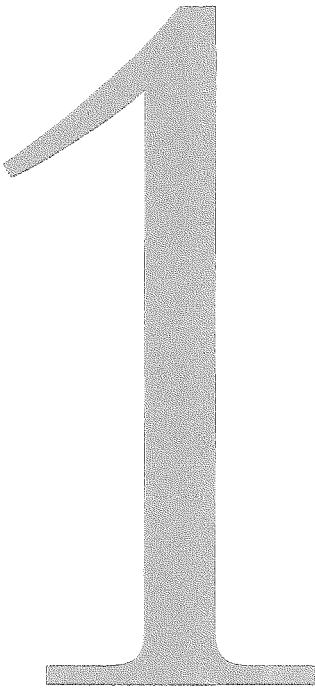
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Introduction



Introduction

1.1 Socioeconomic inequalities in health and health related behavior

1.1.1 Socioeconomic differences in health

The existence of socioeconomic inequalities in health has been well established. Socioeconomic inequalities in health refer to the worse health of those who are in lower socioeconomic groups compared to those who are in higher socioeconomic groups. People in lower socioeconomic groups are likely to live shorter and spend a larger proportion of their life in ill health. In the Netherlands, men with the lowest socioeconomic status die, on average, 4.9 years and women 2.6 years earlier and they have about 15 fewer years of good health than men and women with the highest socioeconomic status.¹ Furthermore, analyses of trends in socioeconomic health inequalities in the Netherlands show that inequalities are not declining in the last decades of the 20th century and in some aspects even show a fairly consistent increase over time.²

1.1.2 Explanations of socioeconomic differences in health

A traditional explanation for the existence of socioeconomic inequalities in health is the “selection versus causation” perspective.³ Health “selection” implies that health determines socioeconomic position. For those in poor health, upward changes in socioeconomic position are less likely and downward changes are more likely to occur. Social “causation” implies that socioeconomic position determines health. Those in a lower socioeconomic position are more likely to develop health problems. This effect of socioeconomic position on health is thought to be the main explanation for socioeconomic inequalities in health. The effect is likely to be mainly indirect through an unequal distribution of determinants of health across socioeconomic groups. These determinants can be divided in material, psychosocial and behavioral factors. The material explanation of health inequalities emphasizes the graded relation between socioeconomic position and access to material conditions, from exposure to low income and health risks in the physical environment. The psychosocial explanation of health inequalities ascribes the existence of health inequalities to the direct and indirect effects of stress stemming from either being lower on the socioeconomic hierarchy, or living under conditions of relative socioeconomic disadvantage. The behavioral explanation of health inequalities implies that lower socioeconomic groups suffer from poor health due to their higher exposure to health damaging behaviors, i.e. smoking, consumption of less healthier diets and excessive amounts of alcohol, or lack of exercise.

Nowadays, there is also a growing interest in the dimension of place or context and the dimension of time in the explanation of health inequalities.⁴ Area or place effects suggest that in addition to individual socioeconomic status, people of low socioeconomic status may have poorer health because they tend to live in areas which in some ways are health damaging.⁵ Life course effects refer to how health status at any given age is likely to be determined by prior life circumstances.

Inequalities in health may be due to a cumulative effect of disadvantage across the life course, latent effects of the early life environment that determine individual life trajectories that in turn affect health status over time, or the cumulative effects of exposure to unfavorable environments that adversely affects health status.

1.1.3 Socioeconomic differences in health related behavior

Health related behaviors are important determinants in the onset of disease and part of the explanation of socioeconomic differences in health. The explanation is that certain health damaging behaviors have a social class gradient and that this contributes to the social class gradient in morbidity and mortality. For example, smoking, poor diet and lack of physical activity are more prevalent among lower socioeconomic groups and these behaviors influence health.

Smoking is found to be more prevalent in lower socioeconomic groups compared to higher socioeconomic groups.^{6,7} The higher prevalence of smoking in lower socioeconomic groups is due both to higher initiation rates and to lower cessation rates. Lack of physical activity is more prevalent in the lower socioeconomic groups.⁸⁻¹⁰ However, the relationship of physical activity to socioeconomic status may differ depending on the dimension of activity assessed.^{9,10} Participation in sports or leisure-time physical activity is reported more frequently in high status individuals. A more complex relationship between socioeconomic status and moderate-intensity activities has been reported. Some studies observe that lower socioeconomic groups are more likely to engage in moderate-intensity activities,¹¹ while others find that lower socioeconomic groups are less likely to engage in this kind of physical activities.¹² Finally, being physically inactive (not engaged in leisure-time physical activity) is more prevalent among lower socioeconomic groups.^{7,8} Dietary patterns tend to differ across socioeconomic groups. Men and women from lower socioeconomic groups consume unhealthier diets than those from higher socioeconomic groups.¹³ This unhealthy diet consists e.g. of a more than average consumption of meat, high consumption of white bread and very low consumption of fruit and vegetables. Obesity is very strongly associated with socioeconomic status, with much higher prevalence rates of obesity in the lower socioeconomic groups.^{7,14,15} The relationship between socioeconomic class and alcohol consumption seems to be complex. The prevalence of alcohol abstinence is likely to be higher in lower educated groups, for both sexes.¹⁶ Because of a higher prevalence of drinkers at higher educational levels, a higher prevalence of excessive drinking might also be expected. However, excessive alcohol consumption is more observed among men with a lower educational level¹⁷ and a majority of studies among women find that lower educated women also have higher rates of excessive alcohol consumption.^{16,17}

1.1.4 Explanations of socioeconomic differences in health related behavior

“Why do people behave as they do?”¹⁸ Answering this question is complex enough even without looking for an answer to the following question: “Why do poor people behave poorly?”¹⁹ as factors underlying the socioeconomic differences in health related behavior are still poorly understood.^{19,20} In understanding the graded

association between lower socioeconomic status and the higher prevalence of health damaging behaviors we should use the models of behavioral change frequently used in the public health area. In these models, intrapersonal and interpersonal factors play a critical role in the adoption and maintenance of health related behavior.¹⁸

The Theory of Planned Behavior is one of the most frequently used intrapersonal-level theories to describe intrapersonal characteristics that may change behavior.¹⁸

The Theory of Planned Behavior assumes that intention to change behavior is determined by attitudes towards performing the behavior, subjective norm associated with the behavior, and perceived behavioral control.²¹ Studies that sought for explanations of socioeconomic differences in health related behavior show that socioeconomic differences in several of the above identified determinants contribute to socioeconomic differences in health related behavior. Socioeconomic differences in health related behavior might be mediated by differences in attitudinal factors. Being in a lower socioeconomic group was associated with less health consciousness (thinking about things to do to keep healthy), stronger beliefs in the influence of destiny on health, and less thinking about the future.²⁰ The attitudinal factors were in turn associated with unhealthy behavioral choices. Lower perceived control among lower socioeconomic groups was an important predictor of socioeconomic differences in decreasing physical activity, continued smoking and smoking cessation.^{22,23} Knowledge is thought to be an important prerequisite for making decisions about health²⁴ because individual perceptions are likely to be formed as a response to beliefs of what causes disease and whether or not those causes can be overcome. A study among the general population in Canada showed that knowledge of the main modifiable CVD risk factors was strongly related to socioeconomic status.²⁵ Furthermore, the presence of more nutrition knowledge is likely to be one of the reasons why people of higher socioeconomic status eat more fruit, vegetables and fat.²⁶

Interpersonal theories are the other main class of individual theories of change. Examples of interpersonal factors are social support, social networks and social norms. Individuals are likely to act on, and react to, environmental stimuli and acquire new ideas and behaviors by modeling their behavior on others in their social environment. Exposure to low social participation explained to some part the socioeconomic gradient in daily smoking²⁷ and fruit and vegetable consumption²⁸. The contribution of a low level of social participation to higher prevalence of daily smoking can be interpreted as indicative of smoking being used as a coping mechanism.²⁷ On the other hand, a person with a higher level of social participation may be more likely to choose a healthier lifestyle, which in turn can be mediated by the social norms provided by the social work. Furthermore, learning about health behavior recommendations and adapting to them becomes more difficult when the individual has low social participation.

The physical environment may also have an effect on health related behavior. Physical environments in deprived areas are more likely to be worse (e.g. less availability of healthy food or sports facilities) than those in more affluent areas.⁵ Living in a deprived area contributes independent of an individual's socioeconomic status to higher prevalences of daily smoking,^{29,30} physical inactivity²⁹ and obesity.^{15,29}

1.2 Strategies to reduce socioeconomic differences in health related behavior

1.2.1 Strategies to reduce socioeconomic differences in health

Strategies to reduce socioeconomic differences in health can be classified in four main target areas.³¹ Targets to (1) diminish socioeconomic disadvantage, and to (2) reduce effects of health on socioeconomic disadvantage, and targets related to (3) factors mediating the effect of socioeconomic disadvantage on health, and to (4) accessibility and quality of healthcare services. Interventions and policies that target socioeconomic differences in health related behavior will be mainly part of the third target area. In addition to these target areas, the European Network on Interventions and Policies to Reduce Inequalities in Health identified innovative approaches to reduce health inequalities.³² Several approaches that targeted the labour market and working conditions, health related behaviors, and health care were possibly effective to reduce health inequalities. Furthermore, the use of territorial approaches, has become increasingly popular as a way of targeting disadvantaged populations. For example, early results of the evaluation of health action zones in the UK suggest that given sufficient time and resources these territorial approaches can make a difference to the health of disadvantaged populations. The use of effective territorial approaches is likely to be a good strategie to reduce socioeconomic strategies of health related behavior. However, a lot remains to be done in the development, implementation and evaluation of these complex approaches before they can prove themselves as an effective way to reduce socioeconomic inequalities in health.

In 1989 as part of a national policy to tackle health inequalities, the Dutch ministry of Health commissioned a research based approach to reduce inequalities in health. In 1995, a second 6-years program was launched to gain systematic experience with interventions and policies designed to reduce health inequalities in the Netherlands.³¹ The main focus of the program was on developing and evaluating interventions and policies to tackle inequalities in health. Now, remarkable progress has been made since the start of the first program in 1989. Many health agencies in the Netherlands are working to reduce health inequalities. However, the unfavorable trends in health related behaviors in lower socioeconomic groups³³ necessitate ongoing action in health promotion policy and practice. In the recommendations written after the end of the program in 2000, the program committee observed the need for more health promotion activities for those living in deprived neighborhoods. In addition, more research is needed to develop effective health promotion strategies in lower socioeconomic groups. Especially community interventions are thought to be a promising tool to improve health related behavior.^{32,34}

1.2.2 Community interventions

Community health behavior interventions are interventions using a “community approach” to achieve changes in health related behavior that apply to the majority of the population in the community.³⁵ Important key principles of the “community

approach” are: participation of residents in planning and implementing the intervention, intersectoral collaboration of organizations from relevant sectors, tailoring to local needs and existing structures, incorporation of a social ecological perspective, use of multi-strategies and a broad lifestyle approach.³⁶

Community participation enables people to choose the healthier alternatives by giving them the means and opportunities to do so as well as making them active partners in the process of change and its outcomes. One important aspect of the participation of residents in the intervention is their membership in social networks within the community. Diffusion of ideas, knowledge and new norms throughout these networks is considered to be important to achieve community change.

Intersectoral collaboration is important because the main determinants of health are to be found not only in the health sector but also within all sectors of the community. Community participation, intersectoral collaboration and tailoring to local needs and existing structures are all related to the concept of community empowerment. An empowered community, as defined by Israel et al., refers to a community in which individuals and organizations apply their skills and resources in collective efforts to meet their respective needs. They provide enhanced support for each other, address conflicts within the community, and gain increased influence and control over the quality of life in their community and have the ability to influence decisions and changes in the larger social system.³⁷ Empowerment is likely to be an important strategy for improving a population’s health as opposed to powerlessness that can be thought of as a broad risk factor for disease. Therefore health promotion practitioners should adopt an empowerment education approach that fosters collective action in the community.³⁸

The social ecological perspective focuses on the nature of people’s transactions with their physical and sociocultural surroundings.³⁹ The social ecological model assumes that health behavior is not only influenced by personal attributes but also by multiple facets of physical and social environments. Interventions should alter the environmental factors that facilitate or hinder positive health behaviors. In addition to indirect environmental effects on health through health behaviors, social and physical environments are thought to have direct effects on health through emotional well-being and social cohesion.

The use of multiple methods is important to reach all segments in a community. Community-wide activities alternated with activities for high-risk populations or specific subgroups within the community may reach a maximum change at the community level. Furthermore, every method has its own goal, e.g. give general information or attract attention versus multiple face-to-face activities to achieve behavioral change.

The choice to address multiple risk behaviors is likely to be more effective than the focus on a single risk behavior. First, the major diseases as cancer and cardiovascular disease are associated with multiple risk behaviors and second, if the emphasis would be on single risk behaviors it is likely that this will only appeal to a part instead of the whole community.

1.2.3 Community health promotion initiatives to reduce socioeconomic differences in health related behavior

Community health promotion methods are promising for the purpose of improving health related behavior in deprived areas. Community programs aim to change behavior of the majority of residents in the community and also the social and physical conditions in which the behavior occurs. The emphasis of these programs on community participation and collaboration to achieve these changes may make them especially appropriate for reaching individuals in lower socioeconomic groups. First, lower socioeconomic groups appear to give less attention to general (mass-media) information campaigns^{40,41} from an external source and are more likely to respond to information from their direct social environment.^{42,43} A community intervention where community representatives are involved in planning and implementing the intervention gives the opportunity to reach other community members through the social networks. Second, in deprived settings residents are likely to be unable to see preventive measures to improve risk behaviors as a priority for action because they may be more occupied by day-to-day social and economic living challenges.⁴¹ However, the engagement of community residents in identifying their own needs, setting their own priorities, and planning their own programs can create more support for health behavior prevention goals. Furthermore, community programs can target unfavorable contextual factors that influence behavior in deprived areas. Together, this health promotion method may contribute to tackle socioeconomic differences in health related behavior.

1.3 This thesis

1.3.1 Community intervention “Wijkgezondheidswerk”

The core of this thesis describes the evaluation of the community intervention “Wijkgezondheidswerk”, a community health behavior intervention program to improve health related behavior in deprived neighborhoods in the city of Eindhoven. Besides this evaluation study, we were able to investigate other important additional topics. The baseline data of the evaluation study were used to examine determinants of health related behavior in deprived neighborhoods and also a systematic review of the literature was conducted.

The community intervention “Wijkgezondheidswerk” is a joint project with a number of partners involved in either intervention implementation or intervention evaluation. The lead agency is the municipal health service of Eindhoven. Other main partners in Eindhoven are the municipal task force of social development, local grassroots organizations, and community social work organizations. Main partners involved in the evaluation component of the project are the Department of Social Sciences of the Wageningen University and the Department of Public Health of the Erasmus University Medical Center Rotterdam. The project was evaluated by means of a community intervention trial and has a quasi-experimental design. Beforehand, the municipal health services assigned the intervention to two neighborhoods and to have an evaluation design with concurrent control neighborhoods, three matched

comparison neighborhoods* were selected prior to intervention implementation. A longitudinal sample survey and repeated cross sectional sample surveys were used to measure changes in key outcomes. In addition to the impact evaluation, the program was supported by participatory action research and a process evaluation. This combination of quantitative and qualitative methods should provide powerful evidence of effectiveness. Details on the design of process and impact evaluation are described in chapter 5 and 6 respectively. The participatory action research was conducted by the Wageningen University and not discussed in this thesis.

1.3.2 Aims and outline of this thesis

The evaluation study was part of the prevention research program from the Netherlands Organization for Health Research and Development (ZonMw). The main objective of this program is to provide scientific support with regard to: knowledge on innovative preventive measures, effectiveness and efficacy of new or existing health promotion methods, conditions for implementation of effective interventions, and implementation of interventions proven to be effective on the national level. The research questions addressed in this thesis are:

- 1. What are determinants of health related behavior in deprived neighborhoods?**
- 2. What is the effectiveness of community interventions in deprived areas?**
- 3. What is the effectiveness of the community intervention “Wijkgezondheidswerk”?**

Chapter 2 and 3 deal with the first research question and in particular with the question which external and psychosocial factors are associated with intention to change behavior. Baseline data of the impact evaluation were used to answer the first research question. Chapter 2 presents the results on the association between stages of change for fruit and vegetable consumption and external and psychosocial factors. Chapter 3 presents the results on the association between stages of change for moderate-intensity physical activity and external and psychosocial factors.

Chapter 4 deals with the second research question. Chapter 4 presents the results of a systematic review that assessed the effectiveness of community cardiovascular prevention programs in deprived settings.

Chapters 5 and 6 deal with the last research question. Chapter 5 presents the design and results of the process evaluation. The main question to be answered for this part of the evaluation was: Was the community intervention “Wijkgezondheidswerk” delivered as planned? Chapter 6 presents the design and results of the impact

* In the quasi-experimental design, 2 out of 10 deprived neighborhoods in the city of Eindhoven were assigned to receive the intervention. These neighborhoods represent the low income, disadvantaged urban setting the project was designed to address. Geographically, one of these neighborhoods consisted of two smaller areas. Therefore, three deprived comparison neighborhoods were matched prior to intervention implementation to one of the three intervention areas.

evaluation. The main question to be answered was: Did the community intervention “Wijkgezondheidswerk” have an impact on change in (intermediate) outcomes of health related behavior in the intervention neighborhoods compared to the comparison neighborhoods?

The seventh and last chapter of this thesis relates the main findings of the studies to each other and discusses several methodological issues and possible explanations for the findings.

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Stages of Change for Fruit and Vegetable Consumption in Deprived Neighborhoods

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Abstract

This article describes the association of external and psychosocial factors on the stages of change for fruit and vegetable consumption, among 2,781 inhabitants, aged 18 to 65 years, in deprived neighborhoods (response rate 60%). To identify correlates of forward stage transition an ordinal logistic regression model, the “Threshold of Change model (TCM)”, was used to analyze the data. The results indicate that men, those from Dutch origin, those with (rather) low health locus of control, those displaying risk behaviors, and those without knowledge of dietary guidelines were less likely to move from one stage to another and therefore were more likely to be in a lower stage of change category. The results make it possible to distinguish target groups, which should receive more attention in future health promotion campaigns, and to identify factors to be addressed in those programs.

2.1 Introduction

There is considerable epidemiological evidence for the importance of fruit and vegetable consumption in reducing risk of cancer and cardiovascular disease.¹⁻⁴ To take advantage of these protective effects, recommendations for an adequate fruit and vegetable consumption are part of dietary guidelines in many countries. The U.S. Dietary Guidelines recommend eating five or more servings of fruits and vegetables per day.⁵ To promote health, the Dutch Dietary Guidelines recommend a daily intake of 200 grams of vegetables and two pieces of fruit.⁶ However, previous studies in the Netherlands, but also in other European Countries and the United States, showed that most people do not comply with these dietary guidelines.⁷⁻⁹ This noticeable difference between recommended and actual intake of fruits and vegetables necessitates effective interventions to increase the level of fruit and vegetable consumption.

To develop effective interventions, it is important to understand the factors that promote behavioral change.¹⁰ In understanding these behavioral determinants, in particular, social cognition models have been used.¹¹ The present study used the Attitude-Social influence-Efficacy (ASE) model to obtain more insight into individuals' motivations to change their fruit or vegetable consumption.^{12,13} The ASE model originated in the Theory of Reasoned Action¹⁴ and Bandura's Social Cognitive Theory.¹⁵ The ASE model states that behavior can be explained by behavioral intention, which in turn is determined by attitudes, perceived social influences, and self-efficacy expectations. External variables, such as sociodemographic factors, are assumed to influence behavior through psychosocial factors and behavioral intention. To measure intentions and behavior, the present study used the so-called Stages of Change construct of the Transtheoretical Model.¹⁶ The model distinguishes five stages in behavioral change: precontemplation (no intention to change in the foreseeable future), contemplation (intending to change but not soon), preparation (intending to change in the next month, action (recent change of behavior), and maintenance (maintaining change for at least 6 months). People are supposed to move through the stages of change. One of the implications of the model is that to move from one stage to another, people need different information, tailored to their specific stage of change.¹⁶ This implies that to develop effective interventions we not only need information on the distribution of the population across the stages of change, but also on factors influencing movement through the stages. Figure 2.1 incorporates both theoretical frameworks^{12,13,16} into the conceptual model used for our analysis.

This article examines the association between the stages of change for fruit and vegetable consumption and external and psychosocial factors. The analysis extends those reported from earlier studies in three ways.

First, the sample is based on a large baseline measurement of a community intervention set out in deprived neighborhoods. People in lower socioeconomic positions are generally worse off with respect to their health than people in higher positions.¹⁷ These socioeconomic inequalities in health can partly be explained by factors as material

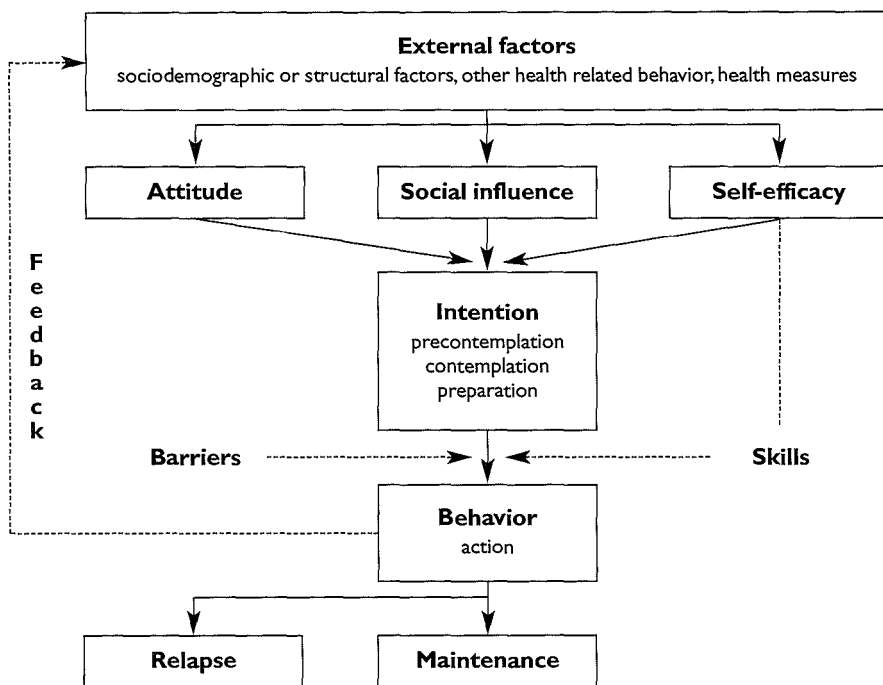


Figure 2.1 Conceptual Model

circumstances; psychosocial stressors; accessibility to, and use of, preventive and curative services; and differences in health related behavior.^{18,19} Previous studies indicated that a lower socioeconomic position often involves lack of physical exercise, a higher prevalence of smoking, a higher prevalence of obesity, a higher fat intake, and a lower consumption of fruit and vegetables.^{19,20} If we choose to carry out an intervention aiming to increase fruit and vegetable consumption in groups of lower socioeconomic status, we ideally need information on determinants of behavior for this specific population. Second, we used the Threshold of Change Model (TCM) to identify factors associated with stages of change. The analytic approach of the TCM fits well within the stages of change theory outlined by the Transtheoretical model. Third, as far as we know no studies have been conducted on the effects of external variables on movement from one stage to another. Moreover, although previous studies investigated the role of psychosocial factors, showing that these factors differ in subjects at different stages of change,^{21,22} there is still a paucity of such studies in populations of lower socioeconomic status.

2.2 Data and Methods

2.2.1 Population

Data were collected as part of a baseline measurement of the “Wijkgezondheidswerk” project (Dutch for “Working on Healthy Neighborhoods”), a community intervention set out to improve (determinants of) health related behavior in two experimental and three control deprived neighborhoods in Eindhoven, the Netherlands. Deprived neighborhoods were selected by the municipality, on the basis of functional, physical and social criteria, which indicated an accumulation of problems and necessity for intervention. A sample of 800 individuals aged 18 to 65 years from each neighborhood was drawn from the population registers. Individuals in the sample received a questionnaire by mail, which included questions on fruit and vegetable consumption, stages of change for fruit and vegetable consumption, other health related behavior, and several psychosocial and sociodemographic determinants. Nonresponders were sent a reminder after 2 weeks, and the same questionnaire was resent after another 2 weeks. The surveys were all written in Dutch, and an introductory letter in Dutch, Turkish and Arabic accompanied them. A stamped envelope was added to facilitate an easy response. Furthermore, it was possible for respondents to get help from a Turkish or Moroccan translator to fill out the questionnaire. A total of 2,781 of 4,663 eligible participants completed the questionnaire (response rate = 60%). Differences in response rates between subgroups were modest in size. Study participants differed from nonparticipants by gender, marital status and age. Women and, those who were married, were more likely to participate compared to men and never-married individuals. Nonresponders were on average 3 years younger than respondents were. No differences were found according to ethnic origin.

2.2.2 Fruit and vegetable intake

A 4-item food frequency questionnaire (FFQ) was used to measure fruit and vegetable intake. Participants were asked on how many days of the week they usually consumed fruit or vegetables, and the amount of fruit and vegetables they usually ate on such a day. Response options to determine frequency of consumption were presented as 1 or less, 2, 3, 4, 5, 6 or 7 days per week. Response options to determine the amount of fruit consumed (including fruit juice accounting for one piece of fruit) were presented as 1, 2, or 3 or more pieces of fruit per day. Response options to determine the amount of vegetables consumed (including raw vegetables, but excluding potatoes) were presented as 1, 2, 3 or 4 or more serving spoons per day (one serving spoon is approximately 50 grams). Our FFQ was derived from another short validated FFQ.²³ Spearman correlations were .51 for fruit and only .35 for vegetables in this short questionnaire. Mean intake of both fruit and vegetables was overestimated by the FFQ as compared with 7-day dietary records.

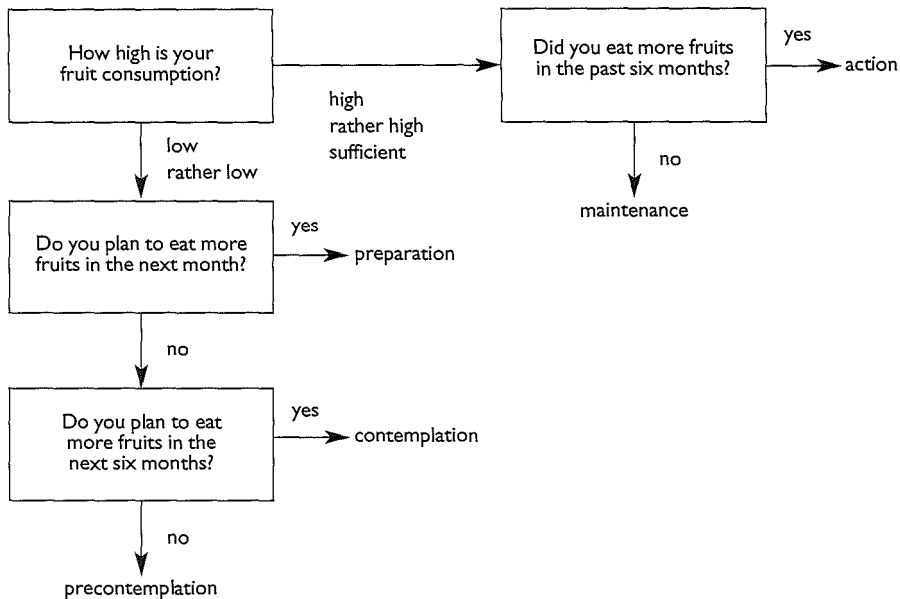


Figure 2.2 Stages of change algorithm for increasing fruit consumption

2.2.3 Stages of change for fruit and vegetable consumption

Figure 2.2 shows the multiple-question algorithm used to classify respondents into their stage of change category for fruit consumption. The algorithm was derived from a questionnaire of another large community intervention in the Netherlands.²⁴

The scoring algorithm was based on the initial question “How high or low is your fruit consumption”, followed by questions assessing intention to change. The scoring algorithm for vegetables was structured in the same way, using, “How high or low is your vegetable consumption” as the initial question. The action criterion of the stage algorithm was a “sufficient” or “(very) high” consumption level. Earlier studies showed that participants are having difficulties in evaluating the adequacy of a complex health related behavior.^{25,26} The studies showed that a fair amount of research participants in the maintenance stage will not be aware of their inadequate level of the desired behavior. Therefore, using a scoring algorithm based on subjective, self-rated level of fruit/vegetable consumption, we expected a quite heterogeneous composition of respondents in the maintenance stage. Indeed, only one-third of all respondents in the maintenance stage did comply with the fruit consumption guidelines and 10% did comply with the vegetable consumption guidelines (see table 2.1). As a consequence, we excluded maintainers from the ordinal logistic regression analyses because it is likely that there are different correlates at stake in this heterogeneous group.

2.2.4 Psychosocial factors

Attitude and self-efficacy were assessed with a single item.²⁴ Individuals were asked to evaluate their attitude toward increasing their fruit consumption on a pleasant-unpleasant scale. Response choices were very pleasant, pleasant, not pleasant/not unpleasant, unpleasant, and very unpleasant. To measure self-efficacy, individuals were asked a question rating how certain they were they could increase their fruit consumption. Response choices were very certain, certain, not certain/not uncertain, uncertain, and very uncertain. The measures for vegetable consumption were structured in the same way.

2.2.5 External factors

Sixteen variables were selected that were considered possible predictors of stages of change. The variables represented a selection of external influences like nutritional knowledge, health, other health related behavior, sociodemographic factors, and structural factors.

Sociodemographic factors that were considered were gender, age (divided into three categories), marital status, ethnic origin, educational level and children at home (yes/no). Marital status was categorized into married, never-married, divorced and widowed. Five groups of ethnic origin were distinguished: Dutch, other Western countries, Surinamese or Antillean or Aruban, Turkish or Moroccan, and other non-Western countries. A person belonged to another ethnic group instead of being from Dutch origin, if one of his or her parents was not born in the Netherlands. All data on sociodemographic factors, except educational level, was derived from municipality statistics. Educational level²⁷ was divided into four categories, that is, primary school only or no schooling (I=low), lower secondary or vocational schooling (II), intermediate vocational schooling or intermediate or higher secondary schooling (III), and higher vocational schooling and university (IV=high).

Structural factors included paid employment (yes/no), household income, financial problems (yes/no), and problems in personal relationships. To estimate the level of household income, we used proxies for income level, namely, health insurance, housing tenure and car ownership.²⁷ Most people in the Netherlands with an income above a certain level are privately insured, whereas lower income groups receive public insurance. By combining these proxies, we created five categories (from highest to lowest): privately insured, house owner; publicly insured, house owner; privately insured, rented house; publicly insured, rented house, car; publicly insured, rented house, no car. Financial problems were indicated by difficulties relating to the payment of bills, food, rent and so on.²⁷ Problems in personal relationships were measured by means of a subscale of the Dutch Long-term Difficulties Questionnaire.²⁸ The subscale consisted of 8 items. Scores on each item ranged from 0 (no problem or not applicable) to 4 (serious problem). The sum score ranged from 0 – 19 (median value: 1).

We assessed the knowledge of the recommended level of fruit and vegetable consumption. For fruit as well as for vegetables, respondents were asked to identify the correct dietary guideline from a list of six possible answers.

Health measures²⁹ were perceived general health and health locus of control. Perceived general health was based on the respondent's answer to the question "How do you rate your health in general?" Response options were excellent, very good, good, fair, and poor. Health locus of control was based on the respondent's answer to the question "Do you think you can do much or little to prevent health problems?" Response options were much, rather much, not much/not little, rather little and little.

