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# ON THE WAY TO HEALTHIER SCHOOL CANTEENS

Implementation and evaluation of healthier canteen  
guidelines



Irma Evenhuis

# **ON THE WAY TO HEALTHIER SCHOOL CANTEENS**

Implementation and evaluation of healthier canteen guidelines

Irma Jeltiena Evenhuis

The studies presented in this thesis were conducted at the Department of Health Sciences, Vrije Universiteit Amsterdam, within the Amsterdam Public Health research institute, the Netherlands.

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VRIJE UNIVERSITEIT

## **ON THE WAY TO HEALTHIER SCHOOL CANTEENS**

Implementation and evaluation of healthier canteen guidelines

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# CHAPTER 1

## General Introduction





*"I said to the manager: 'I notice one thing; you don't have any whole wheat bread on offer. It is all white bread'. The next day, the manager offered only whole wheat bread, just as a test. When the students came in, only few asked for white bread. The others just took the healthier offer for granted."*

(Quote from a school canteen advisor during the needs assessment)

## **Unhealthy eating habits during adolescence**

In many countries, including the Netherlands, the eating habits of most adolescents can be improved. The majority of adolescents consume insufficient fruit and vegetables, and their intake of sugary beverages and snacks high in sugar and fat is above the recommended intake [1-3]. In the Netherlands, among adolescents (14-18 year), the average daily intake for fruit and vegetables is with 80 and 95 gram per day, less than half of the recommended daily intake (200 and 250 grams respectively) [4]. The intake of sugary beverages is twice as high among adolescents than among adults (600 and 300 gram p/day respectively) [5]. This unhealthy dietary pattern in adolescents is of great concern as it is associated with an increased risk for many chronic non-communicable disease such as type 2 diabetes, cardiovascular diseases, several types of cancer and overweight and obesity [6, 7]. This may, in turn, cause physical and psychosocial health problems and a reduced quality of life during adolescence, and also during adulthood [8-10]. Although much effort has been made to encourage a healthy dietary pattern among adolescents over many years, the prevalence and burden of overweight and obesity among them remains alarmingly high in the Netherlands [11, 12]. This makes stimulating a healthy dietary pattern in this age group very important.

Adolescents are known to be prone to adapt unhealthy behaviours possibly because their cognitive regulation is still developing and their decision-making process is more easily influenced by emotions and social factors [8, 13]. This makes them more susceptible to engaging in risky behaviour. Besides, adolescents are moving on to more autonomy. They are developing their own identity, have to deal with more responsibilities, and are developing habits, including dietary ones, that are sustained over time [10, 14]. For this reason, intervening in dietary behaviour during adolescence provides opportunities to create healthy eating habits that are likely to persist into adulthood.

## **The necessity of a healthy food environment**

Food choices are determined by both individual and environmental factors [15]. Over the past decades, our food environment has changed in such a way that consumers are stimulated to eat ultra-processed foods and drink sugar-sweetened beverages. Since these products are high in calories, fat, salt and sugar and low in fibre and essential nutrients, such as certain fatty acids, amino acids, vitamins and minerals, they do not contribute to a healthy dietary pattern. Nevertheless, their availability, promotion and marketing has increased enormously over the years [16]. The combination of palatability, low prices and convenience make it hard for individuals, particularly adolescents, to resist these foods [17]. Besides, health often plays a minor role in adolescents' food choices because they are not yet able to see the long-term consequences of their behaviour [18]. Also, both the negative and positive health effects of food choices are not immediately noticeable to them. In addition, social norms play an important role at their age, and their choices are

often guided by peers and parents [18-20]. It is therefore even more difficult to influence adolescents' food choices and dietary behaviour at the individual level. To help them make healthier choices, they need to be supported to resist temptations of unhealthy food that are offered widely in their environment. Consequently, changing the food environment to a healthier environment can facilitate healthier choices.

In a healthy food environment, people are stimulated to make healthier food choices as the default while choosing less healthy options is constrained. In particular, increasing the availability and accessibility of healthier food making use of marketing techniques, may encourage people to choose healthier options [21-23]. Examples of such strategies are placing the healthier products more to the front, presenting them attractively, or in an eye-catching position compared to less healthy products. If these adaptations maintain consumers' freedom of choice, they are also known as nudges [24]. These nudging techniques, which are cheap to perform and require minimal effort, have proven to be effective in stimulating healthier food choices [25, 26]. Consequently, in recent years, increasing attention has been paid to interventions using such strategies to create healthier food environments [15, 27, 28]. This attention focuses mainly on food environments in settings such as governmental buildings, public transport stations, and places typically visited by children. Interventions aimed at changing the food environment have also received consumers' approval, especially in settings such as hospitals and schools and when the nudge comes from trusted sources [29-31]. Creating a healthier food environment in schools is therefore an excellent opportunity to influence eating habits of adolescents.

### **Healthy school canteens**

Because of their reach and pedagogical tasks, schools are an appropriate setting to stimulate healthy dietary behaviour among adolescents. Schools are already increasingly aware of their role in stimulating healthier dietary behaviour among their students [32, 33], and many countries have formulated compulsory or voluntary school food policies or guidelines [34]. These consist of nutritional criteria for school meals, and regulations for the availability and promotion of products in the schools' cafeteria and vending machines [27, 34-37]. Examples of such regulations are: promoting fruit and vegetables and access to (free) drinking water; promoting healthier options through lower prices or more access points; offering age appropriate portions for lunches, with restrictions for salt; and restricting the availability of sweet treats and processed food and drinks. These policies/guidelines have shown promising results in influencing youth to eat more healthily, although the effect on adiposity needs further investigations and implementation challenges limit their positive effects [27, 37-40].

Healthier food choices can be facilitated particularly in a healthier school canteen, including vending machines, where students can autonomously choose what they buy. In addition, by implementing a healthy school canteen, the school can create a norm about healthy food and drinks. Thereby, they are fulfilling their task of contributing to the personal development of students, which includes learning to make responsible lifestyle choices. It is also of additional value when the school environment is consistent with the lessons about a healthy lifestyle. All these reasons make the school canteen an appropriate location for influencing students' behaviour through nudging and marketing techniques [36, 41]. Previous research has shown that an increase in the availability of

healthier products in school canteens is likely to stimulate students to choose these products [26, 38]. This effect can be further enhanced by making these healthier products more accessible through attractive presentation and promotion [25, 42-45]. Examples of strategies applied in schools include increasing the offering of water and making it more easily accessible; offering more (ready-to-eat) fruit or vegetables; promoting healthy products with reduced prices or advertisements; and reducing the number of less healthy snacks [42, 46-48]. However, as the quality of some of the performed studies is