Three measures of health related behavior were used: current smoking (yes/no),²⁷ excessive alcohol consumption (three or more glasses per day) (yes/no),²⁷ and compliance with the recommended level of moderate physical activity (at least 30 min moderate-intensity physical activity on at least five days of the week) (yes/no).³⁰

2.2.6 Analyses

After excluding respondents with missing data on stages of change, consumption, psychosocial or external variables, 2,219 persons could be included in the analysis concerning vegetable consumption, and 2,171 persons could be included in the analysis concerning fruit consumption. Descriptive statistics were used to describe the distribution of consumption-related variables and psychosocial factors across stages of change categories. Differences in mean scores for fruit and vegetable consumption and psychosocial factors between the stages of change were assessed using one-way analysis of variance with Scheffé's multiple comparison test. To determine the multivariate associations between external factors and the stages of change, we considered only respondents in the precontemplation, contemplation, preparation and action stages. These first four stages can be analyzed as an ordinal scaled variable. Therefore, we chose an ordinal regression model to determine which factors were independently associated with stages of change. In particular, we used the TCM as described by Hedeker et al.³¹ This model uses a common statistical technique, a Partial Proportional Odds Model,³² to estimate the parameters of the model, but distinguishes itself from other ordinal models by its focus on thresholds that separate the stages of change categories. In our case of four ordered stages of change categories, three thresholds exist: one between precontemplation and contemplation (contemplation threshold), one between contemplation and preparation (preparation threshold), and one between preparation and action (action threshold). These thresholds can be conceptualized as hurdles of increasing difficulty that separate individuals in forward stage transition. By estimating these thresholds, the probability of crossing each threshold can be determined for the population of respondents. Finally, it also allows us to assess the influence of variables on these thresholds and therefore identification of correlates of forward stage transition. The effect of an explanatory factor can be assumed to be the same or to vary for each threshold. Factors with an equal effect on each threshold (i.e. nonstage-specific factors) have proportional odds in the Partial Proportional Odds model. Factors with unequal effects on the thresholds (i.e. stage-specific factors) have non-proportional odds. The first step in our analysis for the external factors was to use univariate Proportional Odds Models to select variables for the multivariate analysis. Factors

were considered as a candidate for the multivariate model if they had either a Wald F-test of $p < .25^{33}$ or if they had non-proportional odds. In the second step a multivariate Partial Proportional Odds model was fitted. Equal effects with $p < .05$ and unequal effects with $p < .10$ remained in the final model. Dummy variables were constructed for all external factors. The regression coefficients and their standard errors were used to calculate odds ratios and their 95% confidence intervals. Analyses were carried out with the Statistical Analysis System (SAS) program.³⁴

2.3 Results

2.3.1 Sample Characteristics

Both the sample for the analysis concerning vegetable consumption and the sample for the analysis concerning fruit consumption had the same sociodemographic characteristics. Forty-nine percent were male, and most of the respondents were either married (42%) or never-married (43%). Sixty-nine percent were of Dutch origin, only 4% were of Surinamese or Antillean or Aruban origin, 11% were of Turkish or Moroccan origin, and 16% originated from other countries. Mean age was 39 (± 13) years. Twenty percent had higher vocational schooling or university, 23% had intermediate vocational schooling or intermediate or higher secondary schooling, 35% had lower secondary or lower vocational schooling, and 21% had primary school only or no schooling. More than 60% of the respondents were in the two lowest household income categories. Mean daily vegetable consumption was 101 (± 52) grams per day, and mean daily fruit consumption was 1.0 (± 0.8) pieces per day. Only 8% of all respondents met the dietary guideline for vegetable consumption of 200 grams per day and 22% met the dietary guideline for fruit consumption of two pieces per day. Twenty-five percent knew the correct amount of vegetables and 40% knew the correct number of fruits, recommended for good health.

2.3.2 Consumption and psychosocial factors by stages of change

The distributions of stages of change for fruit and vegetable consumption are given in table 2.1. For fruit consumption, more than half of the respondents were in the maintenance stage and almost a quarter were in the precontemplation stage. Sixty-six percent of the respondents in the maintenance stage did not comply with the dietary guideline for fruit consumption. For vegetable consumption, three-quarters of the respondents were in the maintenance stage and only 16% were in the preaction (precontemplation, contemplation, and preparation) stages. However, only 10% of the respondents in the maintenance stage complied with the dietary guidelines for vegetable consumption. Table 2.1 also shows that differences for vegetable consumption as well as for fruit consumption between the preaction stages were relatively modest but large between the preaction stages and action or maintenance stage.

Both psychosocial factors were shown to be differentially distributed across the stages of change categories for fruits as well as for vegetables. Overall, precontemplators had

Table 2.1 Distribution of stages of change for fruits (N=2,171) and vegetables (N=2,219), mean ± SD daily consumption, and mean scores on psychosocial factors for stages of behavioral change

	Stages of change*				
	Prcon	Con	Prp	Act	Mnt
Fruits					
n (%)	479 (22)	84 (4)	297 (14)	170 (8)	1,141 (53)
Consumption (pieces/day)	0.3 ± 0.4 ^a	0.4 ± 0.4 ^a	0.5 ± 0.4 ^a	1.7 ± 0.8 ^b	1.4 ± 0.8 ^c
Consumption according guidelines; yes (%) [†]	2	1	2	49	34
Attitude [‡]	-0.07 ^a	1.04 ^b	1.21 ^b	0.97 ^b	0.48 ^c
Self-efficacy [‡]	0.58 ^a	1.07 ^{b,c}	1.26 ^{b,c}	1.40 ^b	1.08 ^c
Vegetables					
n (%)	167 (8)	44 (2)	138 (6)	194 (9)	1,676 (76)
Consumption (grams/day)	45 ± 32 ^a	51 ± 35 ^a	57 ± 41 ^a	115 ± 49 ^b	110 ± 49 ^b
Consumption according guidelines; yes (%) [†]	0	0	2	12	10
Attitude [‡]	-0.11 ^a	0.89 ^{b,c}	1.18 ^b	0.85 ^c	0.34 ^d
Self-efficacy [‡]	0.70 ^a	1.09 ^{a,b,c}	1.10 ^b	1.37 ^b	1.00 ^c

* = Prcon=precontemplation, Con=Contemplation, Prp=Preparation, Act=Action, Mnt=Maintenance
 † = Dietary guideline for fruit consumption is at least 2 pieces per day; Dietary guideline for vegetable consumption is at least 200 grams per day
 ‡ = Score ranges from -2 (most negative answer towards increasing consumption) to +2 (most positive answer towards increasing consumption)
 a-d = Means with a common superscript do not differ significantly (p < 0.05) from each other (Scheffé's multiple comparison test)

significantly lower scores than respondents in the contemplation, preparation, action, and maintenance stage. Furthermore, the attitude scores increased from precontemplation to preparation, and decreased in action and maintenance. The self-efficacy scores increased as far as the action stage, with significantly lower scores in the maintenance stage.

2.3.3 Multivariate associations of external factors on the stages of change

The first step of our data analysis was to examine the results of univariate models to select variables for the multivariate models. The external factors paid employment, financial problems, and problems in personal relationships were not associated with the stages of change for fruit consumption. After fitting the multivariate model, it appeared that income level, the presence of children, perceived general health and excessive alcohol consumption were statistically unimportant. Odds ratios for the association between the external factors and stages of change for fruit consumption are given in table 2.2. Gender, ethnic origin, health locus of control, a physical activity level according to the recommended level, and knowledge of fruit dietary

Table 2.2 Association between explanatory factors and stage of change for fruit, as assessed by the Thresholds of Change Model using equal and unequal effects: Odds ratios (OR) and 95% Confidence Intervals (CI)

	Equal effect		Contemplation		Unequal effects		Action	
	OR	CI	OR	CI	OR	CI	OR	CI
Gender								
male	1.52***	1.20 - 1.94	-	-	-	-	-	-
female	1.00							
Age								
18 - 24 years	-	-	0.65	0.40 - 1.05	1.01	0.62 - 1.65	1.40	0.72 - 2.71
25 - 44 years	-	-	0.79	0.56 - 1.11	0.92	0.65 - 1.30	0.71	0.46 - 1.11
45 - 66 years	-	-	1.00		1.00		1.00	
Marital status								
married	-	-	1.00		1.00		1.00	
never-married	-	-	0.74	0.53 - 1.05	0.69*	0.49 - 0.98	1.20	0.78 - 1.85
divorced/widowed	-	-	0.82	0.55 - 1.25	0.98	0.65 - 1.48	0.95	0.57 - 1.58
Educational level								
I (low)	-	-	1.71*	1.07 - 2.73	1.53	0.96 - 2.45	0.61	0.34 - 1.08
II	-	-	1.40	0.94 - 2.08	1.38	0.93 - 2.03	0.76	0.45 - 1.28
III	-	-	1.12	0.76 - 1.66	0.98	0.67 - 1.42	0.69	0.42 - 1.15
IV (high)	-	-	1.00		1.00		1.00	
Ethnic origin								
Dutch	1.00		-		-		-	
Other Western countries	0.90	0.59 - 1.38	-	-	-	-	-	-
Surinamese/Antillean/Aruban	0.18***	0.09 - 0.38	-	-	-	-	-	-
Turkish/Moroccan	0.26***	0.17 - 0.42	-	-	-	-	-	-
Other non-Western countries	0.28***	0.18 - 0.43	-	-	-	-	-	-
Health locus of control								
(rather) high	1.00		-		-		-	
not high/ not low	1.61***	1.22 - 2.13	-	-	-	-	-	-
(rather) low	1.42*	1.00 - 2.01	-	-	-	-	-	-
Moderate physical activity level according recommendations								
no	1.31*	1.03 - 1.67	-	-	-	-	-	-
yes	1.00		-		-		-	
Current smoking								
yes	-	-	1.09	0.83 - 1.42	1.25	0.96 - 1.64	1.96***	1.38 - 2.79
no	-	-	1.00		1.00		1.00	
Knowledge of fruit dietary guideline								
no	1.61***	1.22 - 2.13	-	-	-	-	-	-
yes	1.00		-		-		-	

p-value = * p < 0.05; ** p < 0.01; *** p < 0.001; for test OR=1; higher odds ratios indicate higher thresholds
 - = Association was not estimated

Table 2.3 Association between explanatory factors and stage of change for vegetables, as assessed by the Thresholds of Change Model using equal and unequal effects: Odds ratios (OR) and 95% Confidence Intervals (CI)

	Equal effect		Unequal effects					
	OR	CI	Contemplation		Preparation		Action	
			OR	CI	OR	CI	OR	CI
Gender								
male	1.76***	1.26 - 2.46	-	-	-	-	-	-
female	1.00		-	-	-	-	-	-
Age								
18 - 24 years	-	-	0.66	0.37 - 1.17	1.04	0.59 - 1.82	1.94*	1.08 - 3.48
25 - 44 years	-	-	0.47**	0.28 - 0.79	0.71	0.43 - 1.18	0.96	0.58 - 1.57
45 - 66 years	-	-	1.00		1.00		1.00	
Ethnic origin								
Dutch	1.00		-	-	-	-	-	-
Other Western countries	1.09	0.59 - 2.01	-	-	-	-	-	-
Surinamese/Antillean/Aruban	0.26**	0.11 - 0.61	-	-	-	-	-	-
Turkish/Moroccan	0.58*	0.36 - 0.94	-	-	-	-	-	-
Other non-Western countries	0.50*	0.29 - 0.86	-	-	-	-	-	-
Children								
yes	-	-	1.00		1.00		1.00	
no	-	-	0.61*	0.39 - 0.95	0.82	0.53 - 1.27	1.02	0.66 - 1.58
Paid employment								
no	0.66*	0.46 - 0.96	-	-	-	-	-	-
yes	1.00		-	-	-	-	-	-
Health locus of control								
(rather) high	1.00		-	-	-	-	-	-
not high/ not low	1.56*	1.07 - 2.27	-	-	-	-	-	-
(rather) low	1.53	0.95 - 2.46	-	-	-	-	-	-
Moderate physical activity level according recommendations								
no	1.58**	1.13 - 2.21	-	-	-	-	-	-
yes	1.00		-	-	-	-	-	-
Excessive alcohol consumption								
yes	2.07*	1.05 - 4.08	-	-	-	-	-	-
no	1.00		-	-	-	-	-	-
Knowledge of vegetable dietary guideline								
no	1.55*	1.06 - 2.26	-	-	-	-	-	-
yes	1.00		-	-	-	-	-	-

p-value = * p < 0.05; ** p < 0.01; *** p < 0.001; for test OR=1; higher odds ratios indicate higher thresholds
 - = Association was not estimated

guidelines appeared to be nonstage-specific factors. In other words, crossing the contemplation threshold may be as difficult as crossing the preparation or action threshold. As an example, consider the external factor gender. Women are estimated to be 1.76 times as likely as men to cross all thresholds. Also, those with knowledge of fruit dietary guidelines; those originating from Suriname, the Antilles, Aruba, Turkey and Morocco; those with a (rather) high health locus of control; and those complying to moderate-intensity physical activity guidelines may be more likely to cross the thresholds between stages and are more often in a higher stage of change category. Age, marital status, educational level and smoking were found to be stage-specific factors. In other words, crossing one threshold could be more difficult than crossing another. The results suggested increasing odds ratios for smoking. Non-smokers were estimated to be 1.09, 1.25 and 1.96 times as likely as smokers to cross the contemplation, preparation and action threshold respectively. Although only significant for the action threshold, the difference between smokers and non-smokers is likely to be more pronounced for the higher stages. Although we had to consider age and marital status as significant factors in the model, no clear pattern emerged from the data. Furthermore, the results suggested that those with a low educational level may be more often in the precontemplation and contemplation stage. However, if those respondents with a low educational level were already in the preparation stage, they crossed the action threshold easier than respondents with the highest educational level did. The odds ratios for age were only significant for the contemplation threshold.

The univariate analyses for vegetable consumption showed that educational level, household income, and perceived health were not associated with the stages of change for vegetable consumption. After fitting the multivariate model, it appeared that marital status, financial problems, problems in personal relationships and smoking were statistically unimportant. Odds ratios for the association between the external variables and vegetable consumption are given in table 2.3. Gender, ethnic origin, paid employment, health locus of control, a physical activity level according to the recommended level, excessive alcohol consumption, and knowledge of dietary guidelines were nonstage-specific factors. Women; those originating from Suriname, the Antilles, Aruba, Turkey and Morocco; unemployed respondents; those with a (rather) high health locus of control; those complying to moderate-intensity physical activity guidelines; those not drinking excessively; and those with knowledge of the vegetable dietary guideline may be more likely to cross the thresholds between stages and are more often in a higher stage of change. Age and the presence of children were likely to be stage-specific factors. Respondents aged 25 to 44 years were more likely than older individuals to cross the thresholds. Respondents aged 18 to 24 years, however, seemed to be less likely to cross the last threshold to action. Without the presence of children, respondents seemed to be more likely to cross the thresholds. Nevertheless, these varying effects diminish towards the action threshold.

2.4 Discussion

The results of the present study indicate that the majority of individuals in deprived neighborhoods are in the maintenance stage for fruit consumption as well as for vegetable consumption. However, most individuals in the maintenance stage do not meet the Dutch dietary guidelines. We observe significant differences in mean scores on psychosocial factors between respondents in different stages of change. For fruits as well as for vegetables, gender, ethnic origin, health locus of control, other health related behavior, and knowledge of dietary guidelines are clearly associated with forward stage transition.

Before interpreting the results of these analyses, a few issues concerning the strength and weaknesses of the data and method of the present study are to be considered.

The use of data collected among inhabitants of deprived neighborhoods, makes it possible to assess the determinants of intention to change behavior in a population of relatively low socioeconomic status. Educational level has proven to be a good indicator of socioeconomic status in the Netherlands. Although the distribution of educational level in the present study also shows a considerable proportion of individuals with a higher educational level, the proportion of lower educated individuals is considerably higher compared to national data.³⁵ Furthermore, 27% were in the lowest household income category, and 39% in the second but lowest category. This suggests that our population indeed seems to be a group of lower socioeconomic status.

Furthermore, we used the TCM to analyze the association between external variables and the stages of change.³¹ Apart from Hedeker et al., who proposed themselves to use the TCM to analyze stages of change, as far as we know, the model was not used in other situations before. As there are more available methods for investigating multivariate influences on the stages of change, it is important to note some advantages of the TCM. One advantage is that there is no loss of information due to the fact that we make full use of the ordinal scale of the outcome variable, whereas in traditional logistic regression we make use of a dichotomous outcome. Another advantage is that the analytic approach of the TCM fits well within the stages of change theory outlined by the Transtheoretical Model.¹⁶ This model points to the need for different intervention strategies for individuals at different stages of the change process. This implies that characteristics of individuals differ across the stages of change and that these characteristics have varying influences on membership in the different stages. The TCM can examine these external influences on the stages of change and also take into account the possibility of varying influences across the stages of change.

However, we also have to deal with some of the limitations of the study. First, the response rate (60%) to the survey was as high as the 55% to 60% generally expected from mailed questionnaires in the Netherlands.³⁶ Keeping in mind that response rates tend to be lower among groups of lower socioeconomic status,²⁷ we could conclude that the response was reasonably good. Nevertheless, our results might have been

biased by this nonresponse. This occurs if the nonresponse is selective by the stages of change, for example, if relatively more men in the precontemplation stage than women in the precontemplation stage refuse to participate in the study. Although a comparison of the distribution of sociodemographic characteristics of responders and nonresponders revealed a higher response rate for women and older and married individuals, we cannot be sure how this affected the analysis. Second, the analyses are based on cross-sectional data. As the external variables were measured at the same time as intention to change behavior, their interrelationship does not necessarily reflect a causal association. Third, most measures were never formally validated and thus may not have captured well the underlying theoretical constructs. Furthermore, we used a simple version of a validated FFQ, of which the authors had to conclude that it overestimated fruit and vegetable intake. This could mean that the intake of fruits and vegetables of this sample is lower than presented in this paper. Fourth, we excluded all respondents with missing data on stages of change, consumption variables, psychosocial and external factors. Comparison of the overall sample with this selection showed that the sample used for the analysis was slightly higher educated. This means that the analysis is not entirely applicable to a deprived neighborhood population. Other limitations are introduced by the use of self-reported dietary intake and self-reported intention to change behavior, which could lead to social desirability bias.

Finally, the discussion of three issues concerning the definition and classification of stages of change. First, if the staging algorithm is valid, there should be predictable differences in dietary behavior between persons classified into different stages of change.³⁷ In the present study these differences are present and consistent with earlier research in terms of modest differences in the preaction stages and larger differences between the preaction stages and action and maintenance.^{38,39} Second, our sample showed high proportions especially in the maintenance stage not meeting dietary guidelines. This finding is the result of using a subjective classification method based on self-rated intake to define the stages of change algorithm. Our results support the suggestion of Reed et al.⁴⁰ that an activity criterion ideally should be based on specified objective criteria, otherwise one is likely to end up with higher sample sizes in the late stages of change. Apart from their presumption that this could be due to the fact that more detailed objective criteria are harder to meet, it could be that lack of awareness of one's consumption also affects the stage distribution. Third, comparing our study with other studies, using the subjective classification method based on self-rated intake to define stages of change, remains difficult, because no standardized procedure had been developed in the past for the categorization of people into different stages of change. Therefore, it is important to keep in mind which classification method is used to interpret the results in a correct manner.

We observed that most people were in the maintenance stage, and most of the remaining respondents were precontemplators. These findings are supported by the findings of another Dutch study where the distribution of respondents over stages of change is rather similar.²⁵ However, another study reported large proportions of

respondents in the maintenance and preparation stage and only small numbers in precontemplation, contemplation, and action.²² Taking into account that the Transtheoretical Model would predict that precontemplation and maintenance stage are the most stable stages and therefore most people are expected to be maintainers or precontemplators,¹⁶ the present study might support this prediction. Furthermore, the action stage can be seen as the least stable stage, which could explain low numbers in this stage.

Fruit and vegetable intake was higher in action and maintenance than in the other stages. Respondents in action had the highest intake. These results are in line with earlier findings,^{25,41} but it should be noted that mean intake levels in both studies were higher than in the present study. The overall lower consumption levels in the present study could be due to the research population of relatively low socioeconomic status. Many studies in the Netherlands,^{9,42} but also in Europe^{8,43} and the United States⁷ observed socioeconomic differences with regard to fruit and vegetable consumption.

Although we measured attitude and self-efficacy in a rather simple way, results are rather similar with other findings. Less positive attitudes and lower self-efficacy expectations go together with lower consumption levels and the precontemplation stage.^{22,41}

According to the ASE model, attitudes, self-efficacy and social influences are supposed to influence behavior mainly through behavioral intention. These attitudes, self-efficacy and social influences themselves are supposed to be influenced by external factors. According to the data presented here, forward stage transition might be influenced by several external variables. The intention to change one's own fruit consumption might be influenced by gender, age, marital status, educational level, ethnic origin, health locus of control, physical activity level, smoking and knowledge of dietary guidelines. The intention to change one's own vegetable consumption might be influenced by gender, age, ethnic origin, presence of children, paid employment, health locus of control, physical activity level, excessive alcohol consumption and knowledge of dietary guidelines. Because no other studies used a TCM to examine stages of change data, it will be difficult to compare our results to those of others. Laforge et al. used a logistic regression model for being in the precontemplation stage for consumption of fruit and vegetables.⁴⁴ They observed that men were about twice the risk of being in the precontemplation stage than were women and that years of education was a strong predictor of being in the precontemplation stage. Both the effect of gender and educational level are consistent with our data. However they did not find effects for being in the precontemplation stage for age, employment outside home, health status and alcohol consumption. Campbell et al. also reported the same association of stages of change between gender and education.³⁹ They also found a strong relationship between knowledge of dietary guidelines and stages of change. More participants in action or maintenance knew the recommendations for good health compared to those in earlier stages.

Our findings suggest some practical implications. First of all, the substantial proportion of respondents who do not meet the dietary guidelines for fruit and

vegetable consumption confirms the need for public health interventions aimed at increasing consumption. Nevertheless, these interventions might not be effective as long as people misjudge their level of consumption. Therefore, increasing awareness of their inadequate fruit and vegetable consumption should be an important starting point of interventions. Computer tailored interventions are nowadays often used to give people advice on their own intake.⁴⁵ A method suitable for a community intervention could be a regular newsletter on health related topics, because it can reach large numbers of individuals.⁴⁶ An important topic to be included in the newsletter should be a communication about the present guidelines and also the visualization of an adequate consumption to increase people's awareness. Increasing awareness and knowledge may not only motivate those in the precontemplation stage but also those people in the maintenance stage who are unaware of their inadequate behavior. Second, for those in the contemplation and preparation stages, interventions should be aimed at more positive attitudes, increasing self-efficacy expectations, and coping with unsupportive environments. Third, health educators should take into account that specific groups need more attention to proceed in the behavioral change process and that health related behavior and health locus of control also influence forward stage transition.

Furthermore, this study supports to research suggesting that the TCM is a useful method for analyzing stages of change data. Several external factors were likely to have an effect on forward stage transition. Although we could identify specific groups in need for more attention to proceed in the behavioral change process, we could not answer the question why they were more in need. More insight as to why several sub-groups are more likely to be in a lower stage of change category can be useful for planning future public health interventions.

In conclusion, the results from this study show that the distribution of stages of change for fruit and vegetable consumption in groups of relatively low socioeconomic status follows the same pattern as in a more average population. However, it should be noted that the mean consumption level of fruit and vegetables in these groups is likely to be lower than the Dutch average consumption level. These remaining differences in fruit and vegetable consumption between the socioeconomic classes suggest that nationwide interventions to improve fruit and vegetable consumption may not reach the population segments most in need of changing. Our insights in correlates of forward stage transition provide new starting points for interventions aimed at increasing fruit and vegetable consumption in groups of lower socioeconomic status.

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Stages of Change for Moderate-Intensity Physical Activity in Deprived Neighborhoods

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Abstract

According to recent studies less than 50% of Dutch adults met the moderate-intensity physical activity recommendations. Of particular concern, people in lower socioeconomic groups are more likely to be sedentary than the general population. In order to develop effective interventions to stimulate physical activity, it is important to understand factors that promote behavioral change. This article describes the association of external and psychosocial factors with the stages of change for moderate-intensity physical activity among individuals with generally low socioeconomic positions. We used data from a self-administered questionnaire among individuals aged 18 to 65 years (response rate 60%, n=2,781). To identify factors associated with movement across stages an ordinal logistic regression model, the "Threshold of Change model (TCM)", was used to analyze the data. Results indicate that individuals who are older, lower educated, have low health locus of control, have no knowledge of physical activity issues, and present other risky health behaviors, were more likely to be in a lower stage of change category. A positive attitude, high self-efficacy expectations, perceiving the physical activity level of others as high, and much social support was associated with higher levels of stages of change. The results make it possible to distinguish target groups, which should receive more attention in future health promotion campaigns, and to identify specific sub-groups in need of more attention to proceed in the behavioral change process.

3.1 Introduction

There is considerable epidemiological evidence for the importance of physical activity in reducing risk of several chronic diseases including cardiovascular disease, non-insulin-dependent diabetes, osteoporosis, colon cancer and anxiety and depression.¹⁻³ Recommendations for an adequate physical activity level are therefore part of public health recommendations in many countries. The U.S. Centers for Disease Control and Prevention and the American College of Sports Medicine recommend for adults 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week.² Moderate activities are types of activities performed at an intensity of 3 to 6 METs (work metabolic rate/resting metabolic rate). However, previous studies in the United States⁴ and the Netherlands,^{5,6} showed about 60% of all adults do not meet these recommendations. This noticeable difference between recommended and actual activity level necessitates effective interventions to increase the level of moderate-intensity physical activity.

To develop effective interventions, it is important to understand the factors that promote behavioral change.⁷ In understanding these behavioral determinants in particular, social cognition models have been used.⁸ One frequently used model is the Transtheoretical Model of Change,⁹ which has been applied to a number of behaviors, including physical activity.¹⁰ The model states that behavior change is a staged process in which five discrete stages can be distinguished. The precontemplation stage (no intention to change in the foreseeable future), contemplation stage (intending to change but not soon), preparation stage (intending to change in the next month), action stage (recent change of behavior), and maintenance stage (maintaining change for at least 6 months). One of the implications of the model is that to move from one stage to another, people need different information, tailored to their specific stage of change.⁹ Earlier research, integrating the stage concept of the Transtheoretical Model with motivational models of health behavior (e.g. Theory of Planned Behavior¹¹ and Social Cognitive Theory¹²), suggested that social cognitive influences like attitudes, social influences, and self-efficacy expectations differ across different stages.^{5,13,14} This implies that to develop effective interventions we not only need information on the distribution of the population across the stages of change, but also on external and psychosocial factors that may influence movement from one stage to another.

To examine the association between the stages of change for moderate-intensity physical activity and external and psychosocial factors the present study used the stages of change construct of the Transtheoretical Model integrated within a motivational model of health behavior, the Attitude-Social influence-Efficacy (ASE) model (see figure 2.1).^{15,16} The ASE model states that behavior is best predicted by behavioral intention, which in turn is determined by three important factors. The first factor is attitude, consisting of a general positive or negative evaluation of a particular behavior. The second factor is a person's perceived social influences, which are a result of social norms about the behavior, support from the environment to perform the behavior, and the perception of behavior from others (modeling). The third factor concerns self-efficacy expectations, based on the estimation of a person

about his or her ability to perform the behavior. External variables, such as sociodemographic factors, are assumed to influence behavior through the three psychosocial determinants and behavioral intention. The ASE model originated in the Theory of Reasoned Action (TRA)¹¹ but differs in the way social influences are measured. While the TRA only measures social norms, the ASE model distinguishes social norms, perceived behavior of others, and direct support to perform a particular behavior.

The analyses extend those reported from earlier studies in four ways. First, the sample is based on a large baseline measurement of a community intervention set out to improve health related behavior in deprived neighborhoods. Typically, these neighborhoods are characterized by weaker social positions of its residents, due to lower income and higher unemployment rates, a higher presence of ethnic minority groups, and more insecure living conditions due to crime and violence. Furthermore, people in lower socioeconomic positions are generally worse off with respect to their health than people in higher positions.¹⁷ These socioeconomic inequalities in health can partly be explained by factors as material circumstances; psychosocial stressors; accessibility to, and use of, preventive and curative services; and differences in health related behavior.^{18,19} Previous studies indicated that a lower socioeconomic position often involves lack of physical activity, a higher prevalence of smoking, a higher prevalence of obesity, a higher fat intake, and a lower consumption of fruit and vegetables.^{19,20} If we choose to carry out an intervention aiming to increase the level of moderate-intensity physical activity in lower socioeconomic groups, we ideally need information on determinants of behavior for this specific population.²¹ Second, we used an ordinal logistic regression model, the Threshold of Change Model (TCM), to identify factors associated with stages of change.²² The analytic approach of the TCM fits well within the stages of change theory outlined by the Transtheoretical Model. Third, previous studies investigated the importance of psychosocial factors on the stages of change for physical activity,^{5,13,14} showing that these factors differ in subjects at different stages of change. However, these studies were mostly conducted in a more general population. A paucity of such studies still exists among lower socioeconomic groups. Fourth, hardly any studies have been conducted on differences in more distal factors between stages of change. The external factors considered in our study are sociodemographic factors, environmental factors, health measures, other health related behavior and knowledge. These factors are thought to be determinants of physical activity participation^{23,24} and therefore also likely to be associated with movement across stages of change.

3.2 Data and Methods

3.2.1 Population

Data were collected as part of a baseline measurement of the “Wijkgezondheidswerk” project (Dutch for “Working on Healthy Neighborhoods”), a community intervention that set out to improve (determinants of) health related behavior in three experimental and three control deprived neighborhoods in Eindhoven, the

Netherlands. The municipality, on the basis of functional, physical and social criteria indicated deprived neighborhoods. A low score on these criteria indicated an accumulation of problems and a necessity for intervention. An aselect sample of 800 individuals aged 18 to 65 years from each neighborhood was drawn from the population registers. Individuals in the sample received a questionnaire by mail, which included questions on moderate-intensity physical activity, stages of change for moderate physical activity, other health related behavior and several psychosocial and demographic determinants. A reminder was mailed to nonresponders after two weeks and the same questionnaire was resent after another two weeks. The surveys were all written in Dutch, and an introductory letter in Dutch, Turkish and Arabic accompanied them. Furthermore, it was possible for respondents to get help from a Turkish or Moroccan translator to fill out the questionnaire. A total of 2,781 of 4,663 eligible participants completed the questionnaire (response rate = 60%). Differences in response rates between subgroups were modest in size. Women and those who were married were significantly more likely to participate compared to men and never-married individuals. Nonresponders were on average three years younger than respondents were. No response differences were found according to ethnic origin.

3.2.2 Moderate physical activity level

To assess physical activity levels we used the SQUASH (Short QUestionnaire to ASsess Health enhancing physical activity) questionnaire.²⁵ The SQUASH questionnaire measures various physical activities like walking, bicycling, housework, activity level at work, home repair, gardening and sports. Respondents were asked to report the frequency (days/week) and duration (min/day) they engaged in these activities in an average week in the past months. All different forms of physical activity were scored by multiplying the total minutes per week of the activity with an intensity score derived from Ainsworth's compendium of physical activities.²⁶ A total activity score was calculated by taking the sum of all these separate activity scores. The SQUASH questionnaire also allows us to determine whether respondents met the Dutch recommendations for physical activity of 30 minutes on five, preferably all days of the week of moderate-intensity physical activity.²⁷ Furthermore, we assessed perceived reasons or benefits in taking part in physical activity and perceived barriers for physical activity participation.

3.2.3 Stages of change for moderate physical activity

Figure 3.1 shows the multiple-question algorithm used to classify respondents into their stage of change category for physical activity. The algorithm was derived from a questionnaire of another large community intervention in the Netherlands.²⁸ The scoring algorithm was based on the initial question “How high or low is your physical activity level”, followed by questions assessing intention to change. The questionnaire’s instructions defined “physical activity” as, not only practicing one or more sports, but also for example cycling or walking to/from work or school, and walking, cycling, gardening and home repair in leisure time. The action criterion of the stage algorithm was a “sufficient” or “(very) high” physical activity level. Earlier results^{5,29} showed that subjects are having difficulties in evaluating the adequacy of a complex health related behavior. These earlier studies showed that a fair amount of subjects in the maintenance stage would not be aware of their inadequate level of the desired behavior. Therefore, using a scoring algorithm based on subjective, self-rated level of physical activity, we expected a quite heterogeneous composition of respondents in the maintenance stage. The results of table one show that these expectations were true. Two thirds of all respondents in the maintenance stage did comply with the physical activity recommendations, but still one third did not. As a consequence, we excluded all maintainers (n=1,260) from the logistic regression analyses because there are likely to be different determinants at stake in this heterogeneous group.

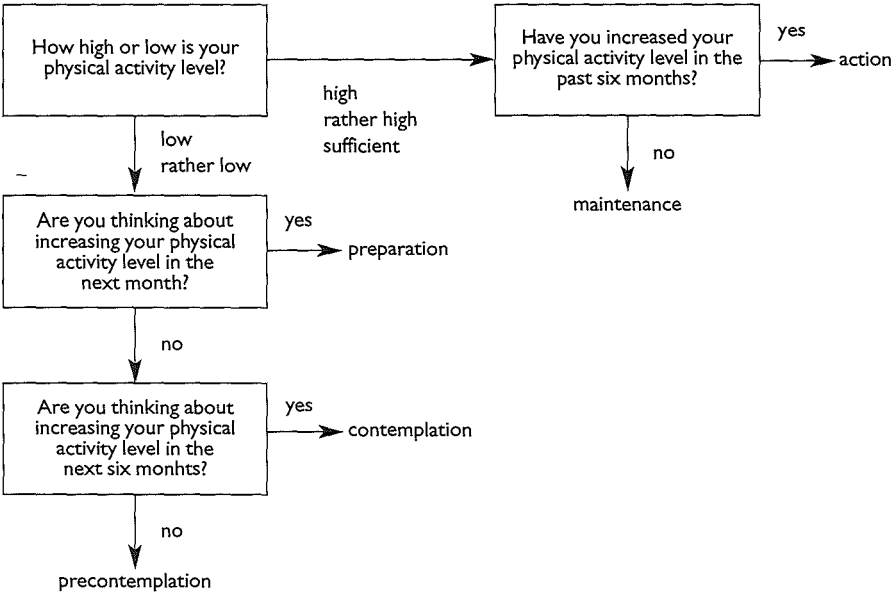


Figure 3.1 Stages of change algorithm for moderate-intensity physical activity

3.2.4 Psychosocial factors

To measure attitudes toward increasing one's level of physical activity individuals were asked to give their opinion on a five-point positive-negative scale. To measure self-efficacy, individuals were asked to rate how certain they were they could increase their physical activity levels. Response choices were very certain, certain, not certain/not uncertain, uncertain and very uncertain. Perceived level of physical activity of others was measured by asking respondents to assess how physically active other people in their social environment were. Response choices were ranging from a high physical activity level to a low physical activity level on a 5-point scale. To measure perceived social support in increasing one's physical activity level we used a three-point scale. Response choices were no support, a little support and much support. Higher scores on the psychosocial factors indicated a more positive attitude, greater self-efficacy, a higher perceived physical activity level of others, and more social support.²⁸

3.2.5 External factors

Twenty-one variables were selected that were considered possible predictors of stages of change. The variables represented a selection of external influences like sociodemographic factors, material environmental factors, psychosocial environmental factors, health measures, other health related behaviors and knowledge of physical activity topics.

Sociodemographic factors that were considered were gender, age (18-24/25-44/45-66), marital status, ethnic origin, highest attained educational level, and children at home (yes/no). Marital status was categorized into married, never-married, and divorced and widowed. Five groups of ethnic origin were distinguished: Dutch, other Western countries, Surinamese or Antillean or Aruban, Turkish or Moroccan, and other non-Western countries. A person belonged to another ethnic group instead of being from Dutch origin, if one of his or her parents was not born in the Netherlands. Educational level was divided into four categories, that is, primary school only or no schooling (I=low), lower secondary or vocational schooling (II), intermediate vocational schooling or intermediate or higher secondary schooling (III), and higher vocational schooling and university (IV=high). All data on sociodemographic factors, except on educational level, were derived from municipality statistics.

Material environmental factors were financial problems (none/some/big), paid employment (yes/no), neighborhood appreciation (low, not low/not high, high), and number of difficulties relating to neighborhood circumstances.

Psychosocial environmental factors were the experience of difficulties relating to health of significant others, and personal relationships. Difficulties with respect to health of significant others and difficulties with personal relationships were measured by means of two subscales of the Dutch long lasting Difficulties Questionnaire.³⁰

Health measures were perceived general health, health locus of control, movement disabilities (yes, a lot/yes, a little/no), and body-mass index (kg/m²)

(underweighted/normal/overweighted/(very) obese). Perceived general health was based on the respondent's answer to the question "How do you rate your health in general?" Response options were excellent, very good, good, fair, and poor. Health locus of control was based on the respondent's answer to the question "Do you think you can do much or little to prevent health problems?" Response options were much, rather much, not much/not little, rather little and little.

Three measures of health related behavior were used. Current smoking (yes/no), excessive alcohol consumption (three or more glasses per day) (yes/no), and compliance with dietary guidelines for fruit (2 pieces per day) and vegetable consumption (200 grams per day) (yes/no).

We assessed the knowledge of the recommended level of moderate physical activity. Respondents were asked to identify the correct physical activity recommendation from a list of six possible answers. We also assessed knowledge of health benefits of moderate physical activity. Respondents were categorized according to their total knowledge score on 5 questions: "bad" (0-2 correct answers), "moderate" (3 correct answers), and "good" (4-5 correct answers).

3.2.6 Analyses

After excluding respondents with missing values in stages of change 2,574 persons were included in the analyses. Cross-tabulations were computed to describe the distribution of physical activity related variables across stages of change categories. Differences across the stages were assessed using analysis of variance for continuous variables and a chi-square test for categorical variables.

For reasons mentioned earlier, we considered only respondents in the precontemplation, contemplation, preparation and action stage (n=1,314) to determine the association between external and psychosocial factors and the stages of change. These first four stages can be analysed as an ordinal scaled variable. Therefore, we chose an ordinal regression model to determine which variables were independently associated with stages of change. In particular we used the TCM as described by Hedeker et al.²² This model uses a common statistical technique, a Partial Proportional Odds Model,³¹ to estimate the parameters of the model, but distinguishes itself from other ordinal models by its focus on thresholds that separate the stages of change categories. In our case of four ordered stages of change categories, three thresholds exist: one between precontemplation and contemplation (contemplation threshold), one between contemplation and preparation (preparation threshold), and one between preparation and action (action threshold). These thresholds can be conceptualized as hurdles of increasing difficulty that separate individuals into the stages of change. By estimating these thresholds, the probability of crossing each threshold can be determined for a population of respondents in each stage of change. Finally, it also allows us to assess the influence of explanatory variables on the thresholds. A variable can have a beneficial, lowering or no effect on the thresholds. Furthermore, this effect of an explanatory variable can be assumed to be equal or to vary for each threshold. Variables with an equal effect on each

threshold (i.e. nonstage-specific factors) have proportional odds in the Partial Proportional Odds model. Variables with unequal effects on the thresholds (i.e. stage-specific factors) have non-proportional odds.

The first step in our analysis was to use univariate Partial Proportional Odds models to select variables for the multivariate analysis. Variables were considered as a candidate for the multivariate model if they had a Wald F-test of $p < .25$.³² In the second step a multivariate Partial Proportional Odds model was fitted. Equal effects with $p < .05$ and unequal effects with $p < .10$ remained in the final model. Dummy variables were constructed for all variables. The regression coefficients and their standard errors were used to calculate odds ratios and their 95% confidence intervals. The analyses were carried out with the SAS statistical program version 8.0.³³

3.3 Results

3.3.1 Sample Characteristics

Half of the respondents were male, most of them were either married (42%) or never-married (42%), and 67% were of Dutch origin. Mean age was 40 (± 13) years. Nineteen percent had higher vocational schooling or university, 22% had intermediate vocational schooling or intermediate or higher secondary schooling, 35% cent had lower secondary or lower vocational schooling, and 24% had primary school only or no schooling. Over 65% of the respondents were in the two lowest household income categories. The average total activity score (minutes \times intensity) was 7,197 ($\pm 5,256$). Fifty-seven percent of all respondents met the moderate-intensity physical activity recommendations of 30 minutes moderate intensive physical activity on at least 5 days of the week. Thirty-six percent of the respondents practiced one or more sports. Seventeen percent was inactive (i.e. no single day 30 minutes of moderate intensive physical activity).

3.3.2 Distribution of physical activity related measures and psychosocial factors by stages of change

In table 3.1 the distribution of stages of change for moderate physical activity are given. Almost half of the respondents were in the maintenance stage, 15% were in the action stage, and 36% were in the preaction (precontemplation, contemplation, and preparation) stages. Respondents in the action stage participated most frequently into one or more sports (57%), they complied most often to physical activity recommendations (71%) and they had the highest total activity score.

The six most important perceived reasons or benefits in taking part in physical activity were “to maintain good health” (37%), “to get fit” (37%), “to release tension” (32%), “for fun” (14%), “to control weight” (10%), and “to socialize” (9%). Sixteen percent of the respondents indicated not to participate in any form of physical activity. We also assessed the perceived barriers for respondents in the contemplation and precontemplation stage. By far the most important barrier for physical activity participation was “no time” (45%). Other barriers were “not fit enough” (17%), “no company” (16%), and “too expensive” (13%). Furthermore, 18% of the

Table 3.1 Distribution of stages of change for moderate intensity physical activity and physical activity related outcomes (N=2,574)

	Stages of change*				
	Prcon	Con	Prp	Act	Mnt
Overall n (%) of sample	411 (16)	159 (6)	359 (14)	385 (15)	1260 (49)
Total activity score (mean \pm SD)**	5,064 \pm 4,241 ^a	5,873 \pm 3,313 ^{ab}	6,236 \pm 4,061 ^b	8,825 \pm 5,740 ^c	7,877 \pm 5,610 ^d
Participation in one or more sports; yes (n (%))[†]	58 (14)	51 (33)	107 (30)	205 (57)	474 (39)
Physical activity level according to recommendations; yes (n (%))[‡]	147 (36)	69 (44)	167 (47)	254 (71)	780 (64)

* = Prcon=precontemplation, Con=Contemplation, Prp=Preparation, Act=Action, Mnt=Maintenance

** = Calculated as minutes physical activity per week multiplied by intensity

† = Chi-square tests for distribution of stage by physical activity related variables were statistically significant ($p < 0.001$)

‡ = Recommended physical activity level: 30 minutes of moderate-intensity physical activity on at least 5 days of the week

a-d = Means with a common letter do not differ significantly ($p < 0.05$) from each other

Table 3.2 Mean scores on psychosocial factors for stages of change for moderate intensity physical activity (N=2,507)

	Stages of change [†]				
	Prcon	Con	Prp	Act	Mnt
Attitude about increasing physical activity level[‡]	0.38 ^a	1.31 ^b	1.46 ^b	0.80 ^c	0.55 ^c
Ability to increase physical activity level[‡]	0.24 ^a	0.87 ^{b,c}	1.16 ^b	0.95 ^b	0.74 ^c
Perceived physical activity level of others[‡]	-0.39 ^a	-0.20 ^a	-0.26 ^a	0.23 ^b	0.09 ^b
Perceived social support[§]	0.36 ^a	0.49 ^{a,c}	0.60 ^{b,c}	0.57 ^{b,c}	0.39 ^a

† = Prcon=precontemplation, Con=Contemplation, Prp=Preparation, Act=Action, Mnt=Maintenance
 ‡ = Score ranges from -2 to 2 (very negative, or uncertain, or low, ..., very positive, or certain, or high)
 § = Score ranges from 0 to 2 (no support, little support, much support)
 a-d = Means with a common letter do not differ significantly (p < 0.05) from each other

precontemplators stated they already had enough physical activity, in contrast to only 3% of the contemplators.

Table 3.2 shows mean scores on psychosocial factors for the stages of change. Respondents in the precontemplation stage had significantly lower self-efficacy expectations and less positive attitudes. Respondents in the preparation stage had the highest scores. Furthermore, respondents in the preaction stages perceived the level of physical activity of other people in their direct surroundings as rather low. Individuals in the preparation and action stage received most social support.

3.3.3 Multivariate associations between psychosocial factors and the stages of change

In table 3.3 odds ratios are given for the multivariate association between stages of change and physical activity related attitude, self-efficacy, social support and perceived physical activity level of others. For the psychosocial factors, these associations were all unequal, meaning that all these factors were likely to be stage specific factors. For attitude, the effects were very pronounced in terms of the contemplation and preparation threshold. Individuals with a positive or neutral attitude were more likely to be across these thresholds than individuals with a negative attitude. For self-efficacy, we see significant unequal effects, although diminishing, on all thresholds. Certainty about one's ability to increase the level of physical activity exerted a much greater effect on the contemplation threshold than on the action threshold. The effect of perceived physical activity level of others was just opposite to the effects of attitude and self-efficacy. A high physical activity level of others exerted the greatest effect on the action threshold. The odds ratio estimates indicated that those perceiving much social support had lower thresholds than those perceiving no social support. However, this effect was only significant for the contemplation threshold.

Table 3.3 Multivariate Associations between psychosocial factors and stages of change for moderate intensity physical activity, as assessed by the Thresholds of Change Model: Odds ratios (OR) and 95% Confidence Intervals (CI) (N=1,291)

	Equal effect		Contemplation		Unequal effects Preparation		Action	
	OR	CI	OR	CI	OR	CI	OR	CI
Attitude about increasing physical activity level								
negative	-		1.00		1.00		1.00	
not positive, not negative	-	-	0.52**	0.32 - 0.84	0.52**	0.32 - 0.85	0.47***	0.28 - 0.79
positive	-	-	0.23***	0.15 - 0.36	0.38***	0.24 - 0.60	1.10	0.68 - 1.79
Able to increase physical activity level								
uncertain	-		1.00		1.00		1.00	
not certain, not uncertain	-	-	0.65*	0.42 - 1.00	0.76	0.49 - 1.16	1.13	0.72 - 1.78
certain	-	-	0.26***	0.18 - 0.39	0.36***	0.25 - 0.52	0.67*	0.45 - 0.99
Perceived physical activity level of others								
low	-		1.00		1.00		1.00	
not high, not low	-	-	0.73*	0.54 - 0.99	0.68**	0.51 - 0.89	0.55***	0.40 - 0.75
high	-	-	0.55***	0.38 - 0.77	0.59**	0.42 - 0.82	0.32***	0.22 - 0.46
Perceived social support								
no support	-		1.00		1.00		1.00	
a little support	-	-	0.88	0.66 - 1.16	0.82	0.63 - 1.07	1.20	0.90 - 1.60
much support	-	-	0.55*	0.32 - 0.95	0.67	0.41 - 1.08	0.76	0.47 - 1.23

p-value = * p < 0.05; ** p < 0.01; *** p < 0.001; for test OR=1; higher odds ratios indicate higher thresholds

- = Association was not estimated

3.3.4 Multivariate associations between external factors and the stages of change

The first step of our data analysis was to examine the results of the univariate models to select variables for the multivariate analyses. Ethnic origin, presence of children at home, neighborhood appreciation, difficulties relating to neighborhood circumstances and difficulties with personal relationships were not associated with stages of change. Gender, marital status, paid employment, financial problems, difficulties relating to health of significant others, perceived general health, body-mass index, and smoking had a p-value less than .25 but were not included in the final multivariate model. Table 3.4 lists the odds ratios of the multivariate model considering either equal or unequal threshold effects. First, we consider the relevant sociodemographic factors, age and educational level. Individuals in the younger age groups were more likely to have lower thresholds than those in the oldest age group. However, as the unequal effects indicate, this difference was less pronounced for the preparation and action threshold, and only remained for those in the age of 25 to 44 years. The association for educational level was more complicated. Those with a low educational level were less likely to be across the contemplation threshold. However, the magnitude of the action threshold is completely different. Those with a lower educational levels were more likely to be across the action threshold, as individuals with the highest educational level. For health locus of control the odds ratio estimates indicated that individuals with a (rather) high control were more likely to be across all thresholds than those with a (rather) low control. However, a (rather) high control exerts a much greater effect on the contemplation threshold than the action threshold. For movement disability, there is a significant effect on the contemplation threshold, for those individuals somewhat disabled. Severely disabled individuals were less likely to be across the action threshold, than non-disabled persons. For the health related behaviors, an excessive alcohol consumption, and consumption of fruits and vegetables according to the guidelines, we see that individuals displaying unhealthy behavior were less likely to be across the thresholds. At last, knowledge seemed to be important to be across the thresholds. Those with knowledge of physical activity recommendations and health benefits of physical activity were more likely to be across the thresholds than those without knowledge of these topics.

3.4 Discussion

The present study shows that almost half of the individuals in deprived neighborhoods are in the maintenance stage, 15% are in action, and the remainder 36% are in the preaction stages. We observe that individuals in action have most favorable physical activity related outcomes. Nevertheless, a considerable part of all respondents do not comply to moderate-intensity physical activity recommendations. Several sociodemographic factors, environmental factors, health measures, other health related behavior, and knowledge are associated with movement across stages. Not surprisingly, the psychosocial factors seem to be highly stage specific factors. The findings for the psychosocial factors fit well into earlier findings in the literature, which in turn emphasize the usefulness of the TCM.

Table 3.4 Multivariate Associations between external factors and stages of change for moderate intensity physical activity, as assessed by the Thresholds of Change Model assuming equal and unequal effects on thresholds: Odds ratios (OR) and 95% Confidence Intervals (CI) (N=1,148)

	Equal effect		Unequal effects					
	OR	CI	Contemplation		Preparation		Action	
			OR	CI	OR	CI	OR	CI
Age								
18 - 24 years	-	-	0.35***	0.23 - 0.55	0.61*	0.41 - 0.90	1.36	0.87 - 2.12
25 - 44 years	-	-	0.52***	0.38 - 0.72	0.61**	0.45 - 0.83	0.68*	0.48 - 0.95
45 - 66 years	-	-	1.00		1.00		1.00	
Educational level								
I (low)	-	-	1.94**	1.23 - 3.07	1.10	0.73 - 1.67	0.56*	0.35 - 0.90
II	-	-	2.04***	1.36 - 3.04	1.19	0.83 - 1.70	0.56**	0.38 - 0.84
III	-	-	1.15	0.75 - 1.77	0.85	0.59 - 1.22	0.43***	0.29 - 0.64
IV (high)	-	-	1.00		1.00		1.00	
Health locus of control								
(rather) low	-	-	1.00		1.00		1.00	
not high/ not low	-	-	0.67	0.46 - 0.97	0.83	0.58 - 1.19	1.15	0.76 - 1.73
(rather) high	-	-	0.44***	0.30 - 0.65	0.53***	0.37 - 0.76	0.75	0.50 - 1.13
Movement disability								
yes, a lot	-	-	1.20	0.76 - 1.89	1.33	0.86 - 2.07	2.03*	1.15 - 3.57
yes, a little	-	-	0.62**	0.46 - 0.85	0.84	0.63 - 1.12	1.16	0.86 - 1.58
none	-	-	1.00		1.00		1.00	
Excessive alcohol consumption								
yes	1.86**	1.16 - 2.97	-	-	-	-	-	-
no	1.00		-		-		-	
Fruit & vegetable consumption according guidelines								
yes	1.00		-		-		-	
no	2.13**	1.26 - 3.60	-	-	-	-	-	-
Knowledge physical activity recommendations								
yes	0.61*	0.38 - 0.99	-	-	-	-	-	-
no	1.00		-		-		-	
Knowledge health benefits of physical activity								
good	0.70**	0.54 - 0.91	-	-	-	-	-	-
moderate	0.66**	0.50 - 0.87	-	-	-	-	-	-
bad	1.00		-		-		-	

p-value = * p < 0.05; ** p < 0.01; *** p < 0.001; for test OR=1; higher odds ratios indicate higher thresholds
 - = Association was not estimated

Before interpreting the results of these analyses, a few issues concerning the strength and weaknesses of the data and methods of the present study are to be considered.

The use of data collected among inhabitants of deprived neighborhoods makes it possible to assess factors associated with movement across stages for moderate-intensity physical activity in a relatively low socioeconomic population. Educational level has proven to be a good indicator of socioeconomic status in the Netherlands.³⁴ Although the distribution of educational level in the present study reflects also a considerable proportion of individuals with a higher educational level, the proportion of lower educated individuals was considerably higher compared to national data.³⁵ Furthermore, 27% of the population are in the lowest household income category and 38% are in the second lowest category. We can compare these figures with data from the longitudinal Dutch GLOBE study set out in Eindhoven and its surroundings. In the GLOBE study only 10% of the respondents were in the lowest category and 24% in the second lowest category, meaning that our population seems to be more deprived as measured by the income level.³⁶ This suggests that our population indeed seems to be a lower socioeconomic group.

Furthermore, we used the TCM to identify determinants of stages of change as proposed by Hedeker et al.²² This approach has not been used before to analyze stage determinants for physical activity. Nevertheless, TCM has striking advantages over more traditional methods, like logistic regression models, to analyze determinants of stages of change. First, the TCM uses the ordinal nature of the response variable instead of e.g. collapsing the originally ordinal response variable into a dichotomous outcome, or categorizing the ordinal scale into several binary variables. Therefore, there will be no loss of information due to collapsing some categories and there will be no loss of statistical power.³⁷ Second, the analytic approach of the TCM fits well within the stages of change theory outlined by the Transtheoretical Model.⁹ This model posits that people in different stages differ in factors important for behavior change, and therefore stresses the need for different intervention strategies for individuals in different stages of change. With the TCM these differences in determinants can be investigated.

However, we also have to deal with some of the limitations of the study. First, the response rate (60%) to the survey was as high as the 55% to 60% generally expected from postal questionnaires in the Netherlands.³⁸ Keeping in mind that response rates tend to be lower among lower socioeconomic groups,³⁹ we could conclude that the response was reasonably good. Nevertheless our results may be biased by non-response. This occurs if the nonresponse is selective by the stages of change if, for example, relatively more precontemplation men than precontemplation women refuse to participate in the study. Although a comparison of the distribution of sociodemographic characteristics of responders and nonresponders revealed a higher response rate of women, older and married individuals, we cannot be sure how this affected the analysis. Second, the analyses are based on cross-sectional data. As the external variables were measured at the same time as the stages of change, their interrelationship does not necessarily reflect a causal association. Third, most measures

were never formally validated and the psychosocial factors were measured with single items. Practical limitations (survey questionnaire size) made it impossible to use more extended questionnaires to capture underlying theoretical constructs in a better way. Fourth, physical activity behavior and the information on external and psychosocial factors was self-reported in the postal questionnaire. This could lead to social desirability bias.

Finally, two issues concerning the definition and classification of stages of change need to be mentioned. First, if the staging algorithm is valid, there should be predictable differences in physical activity behavior between persons classified into different stages of change.⁴⁰ In the present study these differences were present with increasing levels of physical activity as individuals moved to a higher stage. The differences were also consistent with earlier research¹⁰ in terms of modest differences in physical activity levels in the preaction stages and larger differences between the preaction stages and action and maintenance. Second, comparing our stage distribution data with other studies remains difficult, because no standardized procedure had been developed in the past for the categorization of people into different stages of change. Although our sample showed slightly higher proportions of individuals in the action and maintenance stage, our stage distribution data matched reasonably well with the aggregated stage distribution data in a meta-analysis of 80 studies by Marshall & Biddle.¹⁰ These findings support the suggestion of Reed et al.⁴¹ that an activity criterion should be based on specified criteria, including frequency, duration and intensity, otherwise it is likely to end up with higher sample sizes in the late stages. Apart from their presumption that this could be due to the fact that more detailed criteria are harder to meet, it could be that lack of awareness of one's physical activity level affects the stage distribution.^{5,29}

Despite somewhat different assessment methods to measure moderate-intensity physical activity levels, we compare our results with previous studies in the Netherlands.^{5,6} According to the findings of these previous studies, 42%–45% of Dutch adults met the present moderate-intensity physical activity recommendations. This is considerably lower than our findings of 57% of the respondents meeting the current recommendations. However, Ooijendijk et al.⁶ found that lower educated individuals in his population were more likely to meet the moderate-intensity physical activity recommendations. Furthermore, several studies found that the relationship of physical activity to socioeconomic status differed depending on the dimension of activity assessed.^{42,43} Participation in sports or leisure-time physical activity was reported more frequently in high status individuals. Moderate-intensity activities, like household activities, but also walking was often more frequently reported in low status individuals. Indeed the number (36%) of respondents participating in one or more sports was very low compared to the general Dutch population,⁶ with 50% of the individuals participating in one or more sports. Therefore, it seems reasonable that the higher number of respondents meeting the moderate-intensity physical activity recommendations could be due to the type of recommendations used to assess an adequate physical activity level and the different

composition of income and educational level of our population compared to the general Dutch population.

The results with regard to motivational factors to participate in physical activity were in line with an earlier survey among 15 member states of the European Union.⁴⁴ The most important barrier in the present study for precontemplators as well as for contemplators is “no time”. These findings were also found in previous studies.^{5,35,44,45} Noteworthy is the difference between precontemplators and contemplators with regard to their opinion about the individual physical activity level. As earlier shown by Ronda et al.,⁵ precontemplators were more likely to overestimate their physical activity level than contemplators.

As mentioned in the introduction, external factors have not been studied frequently in relation to stages of change for moderate-intensity physical activity. Therefore it will be difficult to compare our results with results of others. Furthermore, only one other study used an ordinal logistic regression model to examine stages of change data.⁴⁶ However, due to poor fit of the proportional odds model, caused by non-proportional odds, another approach was adopted whereby separate logistic models were used. Several external factors, in our study, were likely to have an effect on the stages of change for physical activity. With respect to sociodemographic factors included here, age and educational level were found to have an effect on the stages of change. The findings for age and educational level are rather consistent with the study of Booth et al.⁴⁶

Younger age groups and higher educated individuals tend to be in a higher stage of change for physical activity. Furthermore, in agreement with our findings, they did not find an effect of gender on movement across the stages.

We found no evidence to suggest the importance of material and psychosocial environmental factors on movement across the stages. These findings are inconsistent with regard to a review of recent date considering the influence of environmental factors on physical activity behavior.⁴⁷ The authors found that accessibility, opportunities to exercise and neighborhood characteristics were likely to be associated with physical activity. A possible explanation could be that there are no distinctive differences between respondents on neighborhood characteristics because only deprived neighborhoods were included in the analyses. Furthermore, we could only use quite global measures, which may not have captured well environmental influences.

Although the effects of health locus of control on physical activity participation were stated to be unclear in an earlier review,²³ our results suggest that a (rather) high health locus of control has a positive effect on movement across stages. The results for perceived movement disabilities were more complicated. Severely disabled individuals are less likely to be across the action threshold. This was found to be consistent with earlier findings concerning exercise stage and scoring on the physical aspects of the SF-36 scales.⁴⁸ However, somewhat disabled individuals experience

lower thresholds than non-disabled persons. Maybe these results reflecting an individual's desire to be able to exercise more in the future.

Respondents displaying unhealthy behaviors like excessive alcohol consumption and low consumption of fruits and vegetables are less likely to change their physical activity behavior. This can reflect that intention to change your physical activity behavior may be related to the presence of other healthy lifestyle choices. The association between stages for physical activity with the practice of other health behavior was also demonstrated by Costakis et al. for smoking.⁴⁹ Respondents in precontemplation for physical activity were more likely to be smokers, than respondents in higher stages of physical activity. We saw this pattern only in our univariate analysis.

Finally, the results with regard to knowledge show that individuals in the lower stages are likely to have less knowledge about health benefits and recommendations than individuals in the higher stages. These positive effects of knowledge on stages of change were also demonstrated in earlier studies.^{46,50}

The pattern originating from the figures in table 3.3 resembles the patterns observed in previous studies.^{5,13,14,51} All studies showed the importance of psychosocial factors on movement across the stages. The results of this study are therefore no exception. All measured psychosocial factors are related to stages of change for moderate-intensity physical activity and they differ in subjects in different stages of change. Individuals with a positive attitude, higher self-efficacy expectations, and a more supportive social environment, are more likely to be in a higher stage of change category. Furthermore, the odds ratios suggest that a positive attitude, certainty about one's abilities to increase physical activity levels, and social support make it more easy to cross the early stage thresholds. A high perceived activity level of others however, becomes more important in the latter stages and especially action.

Our findings suggest some practical implications. First of all, there is still a substantial proportion of respondents not meeting the moderate-intensity physical activity recommendations and almost 17% of our study population could be classified as completely inactive (on not one day at least 30 minutes physically active) which confirms the need for public health interventions. Nevertheless, these interventions may not be effective as long as people misjudge their level of physical activity. Therefore, increasing awareness of their inadequate physical activity levels should be an important starting point of interventions. A method suitable for a community intervention could be a regular newsletter on health related topics, because it can reach large number of individuals.⁵² An important topic to be included in the newsletter could be a communication about the present recommendations accompanied by a self-test to assess one's own physical activity level.⁵ Increasing awareness and knowledge may not only motivate those in the precontemplation stage but also those people in the maintenance stage unaware of their inadequate behavior. Second, the far most important barrier for those in precontemplation and

contemplation stages was “no time”. Therefore, health interventions could be aimed at everyday activities, which will cost less extra time like cycling or walking to/from school or work. If we would like to stimulate walking and cycling in leisure time in deprived neighborhoods we should also pay attention to a supportive physical environment. Sufficient green areas of good quality are needed to stimulate these kinds of activities. However these kind of areas often lack in these neighborhoods.⁵³ Third, new insights on the association between the stages of change and external factors allow us to determine subgroups more likely to be in the lower stages of change. In order to develop effective interventions for these specific groups we have to keep in mind that also health locus of control, movement disabilities, other health related behavior, and knowledge of physical activity related topics influence movement across the stages.

Furthermore, this study supports to research suggesting that the TCM is a useful method for analyzing stages of change data. Several external factors were likely to have an effect on forward stage transition. Although we could identify specific groups in need for more attention to proceed in the behavioral change process, we could not answer the question why these specific groups were more in need. More insight as to why several sub-groups are more likely to be in a lower stage of change category can be useful for planning future public health interventions.

In conclusion, the present study gives new information on specific sub-groups in lower socioeconomic groups in need of more attention to proceed in the behavioral change process. Furthermore, the analysis of psychological determinants of stages of change for moderate-intensity physical activity also allows us to answer the question; “Why are people in deprived neighborhoods likely to move forward in the stage process?” All together this study provides new insights for interventions in relatively low socioeconomic groups aimed at increasing moderate-intensity physical activity levels.

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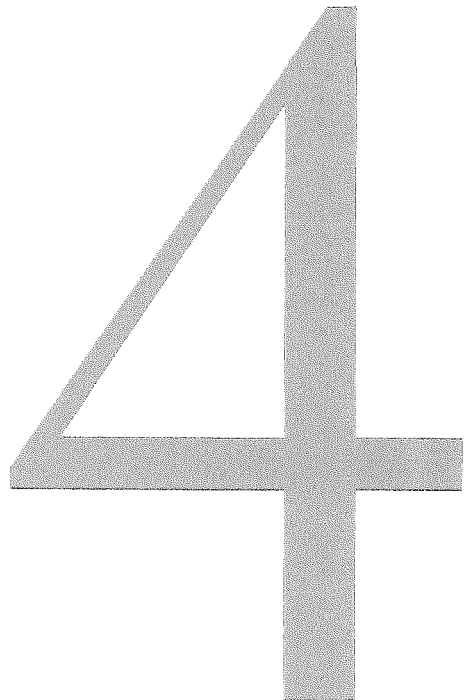
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Community Cardiovascular Disease Prevention Programs in Deprived Areas: a Systematic Review using the Guide to Community Preventive Services

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Submitted



Abstract

We assessed the available evidence on the effectiveness of community cardiovascular disease prevention programs in deprived areas using the review methodology of the Guide to Community Preventive Services. Two reviewers analyzed nine articles from three electronic databases of community interventions from 1980 to 2002. Of the nine studies, four interventions were included in the body of evidence. Two studies focused on multiple risk factors and two on a single risk factor, namely smoking or physical activity. Three studies reported some small significant improvements, one did not show an intervention effect. Current evidence of effectiveness is insufficient due to the small number of qualifying studies and inconsistencies in the reported effects. More high quality studies that include process outcomes, are needed to give more information on the “black box” of intervention effectiveness.

4.1 Introduction

It is well known that individuals in lower socioeconomic groups have higher cardiovascular disease (CVD) morbidity and mortality compared to those in higher socioeconomic groups.^{1,2} To some extent, these inequalities can be attributed to the higher prevalence of CVD risk factors in individuals in lower socioeconomic groups compared to higher socioeconomic groups,³⁻⁵ such as smoking, eating too few fruits and vegetables, lack of physical activity, and being overweight. Achieving a reduction in the prevalence of CVD risk factors in individuals in lower socioeconomic groups is important to reduce socioeconomic inequalities in health.

A number of studies have suggested that CVD risk factors accumulate in deprived areas.⁶⁻⁹ People of lower socioeconomic position are more likely to live in deprived areas than individuals of higher socioeconomic position and deprived areas are also more likely to have adverse physical environmental characteristics and poorer community services.¹⁰ Therefore, both individual and area characteristics may be associated with the higher prevalence of CVD risk factors in deprived areas. Moreover, the findings imply that communities instead of individuals may be an important setting for health promoting activities that aim to reduce socioeconomic inequalities in CVD risk factors.

Community health promotion methods are promising for the purpose of reducing CVD risk factors in deprived areas. Deprived areas often suffer from interconnected problems, a high proportion of inhabitants with a lower socioeconomic position, divisions between ethnic groups, feelings of danger, high unemployment, and rising crime levels, which are likely to compete with healthy behavior prevention efforts. However, community programs aim to change the behavior of the majority of residents in the community and also the social and physical conditions in which the behavior occurs. The emphasis of these programs on community participation and collaboration to achieve these changes may make them especially appropriate for reaching individuals with a lower socioeconomic position. First, lower socioeconomic groups appear to give less attention to mass-media information campaigns than higher socioeconomic groups¹¹ but are more likely to respond to information from their direct social environment.¹² Second, in deprived areas residents are likely to be unable to see CVD prevention as a priority for action because they may be more occupied by day-to-day social and economic living challenges.¹³ However, the engagement of community residents in identifying their own needs, setting their own priorities, and planning their own programs can provide access to the residents' informal networks and can create more support for CVD risk factor related program goals. Furthermore community programs can target unfavorable contextual factors that influence behavior in deprived areas. Together, this may enhance successful program implementation.

We assessed the available evidence of the effectiveness of community CVD prevention programs in deprived areas by means of a systematic review of the literature, using the review methodology of the Guide to Community Preventive Services.

4.2 Methods

4.2.1 Guide to Community Preventive Services

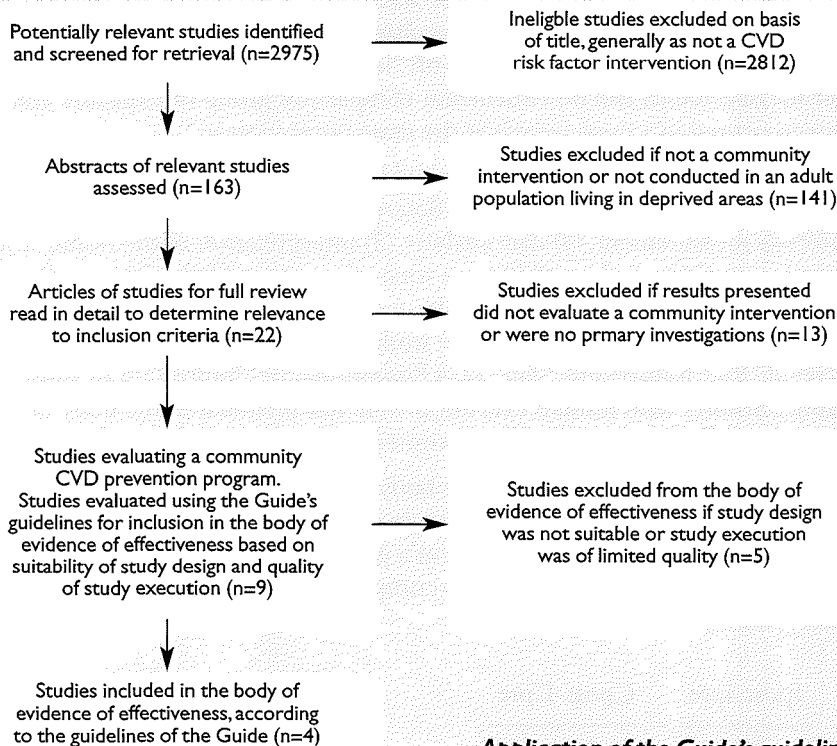
In order to evaluate the effectiveness of community CVD prevention programs the methods of the Guide to Community Preventive Services (the Guide)¹⁴ were used. The Guide was developed to systematically evaluate population-based or public health interventions. The Guide's guidelines were used to review relevant publications, more specifically (1) to assess the suitability of study design and the quality of study execution, (2) to summarize the body of evidence of effectiveness in terms of size and consistency of reported effects, (3) to describe other key characteristics of the programs in terms of applicability of effectiveness data, other intervention effects, and barriers to intervention implementation and (4) to translate the evidence of effectiveness into recommendations.

4.2.2 Search strategy and intervention selection

Medline, PsycINFO and Web of Science databases were searched for studies on (1) the effects of community programs, (2) aimed at a reduction of CVD risk factors, (3) targeting the majority of the adult population, and (4) conducted in deprived areas (search terms that were used to capture the studies are available on request). The term community was defined according to the structural definition of Green and Kreuter:¹⁵ "Structurally, a community is an area with geographic and often political boundaries demarcated as a district, county, metropolitan area, city, township or neighborhood". Articles had to be published between January 1980 and February 2003, written in English, and conducted in an established market economy*. The search yielded 2975 titles and abstracts for review (figure 4.1). After screening of the titles by one reviewer (GCK), in total 163 abstracts were retrieved. Ineligible studies were for example not an intervention study, not addressing a CVD risk factor topic or not carried out in an adult population. Two reviewers (GCK and FJvL) independently read the abstracts. Studies were only included for full review if they mentioned the targeting of adult individuals of lower socioeconomic groups or those living in deprived areas in the abstract. Furthermore the community program must have a community-wide approach, i.e. be a community intervention that seeks pervasive changes that apply to the majority of the population and not an intervention in the community that seeks more intensive or profound change in a subpopulation.¹⁵ Twenty-two studies met these inclusion criteria. After critical reading of the articles, thirteen studies were not included in the final assessment of the evidence, because they were not primary investigations of the programs (n=4) or because they did not evaluate a community intervention after all (n=9). The remaining nine studies were considered as qualifying studies.

* Established Market Economies as defined by the World Bank are Andorra, Australia, Austria, Belgium, Bermuda, Canada, Channel Islands, Denmark, Faeroe Islands, Finland, France, Germany, Gibraltar, Greece, Greenland, Holy See, Iceland, Ireland, Isle of Man, Italy, Japan, Liechtenstein, Luxembourg, Monaco, the Netherlands, New Zealand, Norway, Portugal, San Marino, Spain, St. Pierre and Miquelon, Sweden, Switzerland, the United Kingdom, and the United States.

Application of search criteria



Application of the Guide's guidelines

Figure 4.1 Flow diagram of the literature review

4.2.3 Evaluating and summarizing the qualifying studies

The methods of the Guide were used to evaluate and summarize the evidence in the nine qualifying studies. To answer questions about whether interventions were effective, the Guide's methods required a comparative study design. All comparative studies together made up the body of evidence of effectiveness. Noncomparative studies were used to describe the intervention's other effects and barriers to intervention implementation.

Each study included in the body of evidence of effectiveness was evaluated by two reviewers (GCK and FJvL) using the standardized data abstraction form¹⁶ of the Guide (available at www.thecommunityguide.org/methods) and was assessed for suitability of the study design and quality of study execution. The reviewers recorded information about: (1) the intervention being studied, (2) the context in which the study was done, (3) the evaluation design, (4) study quality, and (5) study results. Any disagreements between the reviewers were discussed and reconciled by consensus.

Evaluation designs were classified as having “greatest”, “moderate”, or “least” suitability. Studies with “greatest” suitability have concurrent comparison groups and prospective measurement of exposure and outcome. Studies with “moderate” suitability have a retrospective design or multiple pre or post measurements but no concurrent comparison group. Studies with “least” suitability have either single pre and post measurements and no concurrent comparison group or exposure and outcome measured in a single group at the same point in time.

The quality of study execution was evaluated based on six categories of threats to validity: (1) population and intervention descriptions, (2) sampling, (3) exposure and outcome measurement, (4) data analysis, (5) interpretation of the results, and (6) other threats. Each study could have a total of nine possible limitations. Based on the number of limitations (scoring rules available at www.thecommunityguide.org/methods) studies were categorized at execution being “good” (0-1 limitations), “fair” (2-4 limitations), or “limited” (5 or more limitations). Studies with limited execution were not included in the body of evidence of effectiveness to support recommendations.

Results across the studies included in the body of evidence of effectiveness were summarized qualitatively and quantitatively. The intervention effects were calculated for all reported measurements of a given outcome according to the following formula:¹⁷ (I=intervention, C=comparison, pre=pre intervention, post=post intervention)

$$\frac{I_{\text{post}} - I_{\text{pre}}}{I_{\text{pre}}} - \frac{C_{\text{post}} - C_{\text{pre}}}{C_{\text{pre}}}$$

When studies did not include a control group, we assumed that in the absence of an intervention, no change would have occurred, $C_{\text{post}} - C_{\text{pre}} = 0$. In addition the body of evidence of effectiveness was characterized as “strong”, “sufficient”, or “insufficient” based on an algorithm¹⁴ developed by the Guide using information on: strength of study design, quality of study execution, number of available studies, consistency of the results (e.g. studies being generally consistent in direction and size) and magnitude of effect sizes.

In order to support the recommendations, evidence on the applicability of effectiveness data, the intervention’s other effects and barriers to implementation of interventions were also summarized in the results section. To assess the applicability we summarize target populations and settings of all qualifying studies. However, to make a judgement about the extent to which available effectiveness data applies to additional populations and settings, the body of evidence of effectiveness needs to be sufficient or strong. In addition to CVD risk factor outcomes we collected information about nonhealth side effects.

Table 4.1 Studies evaluating a community CVD prevention program in deprived settings

Project, first author, year Study design: suitability^a Quality of execution: # of limitations^b	Location Target group Lead organization	Intervention elements
Bootheel Heart Health Project Brownson, RC, 1996 Before-After: least Good: 0	<ul style="list-style-type: none"> - Six southeastern counties in Missouri (Bootheel area), USA. This is a medically underserved area, characterized by high rates of poverty and low educational levels. - County residents - Missouri Department of Health in cooperation with the Centers of Disease Control and Prevention 	A 3-year intervention program in six counties delivered by 17 coalitions (involving local leaders and community groups). Coalitions developed walking clubs, aerobic exercise classes, heart healthy cooking demonstrations, community blood pressure and cholesterol screenings, and cardiovascular disease education programs
Healthy Neighborhoods Project El-Askari, G, 1998 Non-Comparative Study (case study): not suitable Quality not assessed	<ul style="list-style-type: none"> - El Pueblo neighborhood, City of Pittsburg, Contra Costa County, California - Residents of 176 public housing units - The Contra Costa County Health Services Department with direct input from residents. 	Pull together key gatekeepers from the neighborhood, recruitment of neighborhood health advocates (NHA) among interested residents, training of these advocates in health areas, including tobacco, alcohol, and nutrition. The NHAs developed a survey instrument to assess residents' perceptions of their community and mapped the neighborhood's physical and institutional features. After the mapping, the NHAs developed a plan of action, including 10 potential actions to improve the neighborhood, including installing speed humps, increasing police patrols, and having better street lighting installed.
Tobacco Prevention Project Ellis, G, 1995 Non-Comparative Study (Case study using a force field analysis): not suitable Quality not assessed	<ul style="list-style-type: none"> - City of Richmond, Contra Costa County, California - 92,000 residents - The Contra Costa County Health Services Department established the Tobacco Prevention Project (TPP) as the local lead agency to coordinate tobacco campaign activities. A prominent element of their campaigns was to strengthen local smoking ordinances. 	To gain community support for the smoking ordinance, centered around minimizing the forces working against involvement in tobacco issues and strengthening those factors promoting involvement. Five driving forces for change were identified: (1) health impact of tobacco, (2) support of smoking bans by the majority of residents, (3) history of community activism to limit tobacco and alcohol outdoor advertising, (4) opportunities to link the smoking ordinance effort with current activities addressing alcohol and violence problems, (5) the smoking ordinance effort would be an opportunity for those involved to build skills in policy advocacy. From the summer of 1992 TPP worked to have a stronger ordinance put on the council agenda.

Table 4.1 – continued

Project, first author, year Study design: suitability ^a Quality of execution: # of limitations ^b	Location Target group Lead organization	Intervention elements
Healthy Heart Community Prevention Project Ferdinand, KC, 1997 Non-Comparative Study (case study): not suitable Quality not assessed	<ul style="list-style-type: none"> - New Orleans, Louisiana, USA - African American community - Heartbeats Life Center; a community cardiovascular center 	<p>The Healthy Heart Community Prevention Project (HHCPP) is an ongoing program of cardiovascular identification and modification in the African American community in New Orleans, that targets low socioeconomic status populations. Activities: The HHCPP barbershop/beauty shop intervention: a blood screening program using barbers and beauticians as blood pressure “specialists”. The HHCPP church project: Give God a Hand: sermons on high blood pressure, hyperlipidemia, smoking, and exercise, also conduction of blood pressure screening prior/after religious services. HHCPP professional education: two educational programs for health professionals. HHCPP Kick-off: The Bayou Classic: massive blood pressure screening event at the Bayou Classic, the annual football game.</p>
Neighbors for a Smoke Free North Side Fisher, EB, 1998 Non-Randomized Group Trial: greatest Fair: 2	<ul style="list-style-type: none"> - Predominantly low-income, African American neighborhoods in St. Louis, Missouri, USA - Neighborhood residents (total population range: 8,149 to 22,583) - Washington University and Grace Hill Neighborhood Services 	<p>Wellness councils in each intervention neighborhood organized and directed activities during 24 months. Each council consisted of neighborhood volunteers and a paid staff member from Grace Hill Neighborhood Services. The program included smoking cessation classes, billboards, door-to-door campaigns and a “gospelfest”. Comparison: Control neighborhoods in Kansas City, Kansas (measurement only).</p>
Women's Action Project Frisbey, W, 1997 Non-Comparative Study (Case study using participatory action research): not suitable Quality not assessed	<ul style="list-style-type: none"> - Kamloops, British Columbia, Canada - Low-income women - Local women in cooperation with the municipal recreation department 	<p>The project was initiated by a group of low-income women who identified a lack of access to physical activity services in their community as a major factor inhibiting the development of healthy lifestyles for themselves and their families. The 2-year project consisted of five phases: (1) audit of demographic and geographic characteristics, existing physical activity services, and specialized services for low-income women, (2) use of focus groups and questionnaires to identify the issues and concerns that low-income women had about their health and involvement in physical activity, (3) community mobilization whereby the low-income women and service providers were brought together, (4) development, implementation and monitoring of three alternative program designs, (5) evaluation of the programs. The physical activity intervention was designed for both the women and their children. A number of strategies were implemented to overcome barriers: personal contact and invitations to become involved, subsidies to cover transportation costs, the provision of activity programs for children, and follow-up telephone calls to those who were not regular attendees.</p>

Table 4.1 – continued

Project, first author, year Study design: suitability^a Quality of execution: # of limitations^b	Location Target group Lead organization	Intervention elements
<p>PARR project Lewis, CE, 1993 Randomized Group Trial: greatest Fair (3)</p>	<ul style="list-style-type: none"> - Public housing communities in Birmingham, Alabama, USA - Residents of public housing communities (total rental units range: 455 to 910) - Academic organization 	<p>A 1-year exercise program coordinated by project staff and conducted by a physical activity leader. The leaders also disseminated pamphlets on home-based exercise programs. To enhance participation the following strategies were incorporated: intra-community and inter-community competitions, support of community and church leaders, organizing group health education programs. Comparison: Control rental communities (measurement only).</p>
<p>Coeur en Santé St. Henri Program O'Loughlin, JL, 1999 Non-Randomized Group Trial: greatest Good (1)</p>	<ul style="list-style-type: none"> - Intervention neighborhood St. Henri, Montreal, Quebec, Canada - Neighborhood residents (total population St. Henri 23,360) - The program was run from a hospital-affiliated public health department 	<p>During 48-month implementation phase, more than 40 interventions to promote heart health were implemented, including smoking-cessation workshops, a smoking cessation contest, a heart-health recipe contest, heart-health nutrition education workshops, menu-labeling in local restaurants, a point-of-choice nutrition education campaign in local grocery stores, direct-mail print education materials, screening for CVD risk factors, development and distribution of heart-health video-cassettes, and a mailed intervention for healthy-weight regulation. Comparison: Comparison neighborhood Centre-Sud, Montreal (measurement only).</p>
<p>Washington Heights-Inwood Healthy Heart Program Shea, S, 1996 Non-Comparative Study (implementation monitoring and program tracking): not suitable Quality not assessed</p>	<ul style="list-style-type: none"> - Intervention neighborhood Washington Heights-Inwood area of northern Manhattan, New York, NY, USA - Neighborhood residents (total population 200,000) - The program was managed by a partnership of The Presbyterian Hospital, Teachers College of Columbia University, and the Columbia University School of Public Health. At the end of the 6 years, the program was transferred to a local community organization. 	<p>A six-years experience in implementing the community health education model. The goal of the program was to reduce the prevalence of cardiovascular disease risk factors, specifically smoking, sedentary lifestyle, obesity, hypertension, and hypercholesterolemia in the target community. Successful program elements were: low-fat milk campaign, volunteer exercise clubs, Spanish language smoking cessation video. Program elements that did not meet expectations: school-based smoking prevention activities, cholesterol screening, counseling, education and referral, motivating community physicians to promote heart health in their practices.</p>

a Determined using study design algorithm of the Guide

b Evaluated using the data abstraction form of the Guide. Only assessed if study design suitability was classified as "greatest", "moderate" or "least".

4.3 Results

4.3.1 Effectiveness

Our search identified nine studies evaluating a community cardiovascular disease prevention program in a deprived area.^{13,18-25} Details of these studies are provided in table 4.1. Five studies did not have a suitable study design because they were all non-comparative studies and were, therefore, not included in the body of evidence of effectiveness.²¹⁻²⁵ Table 4.2 summarizes the reported effects of the remaining four studies that were included in the body of evidence of effectiveness. Overall, the four studies together reported data on 29 effect measures of CVD risk factors. For seven of these measures (24%) significant but small effects were reported. The magnitude of the effect sizes ranged from 0.03 to 0.26. Six effects were in the expected direction, in favor of the intervention community, and one was not in favor of the intervention community. One study did not report a significant effect at all. Three of the four studies had greatest suitability of study design.^{13,19,20} One study had a before-and-after design with no concurrent comparison group and was therefore of least suitability.¹⁸ Two of the four studies were of good execution,^{13,18} the other two were rated as fair.^{19,20} Two of the four studies targeted multiple CVD prevention behaviors, such as smoking cessation, a healthy diet, physical activity, and cholesterol and blood pressure check-ups.^{13,18} The two other studies focused on single behaviors, one on physical activity²⁰ and the other on smoking.¹⁹ Of the four studies reviewed, three reported significant changes in health related behavior.^{13,18,19} Two studies reported a 6.4% and 16.6% increase in participation in cholesterol screening and one reported an increase of 3.1% for blood-pressure screening¹³ over a period of two years.^{13,18} However, one of these studies also showed a significant 26.2% increase of respondents who have been told their cholesterol level was high and a non-significant 14.1% increase of respondents who have been told their blood pressure level was high.¹³ Only one of the three studies targeting smokers found that the prevalence of smokers significantly decreased with 17.7%.¹⁹ No positive changes were reported on physical activity, diet (high fat food consumption or fruit and vegetable consumption) and overweight, while one study reported a 16% increase in overweight prevalence in the intervention counties.¹⁸ According to the Guide's rules of evidence,¹⁴ because of a small numbers of qualifying studies assessing the same risk factor and inconsistencies in the reported effects, insufficient evidence was available to assess the effectiveness of CVD prevention programs in deprived areas.

4.3.2 Applicability

Seven studies were conducted in the United States^{18-23,25} and two in Canada.^{13,24} Two were conducted in public housing communities,^{20,22} three in inner-city neighborhoods,^{13,19,21} three city-wide,²³⁻²⁵ and one in six counties of the state of Missouri.¹⁸ The target population varied from small (176 public housing units in the Healthy Neighborhood Project²²) to large (200,000 residents in the Washington Heights-Inwood Health Heart program²¹). However, evidence about applicability could not be assessed because effectiveness was not established.

4.3.3 Other intervention effects

All four studies included in the body of evidence examined the improvement of risk behaviors across subgroups. The Bootheel Heart Health Project and the Neighbors for a Smoke Free North Side showed a positive change in prevalence rates of CVD risk behaviors among those residents who were aware of the project.^{18,19} Furthermore, all nine studies showed that the community can be involved in both planning and implementing the program. As a result, coalition members of the Bootheel Heart Health Project¹⁸ and residents involved in the Healthy Neighborhoods Project²² became more active in local government.

4.3.4 Barriers to intervention implementation

Barriers to intervention implementation in the Coeur en Santé¹³ project were low participation of residents in program activities and low sustainability by local community groups for program activities. Sustainability was low because expensive and time consuming program activities had to be added onto the existing agendas of local community groups with few additional resources. This last barrier was also experienced by the Washington Heights–Inwood Healthy Heart Program,²¹ which had to abandon successful program activities because they could not be institutionalized due to budget problems and personnel turnover. Although sustaining intervention activities can be a problem, also starting an intervention can be difficult. Two studies mentioned that at the start of the project, the program coordinator or researchers first had to gain the trust of the residents and demonstrate that they were in the community to serve the residents rather than to direct them.^{22,24} Furthermore, intervention implementation in the PARR project²⁰ was reported to be easier in well organized communities since these already had active community leaders and residents as well as regularly scheduled and well-attended resident council meetings resorting in better recruitment of intervention intermediaries and community response to the intervention. Another reported barrier was the limitation in intervention delivery imposed by budgetary constraints, making it less likely to maintain the delivery of a multiple intervention strategy. A final barrier concerned the intervention setting. In deprived areas, residents are more likely to be challenged with day-to-day social and economic issues, making chronic disease prevention less urgent.^{13,21}

4.4 Discussion

The effectiveness of community CVD prevention programs in deprived areas could not be determined in this systematic review, because of a small number of studies assessing the same risk factor and a lack of consistency in the reported outcomes of the interventions.

The absence of evidence of effects requires an explanation. In accordance with Merzel and D’Afflitti²⁶ this modest or absent impact of community interventions may be attributed to methodological issues, the influence of secular trends, smaller effect sizes, limitations of the intervention, and limitations of the applied theory. Before

Table 4.2 Summary of reported results for studies included in the body of evidence of effectiveness

Project First author, year Design	Sample size ^a	Effect measure	Reported baseline		Reported effect ^b		Effect size ^c	FU time survey	
			I	C	I	C			
Boothel Heart Health Project Brownson, RC, 1996 Before-After Deprived counties N=?; I=6	Baseline: I=1006	<u>Independent cross-sectional samples</u> % no LTPA	43.1 %		42.1 %		-2.3 %	4 years	
	Post: I=1510		% current smoker	20.8 %		18.1 %			-13.0 %
			% consumes 5+ servings f&v	21.9 %		21.6 %			-1.4 %
			% overweight BMI > 27	39.9 %		46.3 %			+16.0 %
		% cholesterol checked past 2 yrs	59.4 %		63.2 %		+6.4 %		
Neighbors for a Smoke Free North Side Project Fisher, EB, 1998 Non-Randomized Group Trial Deprived neighborhoods N=? I= 3; C=4	Baseline: I=504; C=1040	<u>Independent cross-sectional samples</u> % current smoker	34 %	34 %	27 %	33 %	-17.7 %	2 years	
	Post: I=457; C=1034								
PARR project Lewis, CE, 1993 Randomized Group Trial Rental communities N=13; I=6; C=2	Baseline I=441; C=158 Post: I=480; C=167	<u>Independent cross-sectional samples</u> median overall PA score	56	60	104	216	-174%	1 year	

Table 4.2 – continued

Project First author, year Design	Sample size ^a	Effect measure	Reported baseline		Reported effect ^b		Effect size ^c	FU time survey
			I	C	I	C		
Cœur en Santé St. Henri Program O'Loughlin, JL, 1999 Non-Randomized Group Trial Deprived neighborhoods N=? I=I; C=I	Independent sample Baseline: I=849; C=825 Post: I=345; C=229	Independent cross-sectional samples						3 years
		% daily smokers	33.4 %	42.7 %	33.9 %	46.3 %	-6.9 %	
		% infrequent LTPA	21.1 %	19.7 %	32.0 %	36.7 %	-52.2 %	
		% been told blood pressure high	19.0 %	18.7 %	13.3 %	11.8 %	+6.9 %	
		% been told cholesterol high	14.3 %	12.4 %	10.1 %	11.8 %	-24.5 %	
		% frequent high fat food	20.0 %	21.2 %	22.0 %	26.6 %	-15.5 %	
		% overweight BMI > 27	16.5 %	15.5 %	17.8 %	14.2 %	+16.3 %	
	Longitudinal cohort sample FU (n=819, 48.9%) Baseline: I=849; C=825 Post: I=423; C=396	Longitudinal cohort sample ^d						5 years
		% daily smokers	31.1 %	41.3 %	29.8 %	38.0 %	+3.8 %	
		% infrequent LTPA	20.1 %	16.9 %	37.2 %	34.0 %	-16.1 %	
		% self-rated PA; more active than others	32.0 %	34.1 %	7.5 %	32.5 %	+21.9 %	
		% been told blood pressure high	20.0 %	19.9 %	17.3 %	14.4 %	14.1 %	
		% blood pressure checked past year	74.0 %	69.9 %	78.2 %	71.7 %	+3.1 %	
		% been told cholesterol high	15.3 %	14.1 %	18.0 %	12.9 %	+26.2 %	
		% cholesterol checked past year	39.0 %	37.9 %	46.7 %	39.1 %	+16.6 %	
		% frequent high fat food	18.3 %	19.7 %	23.5 %	21.5 %	+19.3 %	
		% overweight BMI > 27	18.6 %	17.6 %	28.1 %	26.9 %	-1.8 %	

a Numbers analyzed

b Unless otherwise noted, results are presented as a net intervention effect showing the difference in percent change from baseline between intervention and control groups using the following formula:

$$\frac{I_{post} - I_{pre}}{I_{pre}} - \frac{C_{post} - C_{pre}}{C_{pre}}$$

When studies did not include a control group, we assumed that in the absence of an intervention, no change would have occurred, $C_{post} - C_{pre} = 0$.

c **Bold text** indicates statistically significant difference

d Selection of effect measures, in the article also information on seven other CVD risk factors levels was reported (all not significant).

FU = follow-up, I = intervention, C = control or comparison, LTPA = leisure time physical activity, BMI = body mass index, f&v = fruits&vegetables;

making any recommendations we discuss several of the reasons which could have contributed to the modest or absent impact of the interventions in the present review.

Methodology: the randomized group trial is considered best practice to evaluate community interventions.²⁷ Among the studies included in the body of evidence for the present review only the PARR project²⁰ employed this design. Random allocation is best practice for evaluation, it may be a barrier for intervention implementation. In community interventions the intervention is not only supposed to be in the community, but also by the community, that is, participation of the community at large is regarded as necessary for effectiveness. So theoretically, randomization would be the best evaluation choice, for intervention practice it is an extra barrier to implement interventions in communities that do not have the immediate motivation and capacity to carry out the intervention.

Secular trends and small effect sizes: secular trends can either decrease or increase risk factors in control communities. The reported effects in the Bootheel Heart Health project¹⁸ and the Coeur en Santé program¹³ reflect the secular trends in the increasing prevalence of physical inactivity and overweight in control as well as in experimental communities. The observed small effect sizes seem to be comparable with outcomes obtained in other community programs.²⁶ Although smaller effect sizes make detection of changes in behavioral outcomes more difficult²⁸, a modest reduction within a population can still be meaningful at the community level.²⁹

Intervention characteristics: the duration of the interventions of the included studies in this review was relatively short (range between 1 and 6 years). Community building and full intervention implementation and dissemination of behavior changes take time and a relatively short implementation duration as well as a limited follow-up may have contributed to low program impact. Furthermore, intervention delivery can be subject to other weaknesses like insufficient tailoring, limited intensity, low level of community penetration and limited ecological reach.²⁶ If we want to assess intervention delivery, we need information on the processes of intervention implementation. However, in two of the four studies included in the body of evidence information on intervention delivery was limited.^{18,19} Furthermore, information on the effectiveness of single intervention components would be helpful for the development of future interventions. Only the Coeur en Santé program¹³ assessed several intervention components on their effectiveness.

Theoretical limitations: most community interventions try to influence factors like knowledge, attitudes and motivations. Such cognitions are regarded as determinants of behavior change. However, in evaluation of community interventions no changes in the determinants are checked or reported. Two studies in the present review mentioned that they had measured intermediate outcomes like knowledge and attitudes but they did not report them.^{30,31} If programs are theoretically based on behavioral change models including mediating factors it would be very informative to measure and report on these mediators because they can give more insight in how program outcomes are obtained.

Theoretically, a community approach is likely to be an important method for the purpose of reducing CVD risk factors in deprived areas. The effectiveness of this method to improve CVD risk profiles could not be demonstrated in this systematic review. This is consistent with conclusions of other reviews which examined the effect of a community approach in non-deprived areas^{26,32,33}. These reviews also failed to find evidence for the effectiveness of community interventions to improve CVD risk factors. Some studies suggest that due to competing problems in deprived areas like crime, housing, unemployment and other health problems, it will be more difficult to implement a successful community intervention to improve CVD risk factor profiles.^{13,21} In this systematic review we were not able to assess the influence of these competing problems on program outcomes. However, it is more likely that in addition to the deprived area, the overall complexity of implementing a community interventions contributes to the failure of these interventions, which is also shown in the other reviews.

Apart from the Task Force of Community Preventive Services, we are among the first to use the review methodology of the Guide to assess the effectiveness of interventions. We consider the methods of the Guide to be a valuable tool for assessing evidence and linking evidence to recommendations of population-based interventions using quantitative evaluation methods. However, we agree with the Task Force of Community Preventive Services,³⁴ that qualitative research methods can be valuable too, in assessing the effectiveness of population-based interventions. Especially in community interventions with several distinct phases of development, qualitative evidence can capture the complexity of intervention development and implementation as well as the processes of community change. The five non-comparative studies that were not included in the body of evidence of effectiveness illustrated that qualitative data could give us more information about other nonhealth side effects and also about barriers to program implementation.

Community interventions are advocated as the primary means to tackle excess CVD risk factors in lower socioeconomic groups. However, there is lack of evidence to support this conviction. In the absence of alternative health promotion methods to reach lower socioeconomic groups there remains a need for ongoing research in this field. The complexity of community interventions asks for further research into the different components of these interventions. This requires the use of multiple methods, including process evaluations,³⁵ and both qualitative and quantitative evidence,^{36,37} which should give more information on the “black box” of intervention effectiveness.

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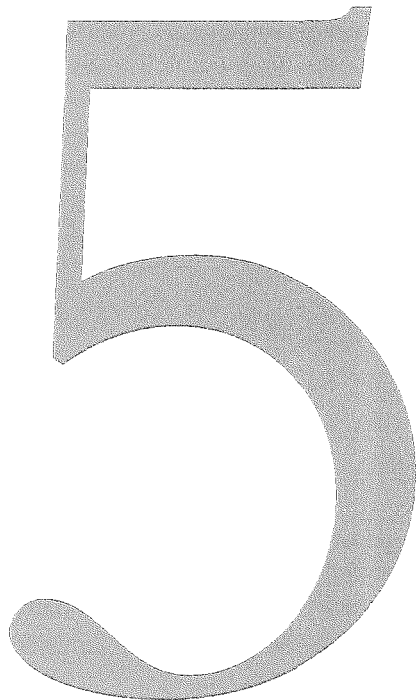
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Process Evaluation of a Dutch Community Intervention to Improve Health Related Behavior in Deprived Neighborhoods

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Abstract

This article reports on the objectives, methods and results of the process evaluation of the Dutch Community Intervention “Wijkgezondheidswerk”, which was aimed at improving (intermediate) outcomes of health related behavior in deprived neighborhoods. Major objectives of the process evaluation were to assess the extent of exposure to the intervention and fidelity of intervention implementation. Data were gathered throughout the intervention period using minutes of meetings, registration forms and a postal questionnaire among residents in intervention and comparison neighborhoods. The results indicate that the neighborhood coalitions organized more than 50 health related activities in the neighborhoods over a two-year period. Two thirds of the implemented activities were directed at increasing attention, information, awareness and knowledge, and one third was directed at behavioral change. Awareness of the program “Wijkgezondheidswerk” was 23% and participation in intervention activities was 3% among the general population of the intervention neighborhoods. The intervention was in broad outlines delivered according to the key principles of a “community approach”, although perhaps the community participation and the use of an ecological perspective can be improved. There was a strained relationship between the key principles of the “community approach” and the a priori defined intervention goals. As the bottom-up approach of the project resulted in only a few evidence-based activities in the total intervention program. This suggests that behavior change or change in intermediate outcomes may become more likely if there is a possibility to include evidence-based intervention components in community interventions.

5.1 Introduction

The Dutch community intervention “Wijkgezondheidswerk” (Dutch for “Working on Healthy Neighborhoods”) was designed to improve (intermediate) outcomes of health related behavior in deprived neighborhoods in the city of Eindhoven. Eindhoven is one of the 30 big cities in the Netherlands and therefore part of the Urban Policy system¹ developed by the Dutch national government. The main objectives of the Urban Policy are to tackle urban problems in the economic, social, physical, and safety domain. In 1997 the city council of Eindhoven acknowledged that ten neighborhoods in the city needed more attention to tackle the problems of a weak social structure, one-sided housing stock (mostly public housing units) and unattractive living circumstances. The accumulation of these problems necessitated collective reinforcements of the social, economical and physical infrastructure in these deprived neighborhoods, which were partly financed from financial resources of the Urban Policy System. Furthermore, research had also shown that there were considerable differences in health and lifestyle between deprived and non-deprived neighborhoods in Eindhoven.² Therefore, in 1999, the Eindhoven municipality funded the pilot program “Wijkgezondheidswerk”, a community intervention to improve health related behavior in two deprived neighborhoods. The program “Wijkgezondheidswerk” started as a top-down program with a priori defined goals and research questions for the evaluation study (figure 5.1). However, to achieve intersectoral collaboration and community participation a bottom-up approach was followed to plan and deliver the intervention. The intervention was evaluated using participatory action research, an impact evaluation and a process evaluation. Participatory action research assessed the process of identifying and agreeing on program objectives, research goals and program activities and the extent of participation of stakeholders in the project. These results were reported elsewhere.³ An impact evaluation determined whether any changes in health related behavior occurred in the intervention neighborhoods compared to the comparison

Main research question:

What is the effect of a community intervention on determinants of health in deprived neighborhoods in Eindhoven?

Sub questions:

Does the intervention program:

1. increase intersectoral collaboration and participation of the target population?
2. increase health promotion activities?
3. increase health literacy and the extent people think they can influence their own health?
4. increase the presence of social-psychological and structural conditions conducive to behavioral change?
5. reduce the frequency of unhealthy behaviors?
6. increase conditions for sustainability of health behaviors?

Figure 5.1 Research questions as defined in the grant proposal of the evaluation study

neighborhoods. The impact of the intervention was assessed by means of a baseline population survey and a follow-up survey at the end of the implementation period. To understand more about how and why the intervention worked, a process evaluation study was conducted, which is described in this article.

The process evaluation aimed at answering two major evaluation questions:

(1) To what extent was the target population exposed to the intervention program?
(2) Was the intervention program delivered as planned? Several authors indicated the importance of such a process evaluation for several reasons.^{4,5} Many interventions, and especially community interventions are complex interventions because they are implemented at multiple levels and with multiple audiences and consisting of multiple components. This makes it important to know the extent to which all intervention components were actually implemented. Measuring program implementation is also critical to avoiding a Type III error,⁶ i.e. evaluating a program that has not been adequately implemented, and thus drawing incorrect conclusions about the effectiveness of a given intervention. Another reason for the need to conduct a process evaluation is that it can help explain why certain results were achieved. It is important to understand which components of the intervention contributed to its success or failure. A systematic review of the effectiveness of community interventions in deprived settings showed that without a process evaluation it remains difficult to understand why interventions had positive, modest or insignificant results.⁷ A process evaluation has the ability to reach into the “black box” of intervention effectiveness, which is needed to improve effectiveness of future generations of community interventions.

5.2 Methods

5.2.1 Intervention and evaluation design

The community intervention “Wijkgezondheidswerk” was evaluated by means of a community intervention trial. The design of the intervention and evaluation study is illustrated in figure 5.2. Beforehand, the Municipal Health Services, the lead agency, assigned two deprived neighborhoods to receive the intervention (“Tivoli” and “De Bennekel”). Geographically, one of these neighborhoods consisted of two smaller areas. Therefore, three comparison neighborhoods were matched with the intervention neighborhoods. The goals of the evaluation study were based on social change theories^{8,9} at the community and individual level. At the community level two key components of the intervention were the development of a neighborhood coalition in each intervention neighborhood and the involvement of residents in planning and delivery of the intervention. The neighborhood coalition should bring together individuals representing diverse professional organizations and residents and plan and deliver the intervention to achieve an improvement of health related behavior in their neighborhood. At the individual level two social cognition models, the Transtheoretical Model of Change¹⁰ and the Attitude-Social influence-Efficacy (ASE) model of behavioral change,^{11,12} were used. The first model postulates that individual behavior change is a dynamic process that involves a series of stages:

Year Month	1999 Apr-Jun	Jul-Sept	Oct-Dec	2000 Jan-Mar	Apr-Jun	Jul-Sept	Oct-Dec	2001 Jan-Mar	Apr-Jun	Jul-Sept	Oct-Dec	2002 Jan-Mar	Apr-Jun	Jul-Sept	Oct-Dec	
Intervention delivery	Preparatory phase			Implementation phase												Continuation phase
Intervention events*	1	2	3,4	5	6,7											
Process evaluation	Continuous data collection															
Impact evaluation																
Participatory research																

* Intervention events:

1. May 1999 Start of the program "Wijkgezondheidswerk" is announced in a community meeting organized by the municipal health service. In this meeting several professional organizations and local grassroots organisations bring up health issues that could be tackled. Start of the development of neighborhood coalitions, in which the municipal health service acts as lead organization. Some participating organisations are already working together but those collaborations do not address neighborhood health issues.
2. September 1999 Implementation of activities is postponed because the grant for the impact evaluation is not yet assigned.
3. Oktober 1999 At the city level the community advisory board is formed.
4. December 1999 The first sequence of participatory action research showed that differences in opinion about the intervention goals and tasks of participating organizations threaten intervention delivery. An important barrier are different opinions about the priority of neighborhood health issues and competing problems. The municipal health service focusses at the implementation of intervention activities related to health related behavior, while the other organizations prefer to implement activities more generally related to health (e.g. improvement of the collaboration between home care, general practitioners and pharmacies at the neighborhood level, activities focussing on the prevention of stress). Furthermore, the participating organizations only have manpower for intervention planning and not for intervention delivery.
5. Januari-April 2000 Differences in opinion are solved by discussing neighborhood health profiles and assessing the capacity of manpower of the lead agency and participating organizations.
6. April 2000 The neighborhood coalitions expand to their final composition including representatives of the municipal health service, social work, social welfare, city development department, local grassroots organisation, a general practitioner and researchers. The representative of the city development department will chair the coalition meetings in the future instead of the municipal health service.
7. May 2000 The neighborhood coalitions achieve an agreement on the intervention goals. The goals are related to Lalonde's health fields: physical and social environment, lifestyle and health care organization. In the field of lifestyle both neighborhoods choose nutrition, and especially fruits and vegetable consumption and physical activity as their main intervention topics. A third topic in De Bennekel was smoking and in Tivoli excessive alcohol consumption. The municipal health service will be the lead agency for interventions activities in the lifestyle field and other organizations will be lead organization for intervention activities in the other health fields.

Figure 5.2 Design of the 2-year community intervention. The time sequence of surveys, process evaluation, participatory action research, and intervention implementation is displayed.

precontemplation, contemplation, preparation, action, and maintenance. Different intervention strategies should be used at different stages to facilitate movement to a more advanced stage. The second model states that behavior can be explained by behavioral intentions, which in turn is determined by attitudes, perceived social influences, and self-efficacy expectations.

The intervention was delivered by the neighborhood coalitions. The coalitions had a different opinion about the neighborhoods health issues and competing problems as compared to the goals and priorities of the Municipal Health Service. The latter was bound to the terms of its contract with the funding agency of the evaluation study. This tension was overcome by giving the power and control of the program explicitly to the neighborhood coalitions. In May 2000 the neighborhood coalitions achieved an agreement on the intervention goals with the Municipal Health Service. The goals were related to Lalonde's health fields:¹³ physical and social environment, lifestyle and health care organization. In the field of lifestyle both neighborhoods chose nutrition, and especially fruits and vegetable consumption and physical activity as their main intervention topics. A third topic in De Bennekel was smoking and in Tivoli excessive alcohol consumption. The Municipal Health Service would take the lead in the lifestyle field and other organizations would take the lead for intervention activities in the other health fields.

5.2.2 Key process evaluation components

The process evaluation data described in this article followed the key process evaluation components as listed by Linnan and Steckler.⁵ The purposes of this process evaluation were to describe (1) the context or environment that may influence intervention implementation, (2) the recruitment of participants on the individual and organizational level, (3) the dose delivered by the intervention providers, (4) the reach of the target audience, (5) the dose received by the target audience, and (6) the fidelity of intervention delivery. The measure of fidelity addressed whether the intervention was carried out according to important key principles of the "community approach". Important key principles are: participation of residents in planning and implementing the intervention, intersectoral collaboration of organizations from relevant sectors, tailoring to local needs and existing structures, incorporation of a social ecological perspective, use of multi-strategies and a broad lifestyle approach.¹⁴ Linnan and Steckler also distinguish a seventh key component, the implementation score, which was not operationalized in this process evaluation study. To operationalize an implementation score we needed quantitative measures of reach, dose delivered, dose received, and fidelity, and this was not available for fidelity.

5.2.3 Data collection of process evaluation components

Data were collected by using minutes of the meetings of the two neighborhood coalitions, registration forms to record program activities, and a baseline and 2-year follow-up self-administered postal questionnaire among the general population of the intervention and comparison neighborhoods. A representative of the Municipal Health Service kept minutes of all community coalitions' meetings. Registration

forms were used by the Municipal Health Services to record information on the intervention activities. On the form information was recorded about content and duration of the activity, the target group, number of participants, successful and unsuccessful elements, and sustainability. The minutes of the meetings were used to determine the number of meetings and members during intervention implementation. They were also screened for additional information on intervention activities, especially for activities that were not implemented. At both baseline and follow-up, sociodemographic factors and (intermediate) outcomes of health related behavior were assessed. At follow-up only, questions were asked about program awareness and program participation. To measure program awareness, we asked, "Do you know the "Wijkgezondheidswerk" Project?" Four possible answers included: yes/yes and I also recognize the projects' logo/I am not sure/no. To measure program participation, we asked "Did you participate in activities of the "Wijkgezondheidswerk" Project? Three possible answers included: yes/I am not sure/no. Furthermore, the survey included questions about awareness of and participation in several large-scale intervention activities, one's opinion about the project and some questions concerning the direct mail newsletter. The final sample for this study comprised 1,929 respondents who completed both the baseline and follow-up surveys (attrition rate: 31%). Dropouts were more likely to be male, younger and smoker than those respondents who participated in both surveys. Lost to follow-up did not differ between intervention and comparison neighborhoods. To assess the context of the intervention we used existing data of the municipality of Eindhoven.¹⁵⁻¹⁸

5.2.4 Data analyses

The data on intervention activities collected with the registration forms were entered in a computerized database. Extra information from the minutes was also added in this database if applicable. "Dose delivered" was computed by summing the number of activities across intervention topic and intervention period for each intervention neighborhood. "Reach" was computed by summing the number of participants of the intervention activities across topic, objective and channel of communication for each intervention neighborhood. "Dose received" was computed using the survey measures of program awareness and participation for each intervention neighborhood and the comparison neighborhoods. Analyses were conducted using SAS version 8.2. Frequency distributions were calculated on all process measures in the survey. Multivariate logistic regression was used to identify sociodemographic and health behavior correlates of intervention exposure and reading the newsletter.

5.3 Results

5.3.1 Context

Table 5.1 shows the socioeconomic characteristics of the selected deprived neighborhoods for the community intervention. The deprived neighborhoods show a higher presence of ethnic minority groups, higher unemployment rates, higher rates of rented property, lower mean household income, and a higher presence of lower educated residents. Community change was induced at the neighborhood level when the Municipal Health Service started to mobilize relevant sectors in the sub-system level around the problem of health in deprived neighborhoods (figure 5.3). The total budget for intervention implementation was 90,000 euros.

Table 5.1 Characteristics of intervention and comparison neighborhoods compared to characteristics of the city of Eindhoven, in 2000

	Intervention neighborhoods		Comparison neighborhoods	Eindhoven
	Tivoli	De Bennekel		
Number of residents	1,764	6,654	8,322	199,896
Number of households	766	2,927	3,781	86,203
Ethnic Origin				
% Moroccan	2	5	2	2
% Turkish	14	8	17	4
% Surinamese/Antillean	5	5	5	3
% Unemployment	14	12	14	7
Housing				
% Rented house	95	80	82	63
% Private property	5	20	18	37
Movement dynamics*	0.89	1.11	1.36	1.00
Mean household income**	€14,200	€15,200	€15,033	€18,100
% low household income < € 7,260	19	23	23	14
Educational level				
% I (low)	29	21	22	11
% II	49	41	35	34
% III	21	21	19	27
% IV (high)	9	16	23	28

* movement dynamics in the city of Eindhoven are set to 1.00. If neighborhood value > 1.00 movement dynamics are above the city average

** standardized for household size and household composition

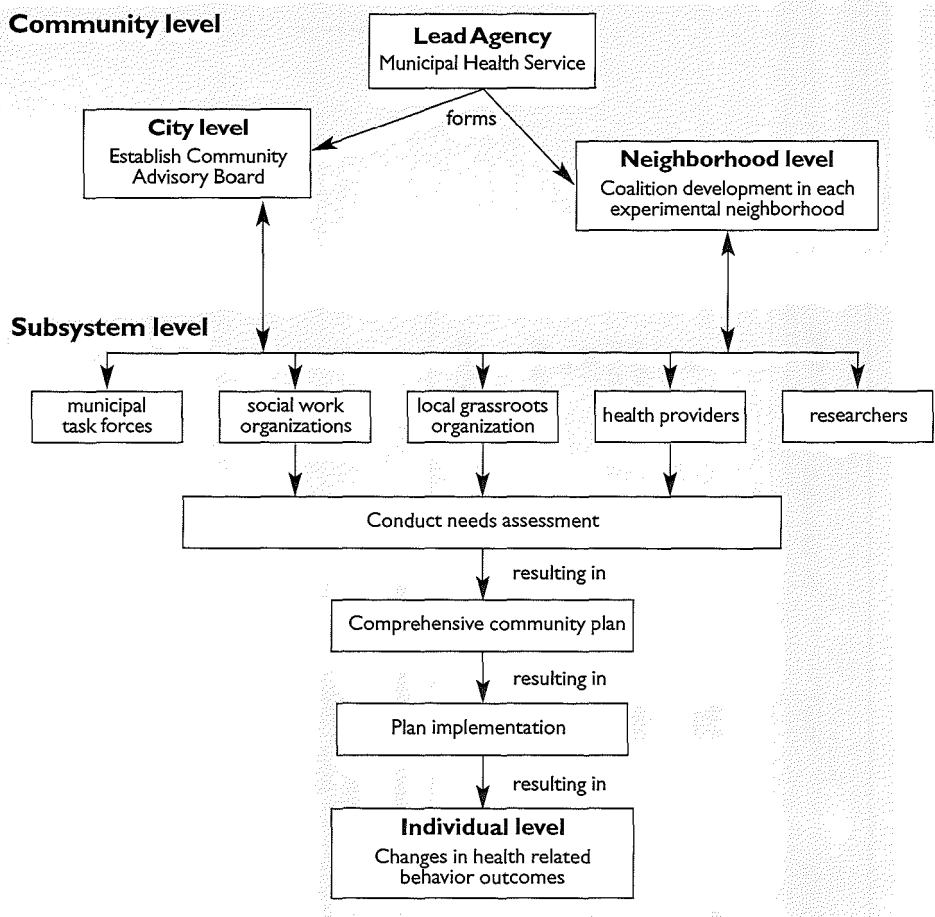


Figure 5.3 Overview of participating organizations in the community intervention “Wijkgezondheidswerk” and intervention development (adapted from Goodman¹⁹)

5.3.2 Recruitment

At the neighborhood level the lead agency (Municipal Health Service) recruited members from various professional and the local grassroots organization to form a neighborhood coalition (figure 5.3). The coalition’s goals involved assessing the situation, deciding what action to take, and implementing the program. Representatives of the Municipal Health Service, community social work organizations, the Municipal Task Force of Social Development, the local grassroots organization, a general practitioner and researchers participated in the neighborhood coalitions. In the beginning eight organizations were involved in the coalition (see table 5.2). After a merger of two community social work organizations, seven organizations were left in the second year of implementation. Furthermore, at the

Table 5.2 Overview of numbers of members, numbers of meetings and distribution of intervention activities* by neighborhood coalition and period

	September 2000 – September 2001		September 2001 – September 2002		Overall
	Tivoli	De Bennekel	Tivoli	De Bennekel	
Number of members**	9 (8)	9 (8)	7 (7)	7 (7)	-
Number of meetings	10	8	7***	10***	35
Nutritional activities	3	3	2 (1)	2	10 (1)
Physical activity activities	1 (1)	5(1)	2 (2)	7	15 (4)
Smoking activities	n.a.	1 (1)	n.a.	1 (1)	2 (2)
Alcohol activities	0	n.a.	0	n.a.	0
Other activities related to health	5(1)	2 (1)	3 (1)	6	16 (3)
Total number of activities	9 (2)	11 (3)	7 (4)	16 (1)	43 (10)

* in parenthesis the number of activities which were not started (N=10) due to low participation rates (n=6), implementation problems (n=3) or bad wheather conditions (n=1)

** in parenthesis the number of organizations involved in the neighborhood coalition

*** including one meeting organized with both neighborhood coalitions together in January 2002

city level a community advisory board was established including members of the professional organizations that also participated in the neighborhood coalitions. The advisory board was established to ensure awareness of the program at higher organizational levels of the participating professional organizations.

The participants of intervention activities were recruited in various ways. Most activities were announced in the programs' direct mail newsletter and also on posters hanging outside the "shop" of the local grassroots organizations. Smokers received a letter from their general practitioner to call for their participation in a quit-smoking course. Participants for school-based activities were recruited by means of a letter from their children's' teacher. Two activities used a door-to-door method to recruit participants

5.3.3 Dose delivered

Table 5.2 reports the number of activities organized by the neighborhood coalitions in both neighborhoods. In total the groups organized 53 activities of which 10 could not be implemented due to low participation rates of neighborhood residents, implementation problems or bad weather conditions. The coalitions implemented, 10 nutritional activities, 15 physical activity activities, 2 smoking activities, and 16 activities related to health in general. The Bennekel coalition implemented more activities (n=27) than the Tivoli coalition (n=16). In appendix 5.A1 and 5.A2 all intervention activities are listed by neighborhood and topic. Table 5.3 shows an overview of all implemented intervention activities (n=43). The objective of most intervention activities was to attract attention or give information and to increase knowledge or awareness. Ten out of 43 activities were directed at behavioral change and only one environmental activity was implemented.

5.3.4 Reach

The intervention program reached about 1,400 residents in De Bennekel and about 1,100 in Tivoli (respectively 21% and 62% of the total number of residents). These numbers were not corrected for double counts and participating residents from other neighborhoods and they do not include the households that were reached by the monthly newsletter. The easy-to-read direct mail newsletter included information on intervention activities to come and that took place and information on health related behavior topics. Over a two-year period, the newsletter was distributed 17 times in each neighborhood. Of the respondents who knew the "Wijkgezondheidswerk" program, 82% remembered the newsletters. Among the respondents who remembered the newsletters, 41% reported that they had read the newsletter often/always, 43% read them sometimes, and 13% never read them. In general, respondents thought the newsletters were interesting and understandable. Multivariate logistic regression showed that age and ethnicity were independently associated with reading the newsletters. Younger respondents, age 18-24 / 25-44 years, were 0.21 (95% CI 0.08-0.60) resp. 0.50 (95% CI 0.30-0.81) times less likely to read the newsletter than older respondents, age 45-66 years. Dutch respondents were 1.75 (95% CI 1.03-2.98) times more likely to read the newsletter than respondents from other ethnic origin.

Table 5.3 Overview of implemented health behavior activities (n=39*) by topic, objective and channel of communication

Objective	Channel of communication	De Bennekel		Tivoli	
		Activities (n)	Participants (n)	Activities (n)	Participants (n)
Nutritional activities					
attention/information	special event	2	115	-	-
knowledge/awareness	face-to-face: single session	3	66	2	221
	face-to-face: multiple session	-	-	2	33
behavior change	environmental	-	-	1	unknown
Physical activity activities					
attention/information	special event	3	601	1	300
knowledge/awareness	face-to-face: single session	2	44	-	-
	face-to-face: multiple session	3	26	2	35
behavior change	special event	4	78	-	-
Smoking activities					
behavior change	face-to-face: multiple session	2	13	-	-
Other activities related to health					
attention/information	special event	2	400	3	450
knowledge/awareness	face-to-face: single session	-	-	1	16
	face-to-face: multiple session	3	60	2	46
behavior change	face-to-face: multiple session	1	10	-	-
Total		25	1413	14	1101

* the newsletters (n=4) were not included in the table

Table 5.4 Awareness and participation in large scale intervention activities of the “Wijkgezondheidswerk”

Large scale intervention activities	Awareness		Participation	
	% (95% CI)	n* (95% CI)	% (95% CI)	n* (95% CI)
De Bennekel (N=713)				
<i>Overall: One or more activities</i>	70 (67-73)	2,904 (2,776-3,032)	13 (11-15)	539 (445-633)
Direct mail newsletter De Bennekel				
AWGW newsletter to all 3,000 households	42 (39-45)	1,743 (1,605-1,880)	n.a.	n.a.
Bennekel on the move				
AWGW community event concerning physical activity	42 (39-45)	1,743 (1,605-1,880)	4 (3-5)	166 (111-221)
Annual Bennekel event				
Community event organized by local grassroots organization	56 (53-59)	2,323 (2,185-2,462)	8 (6-10)	332 (256-408)
GALM intervention				
A physical activity intervention for inactive 55+ adults**	25 (19-31)	147 (114-179)	6 (3-9)	35 (17-53)
Opening of the Verhulst square in De Bennekel				
Official launch of new playing/sports field for children	35 (32-38)	1,452 (1,319-1,585)	4 (3-5)	166 (111-221)
Tivoli (N=280)				
<i>Overall: One or more activities</i>	72 (67-77)	827 (775-879)	11 (8-14)	126 (90-163)
Direct mail newsletter Tivoli				
AWGW newsletter to 700 households	37 (32-42)	425 (369-481)	n.a.	n.a.
Tivoli health market				
AWGW community event concerning healthy behaviors	60 (55-65)	689 (633-746)	5 (3-7)	57 (32-83)
Tivoli on the move				
AWGW community event concerning physical activity	56 (51-61)	643 (586-701)	5 (3-7)	57 (32-83)
Comparison neighborhoods (N=829)				
<i>Overall: One or more activities</i>	11 (9-13)	696 (582-809)	1 (0-2)	63 (27-99)

Note 1 WGW = “Wijkgezondheidswerk” Project

Note 2 Distribution of awareness and participation is calculated only among residents of the neighborhood where the event took place.

* extrapolated absolute number of participants based on the total number of residents in the age of 18-66 years old living in De Bennekel (N=4,149), Tivoli (N=1,149) or comparison neighborhoods (N=6,323)

** in respondents age 55+ (N=586)

5.3.5 Dose received

Table 5.4 shows that between 69%–71% of the respondents in one of the intervention neighborhoods were aware and 11%–12% participated in one or more large-scale intervention activities of the program “Wijkgezondheidswerk”. In the comparison neighborhoods 11% of the respondents was aware and 1% participated in one or more large-scale activities in the intervention neighborhoods. Twenty-four percent of the respondents in the intervention neighborhoods and 7% of the respondents in the comparison neighborhoods knew the program by name. The newsletter and the neighborhoods’ information shop were important sources for this knowledge. Other important sources were other residents, the general practitioner, and information posters. In the intervention neighborhoods 3% of the respondents participated in activities of the program. Multivariate logistic regression showed that neighborhood and age were independently associated with participation in intervention activities. Residents from intervention neighborhoods were more likely to participate than respondents from comparison neighborhoods, but participation in Tivoli was also 2.89 (1.27–6.39) times larger than participation in De Bennekel. Younger respondents, age 18–24 / 25–44 years, were 0.20 (95% CI 0.03–1.05) resp. 0.37 (95% CI 0.15–0.88) less likely to participate than older respondents, age 45–66 years.

5.3.6 Fidelity

Table 5.5 lists the key principles of the “community approach” and whether they were carried out sufficient or insufficient. Most key principles were carried out sufficiently except for community participation and the use of an ecological perspective. However, a tension existed between intervention delivery by the Municipal Health Service using the key principles of the “community approach” and the objectives of the evaluation study that are described in figure 5.1.

5.4 Discussion

The program “Wijkgezondheidswerk” was implemented according to most of the key principles of the “community approach”. Intervention delivery was less sufficient in its ecological reach with regard to the physical environmental level and in community participation, especially in the first implementation year. Most intervention activities were directed at increasing attention, information, awareness and knowledge. One third of the activities had the objective to change behavior. Program awareness and program participation were 23% respectively 3% among residents in the intervention neighborhoods. The data suggests that the direct mail newsletter was important in reaching the residents of the intervention neighborhood. Exposure to intervention activities was likely to be higher among residents of Tivoli and this finding was also supported by the results of the survey among the general population.

At this moment, there is some general consent about the key components of process evaluation, which were used to structure this process evaluation.⁵ However, there are

Table 5.5 Fidelity of intervention delivery

Key principles of community approach	Carried out			Remark
	+	+/-	-	
1. Participation of residents in planning and implementing the intervention		x		In the first year, participation of residents was mostly limited to the involvement of a single member of the local grassroots organization in the neighborhood coalition. In the second year, there was also involvement of residents in organizing activities. Furthermore the neighborhood coalition was more frequently contacted by residents to express their wishes or ideas on health related topics.
2. Intersectoral collaboration	x			Relevant professional organizations including the local grassroots organizations and the general practitioner participated in the neighborhood coalitions. All organizations were involved in planning, developing and implementing the organization.
3. Tailoring to local needs and structures	x			The program "Wijkgezondheidswerk" was incorporated in the municipal action plans for deprived neighborhoods, with an emphasis on the use of a "community approach" to promote health related behavior. To achieve interaction between policy makers and practice a community advisory board was established.
4. Incorporation of a social ecological perspective		x		The intervention used an ecological framework, targeting its efforts at the intrapersonal, interpersonal, environmental and community level. Most intervention activities were directed at the intrapersonal level. Organizational elements targeted the interpersonal and community level. Only one activity was directed at the environmental level.
5. Using multi-strategies	x			The health related activities were mostly organized on a small-scale. Some of these activities already existed, some were especially developed. Some activities existed already on the city level and were adapted to be implemented at the neighborhood level. The effectiveness of most activities was not established. Only one large-scale activity, a movement program for older adults was evidence-based. ²⁰ Activities were only implemented if it was likely that they could be sustained.
6. Using broad lifestyle approach	x			The coalition plans for intervention implementation were not only directed to health related topics but also to the physical and social environment of the neighborhood. The main goals that focused on health related behavior were to increase awareness and consumption of fruits and vegetables and to increase moderate-intensity physical activity. Furthermore the coalitions defined goals for action on barriers in the social and physical environment and health care services.

+ = sufficient, +/- = not sufficient/not insufficient, - = insufficient

no standardized methods available to measure these individual components. Furthermore, not all factors with a potential to affect the outcomes in the impact evaluation were measured. For example, the assessment of the “dose received” was only done in a survey among the general population. Assessment of the “dose received” for all implemented intervention activities will give more information on the short-term effects of single intervention components. Furthermore, some of our process evaluation measures are based on observation of documents and minutes concerning intervention development and implementation. Although this was done systematically, the results are subject to interpretation bias.

Comparing the results of this process evaluation with other studies is difficult for several reasons. The intervention study was conducted in a deprived setting and at the neighborhood level. This is a rather different setting compared to the large community interventions conducted in the USA that are accompanied by process evaluation research and studies that were conducted in deprived settings only give notice of some process measures. Best comparable are the process outcomes of the Coeur en Sante St-Henri program^{21,22} in which also awareness and participation outcomes were measured. In this program, like in our study, there was a large difference between awareness of and participation in intervention activities. Furthermore, their results also showed some contamination of the comparison neighborhoods and their perceived barriers to intervention implementation were recognizable.

Two thirds of the activities of the intervention program were directed at attracting attention, providing residents with information and increasing knowledge and awareness of health related behavior. Given the fact that a considerable part of the population were in one of the preaction stages of improving their dietary or physical activity behavior, these kind of activities are likely to be suitable for this target group.¹⁰ Thus, we may expect program effects on knowledge, attitudes and beliefs. On the other hand, only one third of the intervention activities were directed at behavioral change and therefore it is questionable whether this intervention shall demonstrate an impact on behavioral outcomes. Furthermore, the neighborhood coalitions often chose to implement activities that were based on intuitively reasonable methods instead of on their evidence of effectiveness. As the bottom-up approach of the project resulted in only a few evidence-based activities in the total intervention program. We should also mention however, that the availability of effective interventions that could be used as single intervention components in a community intervention was limited. A last remark concerns the target population of the impact evaluation (adults aged 18-65 years) and the target population of the intervention activities. Although the intervention reached a considerable part of the general population in the intervention neighborhoods, the program probably lacked sufficient tailoring of intervention activities to reach all different segments of the community. Especially, men and younger residents were less often reached with the intervention activities.

The results from this process evaluation were useful to show what was planned and what was achieved. As already noted earlier, such data should open the “black box” of intervention effectiveness. We were able to slightly lift the cover of this “black box” but there are questions that remain unanswered. One of these questions is how to measure an appropriate implementation score for a community intervention? Is a community health program implemented successfully if e.g. an intervention is implemented according to key principles of the “community approach” or should implementation objectives be the result of the product^s of reach (who participated), dose (what the program delivered), dose received (what participants received), and fidelity (intervention carried out according to key principles of the “community approach”).

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Tabel 5.A1 Overview of intervention activities in De Bennekel by topic (n=31)

Intervention activity: description									
Initiator*	Executor	Volunteers	Goal	Target groups	Channel of communication	Participants (n)	Costs	Implemented	
Nutritional activities									
<i>"Healthy sweets": information on healthy sweets for parents of children at the daycare centre from a dietician and making healthy sweets in practice.</i>									
other	municipal health service	no	knowledge/awareness	adults and children	face-to-face; single session	43	€ 550	yes	
<i>Nutrition project on primary school: during one week several lessons were focused on nutrition, Parents (n=4) received dietary information from a dietician</i>									
other	municipal health service	no	knowledge/awareness	adults and children	face-to-face; single session	304	€ 290	yes	
<i>"Healthy salads": information on healthy nutrition for parents of children at the daycare centre from a dietician and making healthy salads in practice.</i>									
other	municipal health service	no	knowledge/awareness	adults and children	face-to-face; single session	19	€ 115	yes	
<i>Ethnic womens' party: party for ethnic women where nutrition education information was available in the own language</i>									
collaborating organization	social work organization	yes	attention/information	adults (ethnic group)	special events	70	€ 15	yes	
<i>Volunteers day: all volunteers of the local grassroots organization received a healthy present.</i>									
residents	residents	yes	attention/information	adults	special events	45	€ 50	yes	
Physical activity activities									
<i>GALM: physical activity intervention for inactive adults 55+ including 30 lessons of 1 hour. Recruitment by former participants.</i>									
other	other	yes	behavior change	older adults (55+)	face-to-face; multiple session	unknown	€ 2,382	yes	
<i>"Aqua slim": course of 12 swimming lessons and 6 dietary information lessons</i>									
lead organization	municipal health service	no	behavior change	adults	face-to-face; multiple session	7	€ 0	no	
<i>Gymnastics class 2000/2001: weekly gymnastic lessons for women</i>									
collaborating organization	social work organization	no	behavior change	adults	face-to-face; multiple session	12	€ 0	yes	
<i>Bicycle prize-giving: a new bike for one of the respondents of the questionnaire</i>									
lead organization	municipal health service	no	attention/information	adults	special events	1	€ 750	yes	
<i>"On the way" 2001: swim instruction for children and information about swimming lessons for parents from non-Dutch origin</i>									
collaborating organization	social work organization	no	attention/information	adults (ethnic group)	face-to-face; single session	20	€ 34	yes	
<i>Bennekel on the move: community event concerning physical activity</i>									
lead organization	municipal health service	yes	attention/information	adults and children	special events	400	€ 4,550	yes	
<i>Gymnastics class 2001/2002: weekly gymnastic lessons for women</i>									
collaborating organization	social work organization	no	behavior change	adults	face-to-face; multiple session	14	€ 0	yes	
<i>Walking tour winter 2001: walking event in the surroundings of De Bennekel, concluded with a meal.</i>									
neighborhood coalition	grassroots organization	yes	behavior change	adults	special events	35	€ 82	yes	
<i>Indoor soccer activity: weekly soccer match for Moroccan men</i>									
residents	residents	no	behavior change	adults (ethnic group)	special events	12	€ 390	yes	
<i>Residents' quit smoking group: social support walking group for those who quited smoking in the Quit Smoking courses</i>									
residents	residents	yes	behavior change	adults	special events	6	€ 775	yes	
<i>"On the way" 2002: swim instruction for children and information about swimming lessons for parents from non-Dutch origin</i>									
collaborating organization	social work organization	no	attention/information	adults and children	face-to-face; single session	24	€ 35	yes	

Table 5.A1 – continued

Intervention activity: description									
Initiator*	Executor	Volunteers	Goal	Target groups	Channel of communication	Participants (n)	Costs	Implemented	
Walking tour summer 2002: walking event in the surroundings of De Bennekel, concluded with a meal									
neighborhood coalition	grassroots organization	yes	behavior change	adults	special events	25	€ 114	yes	
Opening Verhulst square: official launch of new playing/sports field for children									
collaborating organization	municipal task force	yes	attention/information	adults and children	special events	200	€ 66	yes	
Smoking activities									
Course "Quit smoking" (1): course to stop smoking within a group under supervision of a teacher									
lead organization	municipal health service	no	behavior change	adults	face-to-face; multiple session	7	€ 1,001	yes	
Course "Quit smoking" (2): course to stop smoking within a group under supervision of a teacher									
lead organization	municipal health service	no	behavior change	adults	face-to-face; multiple session	2	€ 0	no	
Course "Quit smoking" (3): course to stop smoking within a group under supervision of a teacher									
lead organization	municipal health service	no	behavior change	adults	face-to-face; multiple session	6	€ 715	yes	
Course "Quit smoking" (4): course to stop smoking within a group under supervision of a teacher									
lead organization	municipal health service	yes	behavior change	adults	face-to-face; multiple session	5	€ 0	no	
Other activities related to health									
Social map De Bennekel: a booklet including an overview of all health care organizations and professionals to be distributed among residents									
lead organization	other	no	attention/information	adults	mass media	-	€ 0	no	
Direct mail newsletter De Bennekel 2000/2001: newsletter delivered 7 times during implementation phase to 3,000 households									
lead organization	municipal health service	no	attention/information	adults	mass media	3000	€ 504	yes	
Health education 50+: course for professionals and volunteers on how to recognize health and psychosocial problems of older women									
collaborating organization	other	yes	knowledge/awareness	professionals	face-to-face; multiple session	12	€ 365	yes	
Direct mail newsletter De Bennekel 2001/2002: newsletter delivered 10 times to 3,000 households									
lead organization	municipal health service	no	attention/information	adults	mass media	3000	€ 0	yes	
Annual event De Bennekel: community event organized by social welfare and local grassroots organization									
collaborating organization	social work organization	yes	attention/information	adults and children	special events	400	€ 0	yes	
Poster exhibition: exhibition of winning posters in the lifestyle poster competition									
neighborhood coalition	municipal health service	no	attention/information	adults	special events	unknown	€ 750	yes	
Body Business: 8 lessons for children about body and health. Parents receive health information in their own language									
other	social work organization	no	knowledge/awareness	adults and children	face-to-face; multiple session	35	€ 275	yes	
"Feeling good": course including 6 lessons for women on how to recognize stress complaints and learn how to relax									
collaborating organization	social work organization	no	behavior change	adults	face-to-face; multiple session	10	€ 10	yes	
"Just be healthy": course for 55+ women to discuss questions/complaints/experiences of one's own health									
collaborating organization	social work organization	no	knowledge/awareness	older adults (55+)	face-to-face; multiple session	13	€ 15	yes	

Table 5.A2 Overview of intervention activities in Tivoli (n=22)

Intervention activity: description									
Initiator*	Executor	Volunteers	Goal	Target groups	Channel of communication	Participants (n)	Costs	Implemented	
<u>Nutritional activities</u>									
<i>"Healthy Lifestyle": course of 3 lessons on healthy lifestyle and nutrition</i>									
lead organization	municipal health service	no	knowledge/awareness	older adults (55+)	face-to-face; multiple session	23	€ 450	yes	
<i>Nutrition information for mothers: 4 lessons from a dietician during mothers' weekly meeting at the primary school of their children</i>									
lead organization	municipal health service	no	knowledge/awareness	adults	face-to-face; multiple session	10	€ 285	yes	
<i>"Healthy Sweets": children make healthy sweets under supervision</i>									
residents	grassroots organization	yes	attention/information	adults and children	face-to-face; single session	200	€ 105	yes	
<i>Collaboration greengrocer's shop: the local greengrocer's advertizes in the newsletter with special offers</i>									
lead organization	municipal health service	no	behavior change	adults	environmental	unknown	€ 0	yes	
<i>Breakfast project: children at the daycare center and their parents (n=21) have breakfast together. Parents receive information on healthy breakfasts from a dietician.</i>									
other	municipal health service	no	knowledge/awareness	adults and children	face-to-face; single session	61	€ 255	yes	
<i>"Slim club": lessons on how to get slim including physical activity and nutrition information for women</i>									
collaborating organization	municipal health service	no	behavior change	adults	face-to-face; multiple session	0	€ 0	no	
<u>Physical activity activities</u>									
<i>Weekly swimming in a group</i>									
residents	residents	no	behavior change	adults	face-to-face; multiple session	15	€ 0	yes	
<i>"Aqua slim": course of 12 swimming lessons and 6 dietary education lessons</i>									
lead organization	municipal health service	no	behavior change	adults	face-to-face; multiple session	-	€ 0	no	
<i>Tivoli on the move (1): community event concerning physical activity</i>									
lead organization	municipal health service	yes	attention/information	adults and children	special events	-	€ 115	no	
<i>Gymnastics class for Turkish women: weekly gymnastic lessons</i>									
residents	grassroots organization	no	behavior change	adults (ethnic group)	face-to-face; multiple session	20	€ 0	yes	
<i>Tivoli on the move (2): community event concerning physical activity</i>									
lead organization	municipal health service	yes	attention/information	adults and children	special events	300	€ 4,435	yes	
<i>Walking tour: initiative to mark a walking tour in the surroundings of Tivoli</i>									
neighborhood coalition	grassroots organization	yes	behavior change	adults	special events	-	€ 0	no	
<u>Other activities related to health</u>									
<i>Direct mail newsletter Tivoli 2000/2001: newsletter delivered 8 times to 700 households</i>									
lead organization	municipal health service	no	attention/information	adults	mass media	700	€ 450	yes	
<i>"Health market": community event concerning health related behaviors</i>									
lead organization	municipal health service	yes	attention/information	adults and children	special events	200	€ 2,000	yes	
<i>"Growing older in The Netherlands": course for older Turkish men and women separately in their native language</i>									
collaborating organization	social work organization	no	knowledge/awareness	adults (ethnic group)	face-to-face; multiple session	30		yes	

Table 5.A2 – continued

Intervention activity: description								
Initiator*	Executor	Volunteers	Goal	Target groups	Channel of communication	Participants (n)	Costs	Implemented
<i>Information market municipal task force: presentation of the program "Wijkgezondheidswerk"</i>								
collaborating organization	municipal task force	no	attention/information	professionals	special events	100	€ 0	yes
<i>Welcome's gift: all new residents in the neighborhood receive a gift to attract attention to the program</i>								
residents	grassroots organization	yes	attention/information	adults	special events	150	€ 65	yes
<i>Large-scale community meeting: for this meeting relevant professional organizations were invited to discuss new priorities and possibilities concerning health related activities</i>								
neighborhood coalition	municipal health service	no	attention/information	professionals	special events	-	€ 0	no
<i>Direct mail newsletter Tivoli 2001/2002: newsletter delivered 10 times to 700 households</i>								
lead organization	municipal health service	no	attention/information	adults	mass media	700		yes
<i>Social map Tivoli: a booklet including an overview of all health care organizations and professionals to be distributed among residents</i>								
lead organization	other	no	attention/information	adults	mass media	-	€ 0	no
<i>Health project on primary school: during three weeks several lessons discussed dental hygiene, nutrition and physical activity. Parents (n=43) also receive information on these topics.</i>								
lead organization	municipal health service	no	knowledge/awareness	adults and children	face-to-face; multiple session	123	€ 590	yes
<i>Information on dental hygiene: during mothers' weekly meeting at the primary school of their children</i>								
other	municipal health service	no	knowledge/awareness	adults and children	face-to-face; single session	16	€ 36	yes

*Initiator: lead organization = municipal health service, collaborating organization = one of the professional organizations involved in the neighborhood coalition, other = an organization not involved in the neighborhood coalition.

Impact Evaluation of a Dutch Community Intervention to Improve Health Related Behavior in Deprived Neighborhoods

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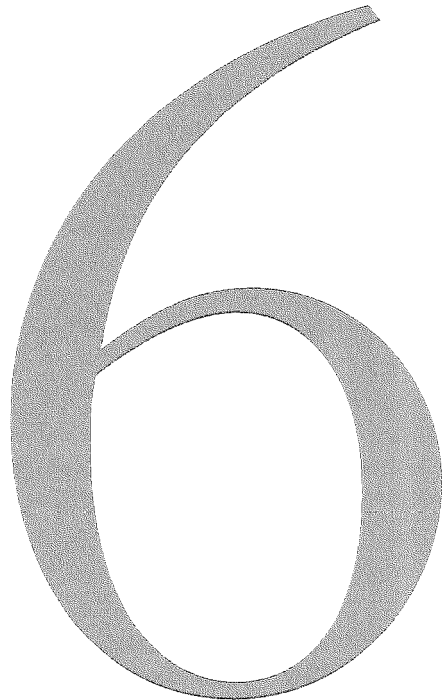
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Submitted



Abstract

Background: This study investigates the impact of a 2-year community intervention on health related behavior among adults aged 18–65 years living in deprived neighborhoods, in Eindhoven, the Netherlands.

Methods: The intervention is evaluated in a community intervention trial with a quasi-experimental design in a longitudinal cohort survey (n=1,926) (attrition rate: 31%) using postal questionnaires. In the 2-year implementation phase more than 40 intervention activities were planned and delivered by intersectoral neighborhood coalitions. Outcome measures were fruit consumption, vegetable consumption, physical activity, smoking, alcohol consumption and intermediate outcomes of behavior like attitudes, self-efficacy, awareness, knowledge and stages of change.

Results: No effects were found for (intermediate) outcomes of vegetable consumption, physical activity, smoking or alcohol consumption. The intervention had an impact on self-efficacy expectations (p=.048), knowledge (p=.033) and stages of change (p=.037) for fruit consumption. Fruit consumption increased in the intervention neighborhoods and slightly decreased in the comparison neighborhoods (overall difference 10 grams/day) (p=.044). There was also an effect on change in proportion of respondents meeting the guidelines for fruit consumption (p=.015). There was no positive dose response relationship between intervention exposure and changes in (intermediate) outcomes of fruit consumption.

Conclusion: The intervention demonstrated no evidence for an impact on vegetable consumption, physical activity, smoking and alcohol consumption and weak evidence for a small impact on (intermediate) outcomes of fruit consumption.

6.1 Introduction

Available data on socioeconomic inequalities in health in Europe show that inequalities in mortality and self-reported morbidity are substantial.¹ Health related behaviors are important determinants of health and are often differentially distributed across socioeconomic groups. Studies have shown that smoking,^{2,3} consumption of a less healthy diet,⁴ lack of physical activity^{5,6} and obesity^{7,8} are more prevalent in lower socioeconomic groups. The challenge is to find effective health promotion strategies that can tackle socioeconomic inequalities in health related behavior.

Although health behavior is to a great extent determined by intra-personal factors the influence of the social and physical environment is increasingly recognized. This advocates the use of community health promotion initiatives that change intra-personal variables as well as environmental variables. The community health promotion approach generally targets several risk behaviors, uses multiple intervention strategies and community participation to reach its goals. Importantly, community interventions are thought to be an important tool to come into contact with hard-to-reach target groups, like lower socioeconomic populations, for several reasons. First, lower socioeconomic groups are more likely to respond to information of their direct social environment^{9,10} instead of external sources like general (mass media) information campaigns.¹¹ Community participation creates the opportunity to reach residents through the social networks of involved community members. Second, the inclusion of multiple change tactics such as group programs, publicity campaigns or school-based activities within the intervention program creates the opportunity to reach participants through multiple information channels. Third, preventive measures to improve risk behaviors are not always an important issue on the agenda of residents in deprived neighborhoods because they also have to deal with problems like poverty, unemployment or housing. However, if health authorities plan and implement activities together with community members and also act upon these “competing problems” they are more likely to create support for health behavior prevention goals.

Much of what we know about community interventions in deprived urban settings comes from a number of studies in the United States and Canada.¹²⁻¹⁴ The Coeur en Santé heart health promotion program promoted heart-healthy behaviors in a disadvantaged neighborhood in Montreal (total population 25,000). The 5-year program reported only a small but positive intervention effect on the frequency of cholesterol checkups in the intervention neighborhoods.¹³ The Washington Heights-Inwood promoted healthy heart behaviors in a disadvantaged urban area in Washington (total population 200,000). The 6-year intervention did not examine the impact on health behaviors, but reported high levels of reach and support for a marketing campaign promoting low-fat milk, exercise clubs, and a Spanish-language smoking cessation video.¹⁴ The Neighbors for Smoke Free North Side program goals was only directed at smoking cessation in predominantly African American neighborhoods in St. Louis (total population range: 8,000 - 15,500). The 2-year intervention program reported a positive intervention effect on the prevalence of

smoking in the intervention neighborhoods.¹² Thus, these results still leave questions regarding the effectiveness of community interventions in deprived settings.

The project “Wijkgezondheidswerk” (Dutch for Working on Healthy Neighborhoods) is a community intervention to improve health related behavior among adults living in deprived neighborhoods (total population range: 1,800 – 6,700) in the city of Eindhoven, the Netherlands. The intervention was based on a theoretical framework that used community organization principles^{15,16} and social cognition models¹⁷ to achieve intervention implementation and change in outcomes of health related behavior. The aim of this evaluation was to examine the impact of the project “Wijkgezondheidswerk” on health related behaviors and intermediate outcomes of behavior.

6.2 Methods

6.2.1 Design and setting

In a quasi-experimental design, 2 out of 10 deprived neighborhoods in the city of Eindhoven were assigned to receive the intervention. Geographically, one of these intervention neighborhoods consisted of two smaller areas. Therefore, three comparison neighborhoods were matched, using information on sociodemographic and health related behavior variables. The impact of the intervention on changes in individual health related behavior and intermediate outcomes of health related behavior, was assessed in a longitudinal cohort survey. In addition to the impact evaluation, the project was supported by participatory action research and a process evaluation, which were reported elsewhere.^{18,19}

6.2.2 Data collection

In September 2000, baseline data were collected from a random sample of 4,800 residents in intervention and comparison neighborhoods aged 18 to 65 years, simultaneously with the start of the intervention. Participants received a postal questionnaire that included questions on health related behavior, intermediate outcomes of health related behavior and several sociodemographic variables. A reminder was mailed to nonresponders after two weeks and the same questionnaire was re-sent after another two weeks. A total of 2,781 of 4,663 eligible participants completed the questionnaire at baseline (response rate: 60%). Nonresponders at baseline were more likely to be male, younger and unmarried. A follow-up of the baseline cohort was conducted in September 2002 after the end of the intervention’s implementation (attrition rate: 31%).

6.2.3 The intervention “Wijkgezondheidswerk”

The program “Wijkgezondheidswerk” is a community health behavior program set out by the municipal health service in Eindhoven to improve health related behavior in deprived neighborhoods. The program started as a top-down program in three deprived neighborhoods where development of a neighborhoods coalition could be ensured. Geographic boundaries of two of the intervention neighborhoods bordered

each other and for practical reasons only one coalition was developed in these two neighborhoods. Representatives of the municipal health service, social work, social welfare, city development department, grassroots neighborhood organization, a general practitioner and researchers participated in the coalitions. Although the intervention started as a top-down program, a bottom-up approach was followed after establishing the neighborhood coalitions. To ensure that the programs' health promotion objectives and community empowerment objectives were accommodated together, the tasks of the neighborhood coalitions were to assess the health needs of the neighborhood, to decide what action to take and to implement the intervention activities. The neighborhood action plans included intervention goals that were related to Lalonde's²⁰ determinants of health: physical and social environment, lifestyle and health care organization. The lifestyle intervention goals were focused on the implementation of activities to achieve an increase of (1) fruit consumption, (2) vegetable consumption, (3) physical activity, and (4) smoking cessation and (5) attention for excessive alcohol consumption. After a period of two years, this resulted in more than 40 implemented intervention activities.

6.2.4 Measures

Sociodemographic variables. Sociodemographic variables were gender, age, educational level and ethnic origin. Educational level was divided into four categories, i.e. primary school only or no schooling (I=low), lower secondary or vocational schooling (II), intermediate vocational schooling or intermediate or higher secondary schooling (III), and higher vocational schooling and university (IV=high). In the Netherlands, educational level is considered a good indicator of socioeconomic status.²¹ Five groups of ethnic origin were distinguished: Dutch, other Western countries, Surinamese/Antillean/Aruban, Turkish/Moroccan, and other non-Western countries. Data on gender, age and ethnic origin were derived from statistics of the municipal administration.

Intervention exposure. Intervention exposure was measured at follow-up among respondents in both the intervention and comparison neighborhoods. The measurements included awareness of the programs name "Wijkgezondheidswerk" and participation in activities of the program "Wijkgezondheidswerk".

Outcomes of health related behavior. Outcomes of health related behavior were fruit and vegetable consumption, physical activity, smoking and alcohol consumption. To assess daily fruit and vegetable intake we used a four-item Food Frequency Questionnaire (FFQ) which was derived from another validated short FFQ.²² Spearman correlations between 7-day dietary records and this FFQ were .51 for fruit and .35 for vegetables. Participants were asked on how many days of the week they usually consumed fruits (including fruit juice accounting for one piece of fruit) or vegetables (including raw vegetables but excluding potatoes), and the amount of fruits (in pieces) and vegetables (in serving spoons) they usually ate on such a day. In calculating mean daily consumption in grams a spoon is standardized as 50 grams and a piece of fruit as 125 grams. To assess physical activity levels we used the validated SQUASH (Short QUestionnaire to ASsess Health enhancing physical activity)

questionnaire (Spearman correlation coefficient for reproducibility=.58 and relative validity=.45).²³ The SQUASH questionnaire measures various physical activities like walking, bicycling, housework, activities at work, home repair, gardening and sports. Respondents were asked to report the frequency (days/week) and duration (min/day) they engaged in these activities in an average week in the past months. Total minutes per week per separate activity were multiplied by an intensity score derived from Ainsworth's compendium²⁴ of physical activity. A total activity score was calculated by taking the sum of all these separate activity scores. Current use of tobacco and alcohol consumption were measured by questions adapted from the Dutch Globe study.²⁵ Smoking status was assessed with the question 'Do you smoke?' Response choices were yes, no (but I used to), no (never). Smokers also had to state how many cigarettes they smoked per day. Self-reported cigarette smoking has proven to be a valid measure compared to biochemical measures of smoking status among adult respondents who participate in community studies.²⁶ Alcohol consumption was assessed by asking respondents if they occasionally drank alcoholic consumptions, and if so on how many days of the week they usually consumed these alcoholic consumptions, and what the amount was of alcoholic consumptions that they usually drunk on such a day. Excessive alcohol consumption was defined as drinking more than 6 glasses on three or more days a week or more than 4 glasses on five or more days a week.²⁷

Intermediate outcomes of health related behavior. To assess the impact of the intervention on intermediate outcomes of health related behavior the questionnaire included measures of knowledge, attitudes, self-efficacy expectations, awareness of own behavior and the intention to change behavior (stages of change). Fruit and vegetable knowledge (7 items) and physical activity knowledge (6 items) were assessed separately using items that referred to diseases related to the health behavior, the national expert recommendations regarding the health behavior, and healthy choices applicable for the behavior. Item scores were added up to derive at an acceptable total item score for fruit and vegetable knowledge (alpha=.58), however a lower total correlation was found for the physical activity total item score (alpha=.43). An alpha higher than .5 can be considered to be sufficient for summation of item scores. Attitude, self-efficacy expectations, awareness and stages of change were measured for fruit consumption, vegetable consumption, and physical activity. Respondents were asked to evaluate their attitude on a pleasant-unpleasant scale. Response choices were very pleasant, pleasant, not pleasant/not unpleasant, unpleasant, very unpleasant. To measure self-efficacy respondents were asked to rate how certain they were they could improve the health behavior. Response choices were very certain, certain, not certain/not uncertain, uncertain, very uncertain. Respondents were allocated to two categories of awareness (aware/unaware) on the basis of their self-rated level of the health behavior (very low, low, intermediate, high, very high) as compared to results of their self-reported levels as described in the "outcomes of health related behavior" paragraph. Respondents who met the national recommendations for the health behavior, but who rated their level as (rather) low were classified as unaware, as well as respondents who did not meet the national

recommendations for the health behavior, but who rated their level as intermediate or higher. The algorithm used to categorize respondents into stages of change is based on their self-reported level of the health related behavior in question. The action criterion of the stage algorithm was complying with the fruit guideline of 250 grams of fruits per day. A respondent was in action if he had changed his behavior to the action criterion within the past six months and in maintenance if he was engaged in the behavior more than six months. Those who not complied with the action criterion were either in pre-contemplation (not considering change), contemplation (thinking about changing within six months), and preparation (planning to change within one month). For the other health related behaviors stage algorithms were assessed likewise. The action criteria were 200 grams of vegetables per day and 30 minutes of moderate-intensity physical activity on at least 5 days of the week.

6.2.5 Statistical analyses

The longitudinal sample was analyzed on an intention to treat basis, which means that a respondent living in an intervention neighborhood at baseline was treated as exposed to the intervention even if he or she moved to another neighborhood at follow-up. A multiple logistic regression analysis was conducted to identify potential selective dropout (with attendance versus dropout as the dependent variable for intervention condition, movement into another neighborhood, gender, ethnic origin and baseline values for age, educational level, fruit and vegetable consumption, physical activity, smoking and alcohol consumption as the independent variables). To estimate the effectiveness of the intervention on continuous outcomes, a mixed model analysis of covariance²⁸ with baseline values of the outcome, gender, age, educational level and ethnic origin as covariates, was applied. To estimate the effectiveness of the intervention on dichotomous and ordinal outcomes, a logistic GEE regression analysis was applied. To estimate the effect of different measures of intervention exposure on change in health related behavior, an analysis of covariance was used. This analysis was only done for those intermediate outcomes on which the intervention was likely to have a significant impact.

6.3 Results

6.3.1 Respondents

Two-year follow-up data were collected from 69% (n=1,929) of the respondents in the baseline survey. Logistic regression analyses showed that loss to follow-up did not differ between the intervention and comparison neighborhoods. However, dropouts were more likely to be male, younger and smoker than respondents who participated in both surveys (results not shown). Table 6.1 shows the demographic characteristics and outcome measures at baseline and follow-up. At baseline, respondents in the intervention neighborhoods were significantly older, lower educated, had a less positive attitude and lower self-efficacy expectations for vegetable consumption, were more active and more often in the maintenance stage for physical activity, had a lower alcohol consumption and were less often excessive drinkers than respondents in the comparison neighborhoods.

Table 6.1 Characteristics of the cohort sample at baseline and followup (N=1,929)

Characteristics ^a	Intervention neighborhoods			Comparison neighborhoods		
	n	baseline	follow-up	n	baseline	follow-up
Respondents, n		1426	1021		1355	908
Mean age, years*	1021	43 (14)		908	39 (13)	
Women, %	1021	53	53	908	53	53
Educational level, %*						
I (low)	259	26	27	196	22	20
II	431	43	40	301	34	33
III	190	19	18	191	21	21
IV (high)	116	12	15	202	23	26
Ethnic origin, %						
Dutch	700	69	69	609	67	67
Other Western countries	81	8	8	87	10	10
Turkish/Moroccan	108	11	11	116	13	13
Surinamese/Antillean/Aruban	42	4	4	33	4	4
Other non-Western countries	89	9	9	63	7	7
Awareness of large-scale activities, %	968	-	71	812	-	11
Participation in large-scale activities, %	968	-	12	812	-	1
Awareness of program WGW, %	915	-	23	820	-	7
Participation in program WGW, %	907	-	3	817	-	0
Vegetable consumption, grams/day	953	100 (51)	99 (52)	851	99 (52)	100 (51)
Enough vegetables, %^b	953	8	9	851	9	8
Vegetables attitude score^{c*}	972	0.41 (1.05)	0.38 (0.97)	863	0.51 (1.01)	0.49 (1.00)
Vegetables self-efficacy score^{c*}	973	0.95 (1.03)	1.01 (0.98)	868	1.05 (0.97)	1.03 (0.99)
Fruit and Vegetables knowledge score^d	994	3.99 (1.61)	4.24 (1.65)	888	4.09 (1.63)	4.23 (1.66)
Vegetables stages of change, %						
precontemplation	597	70	71	490	65	69
contemplation	36	4	4	51	7	5
preparation	147	17	16	144	19	17
action	9	1	2	11	1	2
maintenance	62	7	7	59	8	7
Fruit consumption, grams/day	958	125 (105)	130 (105)	856	130 (106)	125 (101)
Enough fruit, %^b	958	22	23	856	25	21
Fruit attitude score^c	968	0.49 (1.08)	0.49 (0.98)	856	0.58 (1.02)	0.52 (1.00)
Fruit self-efficacy score^c	967	0.97 (1.06)	0.99 (1.01)	862	1.00 (0.99)	0.94 (1.07)
Fruit stages of change, %						
precontemplation	458	54	55	362	47	53
contemplation	45	5	4	41	5	5
preparation	146	17	17	161	21	19
action	33	4	3	41	5	4
maintenance	171	20	22	169	22	19
Physical activity, METs/week	953	7,253 (5,443)	6,898 (5,358)	832	6,931 (4,945)	6,817 (4,677)
Active enough, %^{bb}	953	59	58	834	53	56
Physical activity attitude score^c	963	0.73 (1.07)	0.68 (1.07)	855	0.82 (1.02)	0.75 (1.00)
Physical activity self-efficacy score^c	969	0.74 (1.10)	0.70 (1.09)	859	0.78 (1.03)	0.74 (1.09)
Physical activity knowledge score^d	995	2.92 (1.33)	2.99 (1.38)	886	2.99 (1.37)	3.05 (1.41)
Physical activity stages of change, %*						
precontemplation	210	24	24	188	25	25
contemplation	24	3	4	39	5	5
preparation	86	10	10	99	13	11
action	119	14	10	86	11	11
maintenance	431	50	52	345	46	48

Table 6.1 - continued

Characteristics ^a	Intervention neighborhoods			Comparison neighborhoods		
	n	baseline	follow-up	n	baseline	follow-up
Current smoker, %	938	41	40	853	41	39
Smoking, cigarettes/day	926	6.1 (9.1)	5.8 (9.0)	847	6.0 (9.5)	6.0 (9.7)
Excessive alcohol consumption, %^b	964	5	4	853	8	7
Alcohol consumption, glasses/day^c	956	0.8 (1.0)	0.8 (1.1)	848	0.9 (1.2)	0.9 (1.2)

* Intervention and comparison neighborhoods differed significantly at baseline

a Values for each characteristic are unadjusted percentages or unadjusted means (SD). Due to missing values at baseline or follow-up, the number of subjects presented differs by characteristic

b Dietary guideline for vegetable consumption: at least 200 grams of vegetables per day, dietary guideline for fruit consumption: at least 250 grams of fruits per day, physical activity recommendations: at least 30 minutes of moderate-intensity physical activity on at least 5 days of the week, excessive alcohol consumption 6 or more glasses on 3 or more days a week or 4 or more glasses on 5 or more days a week.

c Score ranged from -2 to 2; the higher the score, the more positive the attitude or the higher the self-efficacy expectations

d Score ranged from 0 to 7; the higher the score, the higher the knowledge

e Score ranged from 0 to 6; the higher the score, the higher the knowledge

WGW = Wijkgezondheidswerk

MET = metabolic energy expenditure (calculated as the total minutes of physical activity per week multiplied by intensity)

6.3.2 Intervention impact on intermediate outcomes of health related behavior

Analyses showed a significant intervention effect on most intermediate outcomes of fruit consumption, one intermediate outcome of physical activity and none on intermediate outcomes of vegetable consumption (tables 6.2 and 6.3). A statistically significant effect was found in favor of the intervention neighborhoods with respect to the fruits and vegetables knowledge score (table 6.2). The increase in knowledge approached significance in the intervention neighborhoods whereas it decreased slightly in the comparison neighborhoods over time. Similar results were found for self-efficacy expectations for fruit consumption ($p=.048$). The decline in the self-efficacy score approached significance in the control neighborhoods whereas the intervention neighborhoods showed a slight increase over time. In the intervention and comparison neighborhoods, 19% and 25%, respectively, moved down one or more stage of change categories for fruit consumption and 19% and 18% moved up one or more stage of change categories. Overall, respondents in the comparison neighborhoods were likely to be in a lower stage of change category at follow-up compared to baseline ($p=.001$) and this change differed significantly from respondents in the intervention neighborhoods (intervention x time interaction $p=.005$) (table 3). Awareness of one's own physical activity level improved in the intervention neighborhoods at follow-up compared to awareness in the comparison neighborhoods ($p=.031$).

Table 6.2 Results of analysis of covariance regarding intervention effectiveness on intermediate outcomes of health related behavior

Intermediate outcomes of behavior ^a	Intervention neighborhoods		Comparison neighborhoods		Difference	
	Mean change (95% CI) ^b	p	Mean change (95% CI) ^b	p	Mean change (95% CI) ^b	p
Vegetable attitude score	0.08 (0.00-0.15)	0.053	0.15 (0.07-0.23)	<0.001	-0.08 (-0.16-0.01)	0.07
Vegetable self-efficacy score	0.07 (-0.01-0.15)	0.08	0.02 (-0.06-0.10)	0.55	0.05 (-0.04-0.13)	0.28
Fruits and vegetables knowledge score	0.10 (-0.01-0.22)	0.07	-0.03 (-0.14-0.09)	0.64	0.13 (0.01-0.25)	0.033
Fruits attitude score	0.07 (0.00-0.15)	0.06	0.07 (-0.01-0.15)	0.08	0.00 (-0.08-0.09)	0.95
Fruits self-efficacy score	0.02 (-0.07-0.10)	0.69	-0.07 (-0.16-0.01)	0.09	0.09 (0.00-0.18)	0.048
Physical activity attitude score	0.03 (-0.07-0.12)	0.61	0.06 (-0.04-0.15)	0.23	-0.03 (-0.14-0.08)	0.58
Physical activity self-efficacy score	0.00 (-0.09-0.08)	0.93	-0.02 (-0.11-0.06)	0.59	0.02 (-0.07-0.11)	0.68
Physical activity knowledge score	0.07 (0.05-0.10)	<0.001	0.06 (0.04-0.08)	<0.001	0.01 (-0.01-0.04)	0.25

a Attitude and self-efficacy scores ranged from -2 to 2; the higher the score, the more positive the attitude or the higher the self-efficacy expectations. Fruit and vegetable knowledge score ranged from 0 to 7; the higher the score, the higher the knowledge. Physical activity knowledge score ranged from 0 to 6; the higher the score, the higher the knowledge.

b Mean change, expressed as the excess of the follow-up over the baseline value, obtained from analysis of covariance controlling for gender; age, educational level, ethnic origin and clustering by neighborhood

Table 6.3 Results of logistic GEE regression analysis regarding intervention effectiveness on intermediate outcomes of health related behavior

Intermediate outcomes of behavior	Intervention neighborhoods		Comparison neighborhoods		Intervention x Time interaction ^b
	Odds ratio (95% CI) ^a	p	Odds ratio (95% CI) ^a	p	
Awareness of vegetable consumption	1.07 (0.90-1.27)	0.44	0.85 (0.71-1.02)	0.09	0.08
Stages of change vegetables^c	0.95 (0.81-1.11)	0.50	1.18 (1.01-1.38)	0.036	0.051
Awareness of fruit consumption	0.96 (0.83-1.11)	0.58	0.86 (0.73-1.01)	0.07	0.32
Stages of change fruit^c	0.97 (0.86-1.11)	0.70	1.28 (1.11-1.47)	0.001	0.005
Awareness of physical activity level	1.19 (1.00-1.42)	0.053	0.90 (0.75-1.08)	0.25	0.031
Stages of change physical activity^c	0.99 (0.86-1.14)	0.86	0.94 (0.81-1.10)	0.46	0.68

a Logistic GEE regression analysis, controlling for gender, age, educational level and ethnic origin

b A significant Intervention x Time interaction indicated an impact of the intervention

c Multinomial logistic regression analysis. An odds ratio larger than 1 indicates that the odds of being in a lower stage of change category is larger at follow-up versus baseline

GEE = Generalized Estimated Equations

Table 6.4 Results of analysis of covariance regarding intervention effectiveness on outcomes of health related behavior

Outcomes of behavior	Intervention neighborhoods		Comparison neighborhoods		Difference	
	Mean change (95% CI) ^a	p	Mean change (95% CI) ^a	p	Mean change (95% CI)	p
Vegetable consumption (grams/day)	0 (-5-4)	0.86	-1 (-5-4)	0.79	0 (-5-6)	0.96
Fruit consumption (grams/day)	7 (-1-15)	0.08	-2 (-10-5)	0.56	10 (0-19)	0.044
Physical activity score (METs/week)	-423 (-889-44)	0.08	-440 (-884-4)	0.05	17 (-513-548)	0.95
Smokers (cigarettes/day)	-1.2 (-2.4-0.1)	0.07	-0.1 (-1.4-1.2)	0.88	-1.1 (-2.2-0.1)	0.07
Alcohol consumption (glasses/day)	0.0 (-0.1-0.0)	0.30	0.0 (-0.1-0.0)	0.41	0.0 (-0.1-0.1)	0.82

a Mean change, expressed as the excess of the follow-up over the baseline value, obtained from analysis of covariance controlling for gender, age, educational level, ethnic origin and clustering by neighborhood

METs = Metabolic energy expenditure

Table 6.5 Results of logistic GEE regression analysis regarding intervention effectiveness on outcomes of health related behavior

Outcomes of behavior ^a	Intervention neighborhoods		Comparison neighborhoods		Intervention x Time interaction ^c
	Odds ratio (95% CI) ^b	p	Odds ratio (95% CI) ^b	p	
Enough vegetables	1.21 (0.95-1.55)	0.12	0.95 (0.74-1.22)	0.69	0.17
Enough fruit	1.09 (0.93-1.27)	0.27	0.79 (0.67-0.94)	0.006	0.006
Active enough	0.97 (0.84-1.12)	0.65	1.14 (0.97-1.33)	0.11	0.13
Current smoker	0.92 (0.86-1.00)	0.039	0.93 (0.86-1.01)	0.08	0.88
Excessive alcohol consumption	0.96 (0.69-1.33)	0.80	0.90 (0.70-1.15)	0.40	0.76

a Dietary guideline for vegetable consumption = at least 200 grams of vegetables per day, dietary guideline for fruit consumption = at least 250 grams of fruits per day, physical activity recommendations = at least 30 minutes of moderate-intensity physical activity on at least 5 days of the week, excessive alcohol consumption = 6 or more glasses on 3 or more days a week or 4 or more glasses on 5 or more days a week.

b Logistic GEE regression analysis, controlling for gender, age, educational level and ethnic origin

c A significant Intervention x Time interaction indicated an impact of the intervention
GEE = Generalized Estimated Equations

6.3.3 Intervention impact on outcomes of health related behavior

Table 6.4 and 6.5 show the impact of the intervention on continuous (table 6.4) and dichotomous (table 6.5) outcomes of health related behavior. With respect to fruit consumption, a statistically significant effect was found in favor of the intervention neighborhoods. Respondents in the intervention neighborhoods increased their fruit consumption (mean change: 7; 95% CI= -1 - 15 (grams/day)) and respondents in the comparison neighborhoods slightly decreased their fruit consumption (mean change: -2; 95% CI= -10 - 5 (grams/day)). The mean change in number of cigarettes smoked per day among smokers approached statistical significance in favor of the intervention neighborhoods (p=.071). The intervention had no impact on vegetable consumption, physical activity or alcohol consumption. Similar effects were found for the dichotomous outcomes of health related behavior. There was a significant intervention effect for fruit consumption, due to the fact that the number of respondents complying with fruit consumption guidelines decreased in the comparison neighborhoods at follow-up. We also examined whether exposure to the “Wijkgezondheidswerk” program was predictive of participants’ fruit consumption at follow-up (results not shown). Although the results suggested that participants that were aware of or participated in the program “Wijkgezondheidswerk” showed higher changes on fruit consumption and the fruit and vegetable knowledge score, this dose-response relationship was not significant.

6.4 Discussion

After 2-years of implementing a wide range of health behavior activities we found weak evidence for a small impact on (intermediate) outcomes of fruit consumption and no evidence for an intervention effect on other (intermediate) outcomes of health related behavior.

Our findings regarding the overall impact of community interventions on health related behavior in deprived settings are comparable with those of previous studies.^{13,29} In general, community prevention programs are complex interventions and most of them showed only modest impact on health behaviors and health status outcomes.³⁰ The modest impact is likely to be the result of multiple factors including methodological limitations and limitations of intervention delivery. Both limitations are discussed below with regard to our study.

Possible methodological limitations of this impact evaluation are (1) the time span of intervention and evaluation, (2) certain sources of bias that can affect the longitudinal sample survey²⁶ and (3) dilution bias.³¹ First, an important consideration in interpreting the outcomes of the impact evaluation is the short time span of two years in which outcomes had to be achieved. Although the required length of an effective intervention period is still heavily debated in the literature, it is questionable whether an intervention lasting only a few years can demonstrate an impact on behavioral outcomes.³⁰ Second, several sources of bias may have affected the longitudinal sample including self-selection at recruitment, attrition, and cross-contamination. However, a major advantage of the cohort design is its greater statistical power to detect change.^{32,33} The response rate of 60% at baseline was as high as the 55% to 60% generally expected from postal questionnaires in the Netherlands.³⁴ Furthermore, still 69% completed the follow-up survey. Importantly, these dropout rates did not differ between the intervention and comparison neighborhoods. Cross-contamination is theoretically possible, but results showed that mobility among intervention and comparison neighborhoods was not high (0.5%). Third, dilution bias may have affected the impact of the intervention. Eleven percent of the respondents living in the intervention neighborhoods at baseline had moved outside the experimental area at follow-up. Consequently these respondents receive weaker intervention exposure but they still were included in the outcome analysis because of the intention-to-treat analysis. Another source of dilution bias can occur due to contamination of the comparison neighborhoods. The process evaluation clearly showed some contamination of the comparison neighborhoods, which is almost unavoidable because the comparison neighborhoods were situated in the same city. Although dilution bias is very likely to be a problem, it will always be present in a community setting.

Limitations of the intervention delivery in the present study included the main scope of interventions activities being on increasing knowledge and awareness and a limited community-wide penetration. Results from the process evaluation showed that two thirds of the intervention activities were directed mostly to give information, and increase awareness and knowledge and that only one third had the objective to change behavior.¹⁸ The intervention exposure measures showed modest levels of program awareness but rather low levels of participation. Furthermore, participants in activities were often part of particular subgroups and as a result population-wide exposure to the intervention was likely to be insufficient. Therefore it is unlikely that

the total range of intervention activities had enough strength to lead to community wide behavior change. On the other hand, we expected a program effect on (intermediate) outcomes of behavior because intervention activities were directed at the first steps towards behavioral change³⁵, like increasing awareness about the causes, consequences and cures for a particular health behavior. Two important explanations are likely to play a role in the absence of a clear intervention effect. In the past only few community interventions noted clear intervention effects on intermediate outcomes of health related behavior.^{36,37} Beforehand the intervention activities were tested to make the program and message more cultural sensitive for the target population. Intervention activities of the program “Wijkgezondheidswerk” were not tested for their effectiveness before they were implemented. Most of the activities were based on intuitively reasonable strategies and only one intervention component in the total package was evidence-based.³⁸ The use of these kind of methods satisfied the need of the neighborhood coalitions but not the researchers’ need for effective intervention components. This tension between goals and priorities between the neighborhood coalitions and the lead agency responsible for the intervention is discussed in more detail in the process evaluation. Second, within the theoretical framework of the intervention, mediating factors such as knowledge, attitudes and self-efficacy expectations, were hypothesized to influence health related behaviors. To assess how well we have done we should investigate the link between the program effects on mediating variables and fruit consumption. This was done by using the statistical procedures described by Mackinnon and Dwyer.³⁹ If the program effect on fruit consumption is mediated by knowledge, attitudes or self-efficacy expectations, the program effect should be reduced when observed change in the mediating variable is included in the model. Beforehand, attitude could not be considered as a mediating variable because the program had no impact on attitude scores. Change in knowledge explained 6% ($p=.08$) and change in self-efficacy expectations explained 3% ($p=.08$) of the program effect on fruit consumption. Although the mediating effects approached significance, the relatively low percentage of variance accounted for, suggests that additional unknown mediators contributed to the program effect on fruit consumption. An implication of this conclusion is to expand known theoretical models and try to identify new predictors of behavior, as behavior is likely to have many determinants.

The project “Wijkgezondheidswerk demonstrates the feasibility of using a “community approach” in deprived neighborhoods to implement a health behavior prevention program. However, after two years the program achieved limited improvements in (intermediate) outcomes of health related behavior at the community level. For evaluation research there are at least three important lessons to be learned. Already acknowledged as important for the rigorous evaluation of complex interventions is the application of multiple evaluation methods including process evaluations. This is the only way to move beyond the “black box” of intervention effectiveness. Second, community involvement and community capacity are “shorter”-term community level impacts in a community intervention. A

community intervention trial should not be conducted until successful community collaboration is achieved and the community is ready to address health promotion issues. And last, a large time frame is needed to achieve sustainable community wide health impact to establish community participation and intersectoral collaboration first and to demonstrate an impact on behavior and health outcomes in a later stage.

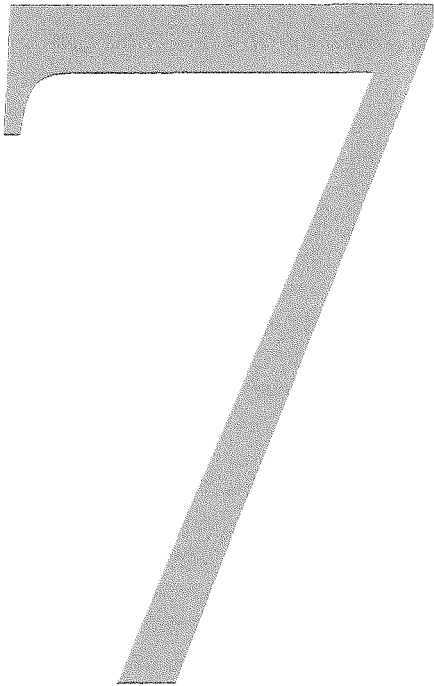
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Discussion



Discussion

In this thesis a series of studies are presented that focus on the improvement of health related behavior in deprived neighborhoods. The objective of this thesis was threefold: (1) to identify determinants of health related behaviors in deprived neighborhoods, (2) to review studies that assessed the effectiveness of community interventions to influence health related behavior in deprived areas, and (3) to evaluate the effectiveness of the community intervention program “Wijkgezondheidswerk”, a program to improve health related behavior carried out in deprived neighborhoods in Eindhoven in 2000–2002. In this final chapter the main findings of the various studies will be summarized, methodological issues concerning the evaluation of a community intervention will be addressed, and several possible explanations and implications for the findings will be discussed.

7.1 Main findings

7.1.1 Determinants of health related behavior in deprived neighborhoods

In order to understand the high prevalence of health damaging behavior in deprived neighborhoods we used the stages of change construct of the Transtheoretical Model.¹ In particular, we examined the association between the intention to change behavior and psychosocial and external variables for fruit consumption, vegetable consumption and moderate-intensity physical activity. For all three behaviors differences in mean scores on the psychosocial variables, such as attitudes and self-efficacy expectations, were observed across the stages of change categories, with lowest scores in the precontemplation stage (no intention to change behavior). Several external factors were associated with stages of change, although the pattern of significant associations differed across the three health behaviors. The associations were similar across the three health behaviors for those individuals with a low health locus of control, those presenting other risk behaviors, and those without knowledge of the behavior in question, who were more likely to be in a lower stage of change category.

7.1.2 Review of effectiveness of community interventions in deprived neighborhoods

In order to explore whether community interventions are likely to improve health related behavior in deprived neighborhoods we reviewed the effectiveness of community cardiovascular disease prevention programs in deprived areas. The conclusion was drawn that due to a small number of qualifying studies ($n=4$) and inconsistencies in the reported effects (3 studies reported some small intervention effects, one did not show any intervention effects), there was insufficient evidence to assess effectiveness. On the other hand, the review gave more insight in research gaps in implementation and evaluation of these complex interventions. Especially, the use of a process evaluation next to an impact evaluation was thought to be essential for future interventions as it may give more information about the “black box” of intervention effectiveness.

7.1.3 Effectiveness of the program “Wijkgezondheidswerk”

The aim of the community intervention “Wijkgezondheidswerk” was to improve health related behavior in two deprived neighborhoods in Eindhoven. Main intervention goals were to achieve an increase in fruit and vegetable consumption, an increase in moderate-intensity physical activity and a lower prevalence of smoking and excessive alcohol consumption among residents in the intervention neighborhoods. During the 2-year implementation phase more than 50 activities were organized in the intervention neighborhoods.

The results from the process evaluation showed what was planned and what was achieved. In broad outlines the intervention was delivered as planned. Most implemented activities were directed to give information, and to increase awareness and knowledge of healthy behaviors. Only a few activities had the objective to change health related behavior and only one used an evidence-based method. The majority of the intervention activities were either single face-to-face sessions or one-day special events and most of the activities were offered only once during the implementation period. Awareness of the program “Wijkgezondheidswerk” in the intervention neighborhoods was 24%. The actual participation of the general population in program activities was just below 3%. The process study also revealed that there was some contamination of the comparison neighborhoods.

The results of the impact evaluation showed the effect of the intervention on changes in (intermediate) outcomes of health related behavior in the intervention neighborhoods. The intervention showed no impact on outcomes of vegetable consumption, physical activity, smoking and alcohol consumption, or on intermediate outcomes of vegetable consumption or physical activity. There was evidence of a small impact on fruit consumption and intermediate outcomes of fruit consumption including knowledge related to fruit and vegetable consumption, stages of change for fruit consumption, and self-efficacy expectations for fruit consumption.

7.2 Methodological issues

The long-term aim of the program “Wijkgezondheidswerk” was to reduce socioeconomic inequalities in health in Eindhoven. A proper evaluation of an intervention to reduce inequalities in health should (1) assess the extent to which the intervention reduced differences in health outcomes between socioeconomic groups and (2) use an experimental study design with either individuals or groups as units of allocation. The measurement of socioeconomic status and the effect variables should use (3) validated methods where possible and in addition to the effect measures, (4) process and cost data should be collected.² All four requirements are discussed below.

7.2.1 Lower versus higher socioeconomic groups

The long-term aim of the intervention was to reduce socioeconomic differences in health. However, the assessment focused on the intended effect of the short-term aim of the intervention, which was to improve health related behavior in two deprived neighborhoods. Therefore, the outcome assessment was restricted to a comparison of

health related behavior outcomes among residents in deprived neighborhoods and left out the assessment of outcomes in non-deprived neighborhoods. Interestingly, to tackle socioeconomic differences in health it would be necessary to conduct these kinds of interventions, exclusively in deprived neighborhoods and not in non-deprived neighborhoods. In addition we have to keep in mind that even in deprived neighborhoods there will be residents with a higher socioeconomic status who may benefit, and perhaps even more than residents with a lower socioeconomic status, from the intervention.² If this were the case, educational level would be an effect modifier in the analysis. In our data, however there was no evidence of effect modification by educational level for the intervention effect on fruit consumption ($p=.91$). Effect modification was defined as a significant interaction effect ($p < .10$) between educational level and the intervention condition. Further exploration showed that although the mean change in higher socioeconomic groups was larger, both higher and lower educated respondents in the intervention neighborhoods benefited from the presence of the intervention (mean changes in fruit consumption ranked from lowest to highest educational level in the intervention condition: -1.2, 2.7, 11.4, 16.9 and the control condition: -10.9, -7.3, 6.3, 3.1).

7.2.2 Experimental study design

To evaluate the program “Wijkgezondheidswerk” we conducted a community intervention trial with a quasi-experimental design, in the sense that although the choice of the control neighborhoods was made by the investigators using a matching procedure, the assignment of the experimental neighborhoods was done beforehand by the municipal health service and therefore beyond the control of the investigators. To measure changes over time, surveys using a cohort design as well as a repeated cross sectional design were conducted in the intervention and matched comparison neighborhoods.

Randomization. Randomized controlled trials are widely accepted as the most reliable method of determining effectiveness.² As community interventions are experimental studies with groups being the units of allocation, the community intervention trial is the strongest design of choice to determine effectiveness on health outcomes. However it was not possible to randomize experimental and control conditions because intervention allocation was done beforehand by the municipal health service. Two deprived neighborhoods that were willing to take action on health and where development of a community coalition could be ensured were assigned to the intervention condition. Therefore we employed a quasi-experimental design with matched comparison neighborhoods. An advantage of assigning the intervention condition to a neighborhood willing to take action is a higher chance of successful intervention development. Community members and organizations will be more motivated to play a role in the program and this is more likely to lead to a broad-based support for program activities and building capacity for action throughout program implementation. A disadvantage of assigning the intervention condition in this way is that we will not know what efforts are necessary to implement such a program in neighborhoods that are not willing to take action on

health. This could be important if the community board decides to implement the program in all deprived neighborhoods in the city. Assigning the intervention directly to neighborhoods known to be able to implement it, instead of using randomization is most likely to affect the time span needed to ensure program development and implementation, and because of that it will shorten the time needed to achieve changes in behavioral outcomes.

Time span of intervention and evaluation. An important consideration in interpreting the outcomes of the impact evaluation is the short time span of two years in which outcomes had to be achieved. Although the required length of an effective intervention period is still heavily debated in the literature, it is questionable whether an intervention lasting only a few years can demonstrate an impact on behavioral outcomes.³ We suspected that, while the 2-year intervention period of the program “Wijkgezondheidswerk” might be sufficient to change intermediate outcomes of behavior such as knowledge, attitudes and beliefs, it may be too short to achieve change in behavioral outcomes. In the evaluation study we anticipated the short time span of intervention implementation by measuring outcomes of behavior as well as intermediate outcomes of behavioral change.

Survey design. Another issue to discuss is the optimal survey design for a community intervention trial. A community intervention evaluation that measures changes over time may use repeated cross-sectional surveys, follow a cohort of residents over time, or employ both designs. We used both approaches to measure change in outcome measures because they both have unique strengths and drawbacks.^{4,6} A major advantage of a cohort design is its better statistical power and precision to detect changes than in a cross-sectional design.^{4,6} Although cohort estimates may be more biased than cross-sectional estimates because of repeated questioning and attrition,⁵ the estimates of cohort designs are more accurate.

Tables 7.1 and 7.2 show the results of the repeated cross sectional surveys. Outcomes were analyzed with a mixed-model regression program, that adjusted for the effects of the clustering of measurements within neighborhoods. The multivariate model included fixed effect terms for experimental condition, gender, age, educational level and ethnicity as well as a random effect term for neighborhood. The primary test of intervention effects is the condition x time interaction. The first independent sample survey also served as the baseline measurement for the longitudinal cohort sample survey. For the second independent sample survey in the year 2002 we only have data of a very small sample (n=274). Response rates were higher in September 2000 than in September 2002. In comparison with respondents in both the 2000 and 2002 samples, nonresponders were more likely to be younger and male. Also, in 2000 nonresponders were more likely to be unmarried. The distribution of respondents within neighborhoods by selected sociodemographic characteristics was rather similar in the 2 surveys. Table 7.2 compares outcomes of health related behavior in intervention and comparison neighborhoods over time. The interaction term condition x time was significant for 2 outcomes. Over time, self-efficacy for vegetable consumption increased in the intervention neighborhoods and decreased in the

Table 7.1 Characteristics of respondents: independent cross-sectional surveys in 2000 and 2002

Characteristics	Intervention neighborhoods		Comparison neighborhoods	
	2000	2002	2000	2002
Respondents, n	1426	115	1355	159
Response %	61	55	59	54
Mean age (years)	41 (14)	42 (15)	38 (13)	42 (15)
Women %	52	57	50	46
Educational level %				
I (low)	27	27	22	25
II	40	39	31	28
III	20	21	24	23
IV (high)	13	14	23	23
Ethnic origin %				
Dutch	67	61	66	64
Other Western countries	4	7	4	6
Turkish/Moroccan	12	14	14	14
Surinamese/Antillean/Aruban	9	12	7	11
Other non-Western countries	8	6	9	6
Awareness of ≥ I large scale intervention activities %	-	71	-	8
Participation in ≥ I large scale intervention activities %	-	12	-	1
Awareness of program "Wijkgezondheidswerk" %	-	14	-	10
Participation in program "Wijkgezondheidswerk" %	-	1	-	0

comparison neighborhoods ($p=.027$). A more striking finding was that fruit consumption decreased in the intervention neighborhoods ($p=.14$) and increased significantly in the comparison neighborhoods ($p=.047$). Despite extensive effort to explain the increase of fruit consumption in the comparison neighborhoods, no explanation has been found. The weak evidence of a program effect on fruit consumption and several intermediate outcomes found in the cohort data would have been strengthened if the cross-sectional data also showed changes in the same direction. However, there is no support for a program effect on follow-up (intermediate) outcomes of fruit consumption in the cross-sectional data.

Only if cross-sectional samples are large, a cross-sectional design will be more efficient.⁴ Our cross-sectional wave in 2002 included only 274 respondents, which makes it unsuitable for determining effectiveness, considering the fact that the estimates of such a small sample will be quite variable and on average further from the true change than the estimates of change based on the cohort sample. On the other hand, we should explore if the cohort sample survey is not too favorably biased due to attrition. This will occur if losses to follow-up make the cohort sample unrepresentative. The data of the longitudinal survey showed that still 69% completed the follow-up survey. We checked for a possible attrition effect by comparing several sociodemographic factors and health behavior variables at baseline among the group

Table 7.2 (Intermediate) Outcomes of health related behavior: independent cross-sectional surveys in 2000 and 2002

Outcomes ^a	Neighborhood	Data of survey		Odds Ratio ^b (95% CI)	Difference ^c (95% CI)	Intervention x Time interaction ^d
		2000	2002			
Vegetable consumption (grams/day)	intervention	99 (52)	99 (53)	-	-1 (-11-9)	0.78
	comparison	98 (53)	101 (48)	-	1 (-8-10)	
Vegetables enough %^a	intervention	7	11	0.7 (0.3-1.2)	-	0.15
	comparison	9	7	1.3 (0.7-2.6)	-	
Vegetables aware %	intervention	23	25	0.9 (0.6-1.4)	-	0.36
	comparison	26	22	1.2 (0.8-1.8)	-	
Vegetables precontemplators %	intervention	70	69	0.9 (0.6-1.5)	-	0.93
	comparison	66	63	0.9 (0.6-1.3)	-	
Vegetables attitude score^f	intervention	0.4 (1.0)	0.4 (1.0)	-	0.0 (-0.2-0.2)	0.92
	comparison	0.5 (1.0)	0.5 (1.0)	-	0.0 (-0.2-0.2)	
Vegetables self-efficacy score^f	intervention	0.9 (1.0)	1.1 (1.0)	-	0.2 (0.0-0.3)	0.027
	comparison	1.1 (1.0)	0.9 (1.0)	-	-0.1 (-0.3-0.0)	
Vegetables & fruits knowledge score^g	intervention	3.9 (1.6)	4.0 (1.5)	-	0.1 (-0.2-0.4)	0.96
	comparison	4.0 (1.6)	4.0 (1.9)	-	0.1 (-0.2-0.4)	
Fruit consumption (grams/day)	intervention	123 (106)	113 (92)	-	-15 (-35-5)	0.015
	comparison	124 (105)	148 (105)	-	19 (0-37)	
Fruits enough %^a	intervention	21	22	1.1 (0.7-1.8)	-	0.35
	comparison	22	28	0.8 (0.5-1.2)	-	
Fruits aware %	intervention	60	58	1.1 (0.7-1.6)	-	0.93
	comparison	63	60	1.1 (0.7-1.6)	-	
Fruits precontemplators %	intervention	53	58	1.3 (0.9-1.9)	-	0.14
	comparison	49	47	0.9 (0.6-1.2)	-	
Fruits attitude score^f	intervention	0.5 (1.1)	0.5 (1.0)	-	0.0 (-0.2-0.2)	0.84
	comparison	0.6 (1.0)	0.5 (1.0)	-	-0.1 (-0.2-0.1)	
Fruits self-efficacy score^f	intervention	1.0 (1.1)	1.0 (1.1)	-	0.0 (-0.2-0.2)	0.90
	comparison	1.0 (1.0)	1.0 (0.9)	-	0.0 (-0.2-0.2)	
Physical activity (METs/week)	intervention	7,176 (5,480)	6,933 (5,058)	-	-6 (-1,009-997)	0.86
	comparison	6,924 (4,991)	6,776 (4,930)	-	113 (-803-1,028)	
Active enough %^a	intervention	58	59	0.9 (0.6-1.3)	-	0.64
	comparison	52	51	1.0 (0.7-1.4)	-	
Physical activity aware %	intervention	61	68	0.7 (0.5-1.1)	-	0.36
	comparison	65	67	0.9 (0.6-1.4)	-	
Physical activity precontemplators %	intervention	24	26	0.9 (0.6-1.3)	-	0.55
	comparison	26	29	1.1 (0.8-1.5)	-	

Table 7.2 – continued

Outcomes ^a	Neighborhood	Data of survey		Odds Ratio ^b (95% CI)	Difference ^c (95% CI)	Intervention x Time interaction ^d
		2000	2002			
Physical activity attitude score^e	intervention	0.7 (1.1)	0.8 (1.0)	-	0.1 (-0.1-0.3)	0.12
	comparison	0.8 (1.1)	0.7 (1.1)	-	-0.1 (-0.3-0.1)	
Physical activity self-efficacy score^e	intervention	0.7 (1.1)	0.7 (1.1)	-	0.0 (-0.2-0.2)	0.91
	comparison	0.8 (1.0)	0.7 (1.1)	-	0.0 (-0.2-0.2)	
Physical activity knowledge score^h	intervention	2.9 (1.3)	2.7 (1.4)	-	-0.2 (-0.5-0.0)	0.22
	comparison	2.9 (1.4)	2.9 (1.5)	-	0.0 (-0.2-0.2)	
Current smoker, %	intervention	45	34	1.5 (0.9-2.2)	-	0.80
	comparison	44	35	1.3 (0.9-2.0)	-	
Smoking (cigarettes/day)	intervention	6.8 (9.8)	5.2 (9.2)	-	-1.1 (-3.0-0.8)	0.50
	comparison	6.5 (9.8)	4.4 (8.8)	-	-2.0 (-3.7--0.3)	
Excessive alcohol consumption %^e	intervention	5	5	0.9 (0.3-2.3)	-	0.95
	comparison	8	8	0.9 (0.5-1.8)	-	
Alcohol (glasses/day)	intervention	0.8 (1.1)	0.6 (1.1)	-	-0.1 (-0.3-0.1)	0.90
	comparison	0.9 (1.2)	0.9 (1.2)	-	-0.1 (-0.3-0.1)	

a Values for each characteristic are unadjusted percentages or unadjusted means (SD)

b Odds Ratios and 95% confidence interval (CI) modeled as function for year (2002 relative to 2000), controlling for gender, age, educational level and ethnic origin. An odds ratio greater than 1 indicates a greater chance of a higher prevalence of enough e.g. vegetables consumption in 2002 compared to 2000, or a higher prevalence of awareness of a health related behavior. An odds ratio greater than 1 for the stages of change outcomes indicates a greater change of higher prevalences in the lower stage of change categories in 2002 compared to 2000.

c Difference of adjusted least squares means and 95% confidence interval (CI) for year (excess of neighborhood adjusted mean in 2002 over neighborhood adjusted mean in 2000), controlling for gender, age, educational level and ethnic origin

d A significant intervention x time interaction indicated an impact of the intervention on neighborhood prevalences/means of the characteristic.

e Dietary guideline for vegetable consumption: at least 200 grams of vegetables per day, dietary guideline for fruit consumption: at least 250 grams of fruits per day, physical activity recommendations: at least 30 minutes of moderate-intensity physical activity on at least 5 days of the week, excessive alcohol consumption 6 or more glasses on 3 or more days a week or 4 or more glasses on 5 or more days a week.

f Score ranged from -2 to 2; the higher the score, the more positive the attitude or the higher the self-efficacy expectations

g Score ranged from 0 to 7; the higher the score, the higher the knowledge

h Score ranged from 0 to 6; the higher the score, the higher the knowledge

MET = metabolic energy expenditure (calculated as the total minutes of physical activity per week multiplied by intensity)

that participated in both cohort surveys and the group that only participated at baseline. Noncohort respondents were significantly more likely to be younger, male and a smoker than cohort respondents. Dropout rates did not differ between the intervention and comparison neighborhoods and there was no selective dropout for the other behavioral outcomes. In conclusion, due to losses to follow-up the cohort sample may represent a somewhat favorable sample of the population.

Sources of bias. A last design issue concerns the internal and external validity of the cohort data. Dilution biases may affect the internal validity of the data.⁷ The fact that people move from the intervention neighborhood to the control area and vice versa will create a dilution bias, causing the effects to be underestimated in the intervention area and overestimated in the control area. However, mobility among intervention and comparison neighborhoods was not high, 0.5% of the respondents in the cohort sample moved from the intervention neighborhood to a comparison neighborhood and 0.4% moved vice versa. Another problem was that 11% of the respondents living in the intervention neighborhoods at baseline had moved outside the experimental area at follow-up. Consequently these respondents received weaker intervention exposure. Still, these respondents were completely included in the outcome analysis because of the intention-to-treat analysis. Dilution bias can also occur due to contamination of the comparison neighborhoods. Especially, if intervention and comparison neighborhoods are in one city as in our case, some diffusion of the program to comparison neighborhoods is inevitable. The awareness and participation figures indeed show some contamination of the comparison neighborhoods. Although dilution bias is very likely to be a problem, it will always be present in a community setting. Non-response bias may affect the external validity of the data. Self-selection at recruitment may occur because of non-response bias. This occurs if the nonresponse is selective by the measured outcomes of health related behavior. Response rates at baseline were as high as the 55% to 60% generally expected from postal questionnaires in the Netherlands.^{8,9} However, response rates were higher among women, those who are married and older individuals. We cannot be sure how this affected the analysis, but it may have resulted in limited external validity of the data, because the representativeness of the sample could not be assured.

7.2.3 Outcome measures

Another important issue is the use of reliable outcome measures. The results of the impact evaluation are based on self-reported information on outcomes of health related behavior. There is a widespread belief that people are inclined to over-report desirable health behaviors and underreport undesirable health behaviors. A good assessment of dietary behavior is quit difficult because eating is a frequent behavior that a person does with relatively little attention.⁵ The validated food frequency questionnaire (FFQ)¹⁰ from which we derived our 4-item FFG was likely to overestimate consumption compared with 7-day dietary records. The validated SQUASH¹¹ questionnaire, which we used to measure moderate-intensity physical activity, is thought to be a fairly reliable instrument to measure physical activity at a population level. Furthermore, self-reports of smoking behavior by self-administered

questionnaires have proven to be an accurate source of information on smoking behavior.⁵ Self-reports of “moderate” alcohol consumption are likely to be valid, although questions can be raised about the validity of self-reported “heavy” drinking:¹² women are likely to underreport “heavy” drinking and men are likely to over report “heavy” drinking. The overestimation of fruit and vegetable consumption and less accurate reports of “heavy” drinking could lead to less reliable mean consumption levels for the overall population; however, this will not lead automatically to differences between intervention and control neighborhoods. What can lead to differences between intervention and control neighborhoods is the educational component of the intervention. Residents in the intervention neighborhoods may become sensitized to socially desirable reports of their behavior, as more attention is paid to health behaviors in their environment.⁵ This kind of intervention effects could influence measurements in the absence of actual behavior change, and therefore confound the interpretation between intervention and control communities. If this had occurred in our intervention neighborhoods, we would expect increases in all health related behaviors and this is certainly not the case. Reporting bias in intermediate outcomes of health related behavior might have occurred by the use of single-item assessments for attitude and self-efficacy. Single-item assessments may not be sensitive enough to detect small intervention effects. However, the baseline analyses of determinants of stages of change show that attitudes and self-efficacy were associated with intention to change behavior, which is an indication of the predictive validity of the assessments of these variables.

7.2.4 Process data

The use of process data has become increasingly important to move beyond the “black box” of intervention effectiveness. Furthermore, this kind of data is critical to avoiding a Type III error. Type III errors occur when we draw incorrect conclusions about the effectiveness of a given intervention while a program was not adequately implemented. But, where we have consensus about optimal designs in the evaluation of effectiveness on the individual or population level, there is no such consensus for the evaluation of processes.^{13,14} At this moment, there is some general consent about the key components of process evaluations, which we used to structure our process evaluation.¹⁴ However, as there is still a substantial need for methodological research we were not able to choose from a series of validated methods to collect process data on these key components. Despite the recognized importance of the use of process evaluations to evaluate community interventions, not all community interventions conducted such an evaluation or reported the available data. This makes comparisons between earlier research and our outcomes difficult. Not only regarding outcomes of the process evaluation but also regarding the interpretation of the outcomes of the impact evaluation of these studies.

7.2.5 Conclusion

The proposed experimental study design to evaluate the effectiveness of interventions to reduce socioeconomic inequalities in health, implied a community intervention

trial with measurement, in one or more experimental populations and one or more control populations, of changes over time in the magnitude of socioeconomic inequalities in health. Although we were not able to apply this study design completely, we consider the evaluation design rigorous enough to evaluate the outcomes of the program “Wijkgezondheidswerk” in a proper way.

We conclude that the weak evidence for a small intervention effect on (intermediate) outcomes of fruit consumption and the absence of evidence for an intervention effect on other outcomes of health related behavior is most likely not attributable to the evaluation design.

7.3 Community interventions in deprived neighborhoods

As most community interventions,³ the “Wijkgezondheidswerk” intervention used an ecological framework,¹⁵ targeting activities at the intrapersonal, interpersonal, environmental and community level to improve outcomes of health related behavior. A critical assumption of ecological models is that single-level interventions are unlikely to have powerful or sustained effects. However, the evidence in support of this assumption is scarce and although most community interventions reflect the principles of an ecological approach only a few interventions were able to provide substantial intervention effort across all levels.³ In the next paragraphs, the main findings of this thesis are discussed in the light of these different levels of the ecological framework. We will also compare our results with the findings of other community interventions in the Netherlands.

7.3.1 Intrapersonal level

The individual baseline data showed that the prevalence of risk behaviors and the distribution across the stages of change supported the need to improve health related behavior in these deprived neighborhoods. A considerable part of the population were in one of the preaction stages for moderate-intensity physical activity, fruit consumption or vegetable consumption or unaware that they did not behave according to national expert recommendations. As a result, intervention activities should be directed at the first steps towards behavioral change, like increasing awareness about the causes, consequences and cures for a particular problem behavior.¹ About two thirds of the intervention activities of the program “Wijkgezondheidswerk” were directed at increasing knowledge and awareness, while only one third was directed at behavioral change. Thus, we may expect program effects on knowledge, attitudes and beliefs. However, the program “Wijkgezondheidswerk” only demonstrated weak evidence for a small intervention effect on fruit consumption and on intermediate outcomes of fruit consumption. Two important explanations are likely to play a role in the absence of a clear intervention effect. First, the strength of the total package of interventions activities was likely to be insufficient to achieve an improvement of (intermediate) outcomes of health related behavior. In the past only few community interventions noted clear intervention effects on psychosocial variables.³ Two community interventions that did found promising results mention the use of focus group discussions and pilot testing of intervention activities before intervention

implementation to make the program and message more cultural sensitive for their target population.^{16,17} Intervention activities of the program “Wijkgezondheidswerk” were not tested for their effectiveness before they were implemented in the community. Most of the activities were based on intuitively reasonable methods and only one intervention component in the total package was evidence-based. Furthermore, the baseline data showed that in deprived neighborhoods, specific groups need more attention to proceed in the behavioral change process. E.g. men should have been a target group of choice because they are more likely to be in the lower stages of fruit and vegetable consumption. However, the implementation of dietary intervention activities was mostly directed at women and children in a school setting. This example shows that the program “Wijkgezondheidswerk” was likely to lack sufficient tailoring of intervention activities to reach different segments of the community. Intervention activities were often good ideas, but they were not always targeted at the most in need.

A second explanation concerns the fact that there was a small program effect on fruit consumption, while we do not see substantial changes in the predicated mediating variables and this change is not related to the change in fruit consumption. A review by Baranowski et al.¹⁸ suggests two major reasons why interventions are not attaining desired levels of change in behavioral outcomes. First, the predictiveness of current theories is modest. Second, interventions are not substantially effecting change in the mediating variables. An implication of the first reason is to expand known theoretical models and try to identify new predictors of behavior, as behavior is likely to have many determinants. An implication of the second reason is to further develop our methods for affecting theoretical mediating variables for example as suggested in the above mentioned first explanation.

7.3.2 Interpersonal level

Social networks and social support are likely to have a positive influence on health.¹⁹ For example, social networks and social support can enhance an individual’s ability to access new contacts and information and to identify and solve problems. Furthermore, research indicates that supportive social relationships may be especially helpful to those in lower socioeconomic groups.^{20,21} Several face-to-face activities of the program “Wijkgezondheidswerk” (e.g. “Quit smoking” and “Feeling good” courses) explicitly focused on providing social support as a starting point to produce desired health outcomes. The potential effects of social networks were enhanced through the development of a neighborhood coalition. By involving community members in this coalition, these members became a link between the intervention program and their own social networks (e.g. when the coalition organized a community event and volunteers were needed or to achieve high participation rates for the neighborhood walking tours). However, our evaluation design was limited in detecting possible changes at the interpersonal level, and we therefore can only speculate about whether these changes were obtained. We think that some of these activities may have affected such changes, but it is difficult to estimate effect sizes.

7.3.3 Environmental level

Multilevel studies that have been published have shown that poor health status and harmful health behavior including higher all-cause mortality risk, higher risk of cigarette smoking, higher body mass index, lower quality diet, and poor self-rated health occur more frequently in deprived neighborhoods.²² These studies provide increasing evidence that people's area of residence may influence health in addition to or in interaction with their individual characteristics. Furthermore, several authors suggest that interventions focused on changes in personal characteristics alone are just not sufficient for behavioral change.²³ A promising approach would seem to combine changes in the environment with changes in individual characteristics. This is why community health promotion programs should not only be directed at improving individual behavior but also at improving the neighborhood environment. However, during the 2-year implementation period of the program "Wijkgezondheidswerk" most activities were focused on individuals and just one activity focused on the neighborhood environment. In one of the intervention neighborhoods the local greengrocer's shop advertized in the program's newsletter with special offers. Although we do not know which intervention components contributed to the small effect on fruit consumption this same intervention neighborhood also showed the highest increase in fruit consumption. Possibly, the attention for individual characteristics combined with changes in the environment attained synergy in promoting behavioral change. Overall, the program was limited in its ability to achieve population wide results through activities at the environmental level.

7.3.4 Community/Neighborhood level

At the neighborhood level, community organization strategies play an important role in the rationale of a community intervention. This emphasizes elements of empowerment, participation, intersectoral collaboration, capacity building and sustainable development. In the program "Wijkgezondheidswerk" a neighborhood coalition was formed in each intervention neighborhood. The Municipal Health Services, as lead agency, was able to bring together relevant professional organizations and the local grassroots organization. The coalition's goals involved assessing the situation, deciding what action to take, and implementing the program. Under the leadership of the Municipal Task Force of Social Development and the Municipal Health Service the coalitions were able to sustain involvement of all its members and took action steps to achieve the goals of the coalition. An important advantage of forming a coalition is that working together creates a synergy that enables individuals and organizations to accomplish more than they could achieve independently, especially if they can share resources. Although coalition members shared knowledge, skills, expertise, perspectives and connections, they were not able to bring financial resources and manpower to the table (except for some contributions from the local grassroots organizations). Resources from outside the coalition paid most of the costs that were associated with the implemented intervention activities and the Municipal Health Service delivered most of the manpower to organize the activities. In this context, sustainability of such a community coalition will depend on new funding

and sustained involvement of the collaborating organizations and in particular the Municipal Health Service for their manpower.

By involving community members in the neighborhood coalitions the lead agency ensured that the intervention activities met the needs of the community and were culturally sensitive. The participatory action research assessed community participation and concluded that the level of community participation depended on: the role residents had in the project, good intersectoral collaboration, the phase of intervention delivery (planning, development or implementation of intervention activities), and the kind of intervention activity.²⁴ Residents that were a member of the neighborhood coalition had a different role compared to residents that volunteered in organizing an activity or that were a participant. Some tasks in the delivery of the intervention were just better suited to professionals and full control of community members on these tasks was not desirable. At the beginning of the project community participation was limited to participation of a single member of the local grassroots organization, but as the project progressed, the level of community participation also grew. At the end of the second year, the coalition had implemented several intervention activities that were proposed and organized by residents themselves.

The program “Wijkgezondheidswerk” was a top-down program that integrated community empowerment goals to implement a health promotion program. Top-down because a priori the Municipal Health Service, researchers and the funding agency determined the shape and direction of the program. Empowerment goals were included because this was one of the key principles of the community approach. In practice, this meant that the development and implementation was negotiated with the community. A major tension shaping the dynamics of the program “Wijkgezondheidswerk” in an early stage of intervention development was the difference in goals and priorities found between the neighborhood coalitions and the agency responsible for the intervention, the municipal health service of Eindhoven. The latter was bound to the terms of its contract with the agency funding the evaluation study, and therefore had to impose some of its goals and priorities on the neighborhood coalitions. Although this tension was overcome by giving the power and control of the program explicitly to the neighborhood coalitions, the differences in priorities between researchers and coalition remained. These differences have two important implications. Single intervention components using intuitively reasonable methods to promote behavioral change satisfied the need of the community coalitions for a certain type of activity. Such an emphasis may be viewed as being in opposition to evidence-based decision making accountability, in that researchers are more concerned with measuring outcomes.²⁵ Although we should mention, that the availability of effective interventions that can be used as single intervention components in a community intervention is limited, there would certainly have been more scope for inclusion of evidence-based components. Furthermore, to measure program effectiveness on health related outcomes preferably all activities should be focused at the chosen health behaviors and target population of the impact evaluation. In practice, it appeared to be impossible to expect that the community coalitions would implement intervention activities under such strict conditions.

7.3.5 Other Dutch community interventions in deprived settings

In the past few years, there were a few similar projects that evaluated a community intervention in a deprived setting. Three interventions were, like our intervention, aimed at reducing socioeconomic inequalities in health in the long-term and set out in deprived areas. The first project “Wijkgericht werken aan gezondheidsbevordering” started in several deprived city districts in Rotterdam.²⁶ The goal of the intervention was to target behavioral change. The project had to be stopped prematurely because the expected political support on these health related topics in the city districts did not exist. Compared to the program “Wijkgezondheidswerk”, this project showed that the situation in the preparatory phase can also be too difficult to start the implementation of intervention activities. The second project “Het Arnhemse Broek, Gezond en Wel” was conducted in a deprived district in the city of Arnhem.²⁷ Community residents defined stress, lack of area safety and parenting problems as the health-related problems they wanted to see addressed in the project. In the 2-year action period 54 activities were implemented. No significant effects on improved perceived health or targeted health-related problems (stress, safety, parenting) were found at the level of the residents. The results of this project are to a large extent comparable to the results of the program “Wijkgezondheidswerk”. The third project “Wijkgericht Gezondheidswerk” was set out in several deprived neighborhoods in the city of ‘s-Hertogenbosch.²⁸ The main goal of the project was to empower community residents. One of the subgoals was to improve determinants of health related behavior. In a 3-year action period 55 activities were implemented. Residents reported an improvement of knowledge on several life-style topics. However, the intervention was evaluated using a non-comparative study design, which makes it difficult to compare these outcomes with our results.

A last project, “Hartslag Limburg” was aimed at reducing cardiovascular disease risk and was set out at the regional level.^{29,30} In this project a high-risk strategy and a population strategy (the community project) were combined to target behavioral change. Intervention activities of the community project were implemented by nine local health committees of which four were active in deprived neighborhoods in the city of Maastricht. During the 5-year action period more than 800 intervention activities were implemented.²⁹ After this period the project showed some promising results at the regional level. For example, in the intervention region body-mass index and blood pressure remained the same, whereas these measures increased in the control region.³¹ Furthermore, the intervention had a significant effect on fat reduction.³⁰ Although, there are some clear differences between the project “Hartslag Limburg” and the project “Wijkgezondheidswerk” in terms of timespan, number of intervention activities, the use of both a population and a high-risk strategy and the fact that not only a low socioeconomic population was targeted, the findings of the project “Hartslag Limburg” should be beneficial for the future of other health promotion community interventions.

7.3.6 Conclusion

It is concluded that after an implementation period of two years, the results of the program Wijkgezondheidswerk are still limited. Furthermore, we have to conclude that in absence of a clear intervention effect, this intervention will probably have a minimal contribution in the reduction of socioeconomic inequalities in health related behavior. The results of our study also show that they are more or less in line with the results of other Dutch community interventions in deprived settings.

There seem to be many entry points for the improvement of community wide health promotion programs in order to achieve more convincing results. Intervention activities directed at behavioral change at the intrapersonal level could be improved by better tailoring to the target population. Especially, in lower socioeconomic groups there should be a greater focus on the social environment. Innovative approaches are needed to produce change through social networks and improve social support. Changes at the environmental level are difficult to achieve in a short time frame, but they are also more difficult to achieve for health practitioners. Mobilizing professional organizations from other sectors is required to accomplish change in the physical environment. With respect to the community level, improving community organization around health promotion issues is a gradual process that needs time. Measuring community wide health impact seems to be unrealistic if methods for realizing community participation and collaboration are still in a developmental stage.

7.4 Implications

7.4.1 Improving health related behavior in deprived neighborhoods

The evidence on effective interventions and policies to reduce socioeconomic inequalities in health is still very fragmentary.³² However, community interventions are certainly not the only possible approach. Reducing smoking in lower socioeconomic groups is an important entry point for reducing socioeconomic inequalities in health. Interventions that are probably effective in lower socioeconomic groups include free/cheap prescriptions for nicotine replacement therapy, increasing prices by raising tobacco taxes, and smoking restrictions in the workplace. Effective measures in the field of nutrition are food and nutrition programs that enable people to purchase more healthy foods. These effective interventions are quite different from a community health behavior intervention. A community intervention offers a package of intervention activities in which residents voluntarily participate. Exposure to the intervention should increase the likelihood of improved health risk behaviors among large population groups. However, these kind of interventions lack the financial incentive or forced compliance with a smoking law to achieve their success. On the other hand, next to those strategies that improve healthy lifestyles, we are able to set out other strategies such as: addressing the social and economic determinants of health, focusing on empowering communities and individuals, and aiming at improving health and social care services within a community intervention. Projects in Health Action Zones (HAZs) in the UK used these kind of strategies to improve health

outcomes and to reduce health inequalities. Evaluation of the HAZs showed that given the short timeframe of the HAZ initiative and the limited resources at their disposal, their direct impact on health inequalities was minimal. But they did build public health capacity across a wide range of stakeholders to tackle health inequalities at the local level, and it is likely that with continued efforts progress can be made towards tackling health inequalities at the local level.³³

7.4.2 Suggestions for further research

Community interventions are complex interventions and pose a number of challenges for evaluation. However, these challenges should be no reason to ignore investments in conducting and evaluating these complex health promotion initiatives. More important is that future investment should be made and judged within the reality of community intervention practice.

Addressing the question of what are realistic and valid outcomes of community health programs is critical for future interventions. Are we interested in individual risk behavior change or in the process of community change? The answer to this question will be clearly linked to the goals of a community intervention. Which in turn has important implications for the application of a suitable evaluation method to determine effectiveness of the intervention. Furthermore, practitioners and researchers should decide a priori what the acceptable levels of implementation would be. Measuring program implementation is critical to avoiding a type III error and thus drawing incorrect conclusions about the effectiveness of a given intervention. Community interventions raise special challenges regarding the assessment of a program implementation score. Is a community health program implemented successfully if e.g. an intervention is implemented according to key principles of the “community approach” or should implementation objectives be the result of the product¹⁴ of reach (who participated), dose (what the program delivered), dose received (what participants received), and fidelity (intervention carried out according to key principles “community approach”)?

If we choose to conduct a community intervention trial, there are at least three important lessons to be learned. First, already acknowledged as important for rigorous evaluation of complex interventions is the application of multiple evaluation methods, including process evaluations, and use of both quantitative and qualitative techniques.³⁴ Especially, the results of the systematic review showed that without a process evaluation, the (lack of) effectiveness of community interventions remains a black box. Second, one of the most important key principles of the “community approach” is to generate local ownership and empowerment. Improvements in organizational collaboration, community involvement and community capacity are the “shorter”-term community-level impacts of a successful community intervention. A community intervention that fails on community-organizing efforts will most likely also fail in improving individual risk behavior in the long-term. Although some characteristics of successful community collaborations have been identified, much remains to be examined. In addition, a community intervention trial should not be conducted until successful community collaboration is achieved and the community

is ready to address health promotion issues. A last remark concerns the fact that a large time frame is needed to achieve sustainable community wide health impact. First, time is needed to establish community participation and later to demonstrate an impact on behavior and health outcomes.

7.4.3 Policy measures

Despite these assumed advantages of a community approach, the program “Wijkgezondheidswerk” achieved limited improvements in outcomes of health related behavior at the community level. The program demonstrated that local professional organizations and local grass roots organizations could be mobilized to participate in the intervention. However it is difficult to maintain enough commitment for these groups, since a community health promotion program is often simply added to their own existing agenda. Apart from the lead agency, the main objective of other collaborating organizations, e.g. social work organizations, is not related to health improvement and therefore they will have few additional resources for participation. A solution to this problem could be a close intersectoral partnership of all professional and grass roots organizations that are actively involved in deprived neighborhoods to address particular local issues. These partnerships may set goals to transform the health and well-being of deprived neighborhoods using the know-how of the collaborating organizations to address some of the key determinants of health.

At the community level it would be helpful if we know the health impact of relevant policy proposals in other relevant sectors, such as: housing, education, social affairs and employment.³⁵ Objectives of these policies are most of time not recognized as possible measurements to improve the health of the population. Integrating health impact assessments (a combination of procedures, methods, and tools by which a policy, program or project may be judged as to its potential effects on health of a population), in the policy making process could ensure that health consequences and effects of future decisions on different populations are not overlooked. An added value of a health impact assessment is the possibility to empower vulnerable groups and to improve participation in the decision-making by including the main stakeholders in the process.

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Summary

The existence of socioeconomic inequalities in health has been well established. Health related behaviors are important determinants in the onset of several chronic diseases and they contribute to the explanation of socioeconomic differences in health. In our current understanding of the determinants contributing to the graded and inverse association between socioeconomic status and the prevalence of health damaging behaviors, intrapersonal, interpersonal factors and the physical environment play a critical role. In our search for effective interventions to target socioeconomic differences in health related behavior, community interventions are thought to be a promising tool. Community interventions aim to change behavior of the majority or residents in the community as well as (or through) the social and physical conditions in which behavior occurs. The emphasis of these programs on community participation and their ability to target unfavorable contextual factors may make them especially appropriate for the improvement of health damaging behavior in deprived areas.

The core of this thesis reports on the evaluation of the community intervention “Wijkgezondheidswerk”, a community health behavior intervention program to improve health related behavior in deprived neighborhoods in the city of Eindhoven. In addition, the baseline data of the evaluation study were used to examine determinants of health related behavior in deprived neighborhoods and a systematic review of the literature on the effectiveness of community interventions in deprived areas was conducted.

Chapter 1 of this thesis is an introductory chapter. It describes socioeconomic differences in health and health related behavior and discusses several explanations for these differences. A brief introduction is given to strategies that are likely to reduce socioeconomic differences in health related behavior, with a special focus on community health promotion programs as a promising method to improve health related behavior in deprived areas. The last section briefly summarizes the design of the community intervention “Wijkgezondheidswerk” and provides the specific aims and outline of this thesis.

Chapter 2 reports on a study in which the association between the stages of change for fruit and vegetable consumption and external and psychosocial factors was examined. We used the baseline data of the evaluation study and the analytic approach of the Threshold of Change Model to identify factors associated with stages of change. The results of the study indicated that the majority of individuals in deprived neighborhoods are in the maintenance stage for fruit consumption as well as for vegetable consumption. Nevertheless, most individuals in the maintenance stage do not meet the Dutch dietary guidelines. We observed significant differences in mean scores on psychosocial factors between respondents in different stages of change. For fruits as well as for vegetables, men, those from Dutch origin, those with (rather) low health locus of control, those presenting risky health behaviors, and those without knowledge of dietary guidelines were more likely to be in a lower stage of change category.

Chapter 3 reports on a study in which the association between the stages of change for moderate-intensity physical activity and external and psychosocial factors was examined. We used the same data and analytic approach as mentioned in the summary of chapter 2. The results of the study indicated that almost half of the individuals in deprived neighborhoods are in the maintenance stage, 15% are in action, and the remainder 36% is in the preaction stages. We observed that individuals in action had most favorable physical activity related outcomes. Nevertheless, a considerable part of all respondents do not comply to moderate-intensity physical activity recommendations. Individuals who are older, lower educated, have low health locus of control, have no knowledge of physical activity related issues, and present other risky health behaviors, were more likely to be in a lower stage of change category. A positive attitude, high self-efficacy expectations, perceiving the physical activity level of others as high, and much social support were associated with higher levels of stages of change. It is concluded that the results of chapter 2 and 3 allow us to distinguish target groups, which should receive more attention in future health promotion campaigns, and to identify specific sub-groups in need of more attention to proceed in the behavioral change process.

In Chapter 4 we reviewed the available evidence on the effectiveness of community cardiovascular disease (CVD) prevention programs in deprived settings using the review methodology of the Guide to Community Preventive Services. After assessing the quality of study design, four studies formed the body of evidence. Two studies focused on multiple CVD risk factors, one study focused on smoking and one study on physical activity. Three studies reported some small but significant effects of the intervention towards improving CVD factors, including an increase in blood pressure, and cholesterol checkups and a decrease in smoking prevalence. However, one of these studies also reported an increase in the prevalence of overweight in the intervention group. One study did not show any intervention effects. According to Community Guide rules of evidence, it is concluded that because of small numbers of qualifying studies and inconsistencies in the reported effects, insufficient evidence was available to assess the effectiveness of community CVD prevention programs in deprived settings. More high quality studies are needed with a stronger focus on what characteristics and components contribute to the success or failure of community interventions.

Chapter 5 describes the process evaluation study of the program “Wijkgezondheidswerk”. Major objectives of the process evaluation were to assess the extent of exposure to the intervention and fidelity of intervention implementation. Data were gathered throughout the intervention period using minutes of meetings, registration forms and a postal questionnaire among residents. During the 2-year implementation period the neighborhood coalitions organized more than 50 health related activities in the intervention neighborhoods. Two thirds of the implemented activities were directed at giving attention and information and increasing knowledge and awareness, and one third was directed at behavioral change. Awareness of the program “Wijkgezondheidswerk” was 24% and participation in intervention activities was 3% among the general population of the

intervention neighborhoods. The intervention was in broad outlines delivered according to the key principles of a “community approach” (participation of residents, intersectoral collaboration, tailoring to local needs, incorporation of a social ecological perspective, using multi-strategies, and using broad lifestyle approach). However, there was a strained relationship between several of these key principles and the a priori defined goals of the intervention study. As the bottom-up approach of the project resulted in only a few evidence-based activities in the total intervention program. This suggests that behavior change or change in intermediate outcomes may have occurred if there had been a possibility to include more evidence-based intervention components.

Chapter 6 describes the impact evaluation study of the program “Wijkgezondheidswerk”. The impact of the intervention was evaluated in a community intervention trial with quasi-experimental design. In the quasi-experimental design two deprived neighborhoods were assigned to receive the intervention, and to achieve some degree of comparability between intervention and comparison neighborhoods, matching was used to select three comparison neighborhoods. Residents were surveyed at baseline and at follow-up after the end of the 2-year implementation period. Residents in the intervention neighborhoods did not show any changes in (intermediate) outcomes of vegetable consumption, physical activity, smoking or alcohol consumption. The intervention had a small positive impact on self-efficacy expectations, knowledge scores and stages of change for fruit consumption. Mean daily fruit consumption increased by 7 grams/day in intervention neighborhoods and decreased by 2 grams/day in comparison neighborhoods ($p=.044$). The limited results of the program “Wijkgezondheidswerk” after an implementation period of 2 years are most likely due to the short time span in which outcomes had to be achieved and the insufficient strength of the total package of intervention activities to achieve improvement in (intermediate) outcomes of health related behavior.

In the general discussion (chapter 7) it is concluded that after an implementation period of two years, there is only weak evidence for a small effect on (intermediate) outcomes of fruit consumption and no evidence for an intervention effect on other (intermediate) outcomes of health related behavior. More research is needed in specific aspects of conducting and evaluation these kind of complex interventions before community interventions in deprived neighborhoods can be used effectively to improve health related behavior and to tackle socioeconomic health inequalities in the long-term.

Samenvatting

In een groot aantal onderzoeken is het bestaan van sociaal-economische gezondheidsverschillen aangetoond. Gezondheidsgedragingen zijn een belangrijke determinant voor het ontstaan van verschillende chronische ziekten en leveren een bijdrage aan de verklaring van sociaal-economische verschillen in gezondheid. In onze huidige kennis over determinanten die een bijdrage leveren aan de graduele en inverse associatie tussen sociaal-economische status en gezond gedrag, spelen intra- en interpersoonlijke factoren en de fysieke omgeving een belangrijke rol. In de zoektocht naar effectieve interventies om de aanpak van sociaal-economische verschillen in gezondheidsgedrag te verkleinen, zouden community interventies een belangrijke bijdrage kunnen leveren. Community interventies hebben als doel het veranderen van gedrag bij een meerderheid van de bewoners in de community, door het veranderen van de sociale en fysieke omstandigheden waarin dit gedrag plaats vindt. De nadruk van deze interventies op participatie van de bevolking en de mogelijkheid om ongunstige contextuele factoren te kunnen beïnvloeden, maakt ze bijzonder geschikt om ongezond gedrag in achterstandsbuurten te verbeteren.

Het accent van dit proefschrift ligt op de evaluatie van een community programma “Wijkgezondheidswerk”, dat zich richt op het bevorderen van gezond gedrag in achterstandsbuurten in Eindhoven. De baseline gegevens van de evaluatiestudie zijn gebruikt om onderzoek te doen naar de determinanten van gezond gedrag in achterstandsbuurten. In aanvulling hierop is er een systematisch literatuuronderzoek uitgevoerd naar de effectiviteit van community interventies in achterstandsbuurten.

Hoofdstuk 1 van dit proefschrift is een inleidend hoofdstuk. Het beschrijft de sociaal-economische verschillen in gezondheid en gezond gedrag en het bespreekt verschillende verklaringen voor deze verschillen. Verder geeft het een korte inleiding over strategieën die mogelijk een bijdrage kunnen leveren aan het verminderen van sociaal-economische verschillen in gezond gedrag. Speciale aandacht is er voor community programma's. De laatste paragraaf geeft een korte samenvatting van de opzet van de community interventie “Wijkgezondheidswerk” en geeft de doelen en de opzet van dit proefschrift.

Hoofdstuk 2 beschrijft een studie waarin is onderzocht of er een associatie is tussen de stadia van gedragsverandering voor groente- en fruitconsumptie en externe en psychosociale factoren. De voormeting van het evaluatieonderzoek en de analyse methode van het “Threshold of Change Model” zijn gebruikt om de factoren te identificeren die geassocieerd zijn met de stadia van gedragsverandering. De resultaten van de studie geven aan dat het overgrote deel van de bewoners in achterstandsbuurten voor fruit- en groenteconsumptie in de behoudsfase is. Echter, de meeste mensen in de behoudsfase voldeden niet aan de Nederlandse richtlijnen voor een gezonde voeding. Verder zijn er significante verschillen in de gemiddelde scores op psychosociale factoren tussen respondenten in de verschillende stadia van gedragsverandering. Voor fruit en groente is het waarschijnlijker dat de volgende groepen zich in een lager stadium van gedragsverandering bevinden: mannen,

autochtonen, diegenen die aangeven een (erg) lage controle over de eigen gezondheid te hebben, diegenen die ongezond gedrag vertonen en diegenen zonder kennis van de richtlijnen voor gezonde voeding.

Hoofdstuk 3 beschrijft een studie waarin is onderzocht of er een associatie is tussen de stadia van gedragsverandering voor matig-intensieve lichamelijke activiteit en externe en psychosociale factoren. We gebruikten dezelfde gegevens en analytische methode als in hoofdstuk 2. De resultaten van de studie gaven aan dat bijna de helft van de mensen in achterstandsbuurten in de behoudsfase waren, 15% in de actiefase en de overige 36% in één van de pre-actiefases. We namen waar dat mensen in de actiefase de meest gunstige uitkomsten hadden waar het lichamelijke activiteit betrof. Echter, een aanzienlijk gedeelte van de respondenten voldeed niet aan de Nederlandse norm voor gezond bewegen. Groepen waarvan het waarschijnlijker was dat ze zich in een lager stadium van gedragsverandering bevonden, zijn: diegenen die ouder zijn, lager opgeleid, diegenen die aangeven een (vrij) lage controle over de eigen gezondheid te hebben, diegenen zonder kennis van onderwerpen die gerelateerd zijn aan lichamelijke activiteit, en diegenen die ongezond gedrag vertonen. Een positieve mening, een hogere eigen-effectiviteitsverwachting, de bevinding dat anderen in je omgeving een hoog lichamenlijk activiteitsniveau hebben, en de ervaring van meer sociale steun waren geassocieerd met de hogere stadia van gedragsverandering. De conclusie is dat de resultaten van hoofdstuk 2 en 3 ons in staat stellen om verschillende doelgroepen te onderscheiden, die meer aandacht nodig zouden moeten hebben in toekomstige voorlichtingscampagnes, en dat we speciale groepen kunnen identificeren die meer aandacht nodig hebben om vooruitgang te boeken als het gaat om gedragsverandering.

In hoofdstuk 4 hebben we het beschikbare bewijs van de effectiviteit van community projecten ter preventie van hart- en vaatziekten (HVZ) in achterstandsbuurten bekeken. Daarbij hebben we gebruik gemaakt van de review methode van de “Guide to Community Preventive Services” (the Guide). Na de beoordeling van de kwaliteit van het onderzoeksdesign, maakten 4 studies deel uit van de “body of evidence”. Twee studies waren gericht op meerdere risicofactoren voor HVZ, één studie was gericht op roken en één op lichamelijke activiteit. Drie studies rapporteerden enkele klein significante verschillen na de interventie met betrekking tot de verbetering van risicofactoren voor HVZ, zoals bloeddruk, cholesterol controles, en een daling van de prevalentie van roken. Echter, één van de studies rapporteerde ook een stijging van de prevalentie van overgewicht in de interventiegroep. Eén studie vond geen significante effecten van de interventie. Volgens de “rules of evidence” van the Guide, is geconcludeerd dat door het kleine aantal studies en de inconsistentie van de gerapporteerde effecten, er onvoldoende bewijs beschikbaar was om te oordelen over de effectiviteit van community projecten ter preventie van HVZ in achterstandsbuurten. In de toekomst is er behoefte aan studies van goed kwaliteit met een sterke focus op de karakteristieken en componenten die een bijdrage kunnen leveren aan het succes of falen van een community interventie.

Hoofdstuk 5 beschrijft de procesevaluatie van het programma “Wijkgezondheidswerk”. Belangrijke doelen van de procesevaluatie waren het

beoordelen van de mate van blootstelling aan de interventie en de mate waarin de interventie werd uitgevoerd volgens plan. Gegevens werden verzameld gedurende de interventieperiode met behulp van notulen van vergadering en registratieformulieren en een schriftelijke vragenlijst onder bewoners. Gedurende de 2 jaar durende implementatieperiode organiseerden de buurtprojectgroepen meer dan 50 aan gezondheid gerelateerde activiteiten in de interventiebuurten. Tweederde van de activiteiten richtte zich op het trekken van aandacht en het geven van informatie en het vergroten van kennis en bewustzijn, een derde was gericht op gedragsverandering. Onder de algemene bevolking was 24% zich bewust van het programma Wijkgezondheidswerk en 3% had aan één van de activiteiten deelgenomen. De interventie is in grote lijnen uitgevoerd volgens de belangrijkste elementen van de community benadering (participatie van de bevolking, intersectorale samenwerking, omgevingsgericht, aansluiten bij de bestaande situatie, gebruik van verschillende media en methoden, en het gebruik van een leefwijzebenadering). Echter, er bestond een gespannen relatie tussen een aantal van deze elementen en de eerder geformuleerde doelstellingen voor de interventiestudie. De bottom-up werkwijze resulteerde namelijk in een laag aantal evidence-based activiteiten binnen het totale interventieprogramma. Dit suggereert dat gedragsverandering of verandering in de intermediaire uitkomsten van gedrag mogelijk hadden plaatsgevonden als het mogelijk was geweest om meer evidence-based interventieactiviteiten op te nemen in het totale programma.

In hoofdstuk 6 wordt de impactevaluatie van het programma Wijkgezondheidswerk beschreven. De impact van de interventie is geëvalueerd met behulp van een community interventie trial met quasi-experimenteel design. In het quasi-experimentele design werden twee achterstandsbuurten toegewezen aan de interventieconditie, en om er voor te zorgen dat er een zekere mate van vergelijkbaarheid was tussen de interventie en controlebuurten, werd matching gebruikt om de 3 controlebuurten te selecteren. Buurtbewoners werden ondervraagd in een voormeting en twee jaar later in de nameting aan het eind de interventieperiode. Er waren geen veranderingen in (intermediaire) uitkomsten van gedrag voor groenteconsumptie, lichamelijke activiteit, roken en alcoholconsumptie tussen bewoners in de interventiebuurten en bewoners in de controlebuurten. De interventie had een kleine positieve bijdrage op eigen-effectiviteitsverwachtingen, kennisscore en stadia van gedragsverandering voor fruitconsumptie. De gemiddelde dagelijkse hoeveelheid fruit steeg met 7 gram/dag in de interventiebuurten en daalde met 2 gram/dag in de controlebuurten ($p=.044$). Het beperkte resultaat van het programma Wijkgezondheidswerk na de implementatie van 2 jaar is waarschijnlijk toe te schrijven aan de korte tijdsduur waarin uitkomsten moesten worden behaald en de onvoldoende kracht van het totale activiteiteenaanbod binnen de interventie dat erop gericht was om (intermediaire) uitkomsten van gezondheidsgedrag te verbeteren.

In de algemene discussie (hoofdstuk 7) wordt geconcludeerd dat na een interventieperiode van twee jaar, alleen een zwak bewijs bestaat voor een klein effect op (intermediaire) uitkomsten van fruitconsumptie en dat er geen bewijs is voor een

interventie-effect voor andere (intermediaire) uitkomsten van gezondheidsgedrag. Meer onderzoek is nodig naar de specifieke aspecten naar de uitvoering en evaluatie van deze complexe interventies voordat community interventies in achterstandsbuurten kunnen worden ingezet als effectief middel om gezondheidsgedrag te verbeteren en op lange termijn sociaal-economische gezondheidsverschillen te verkleinen.

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Gitte

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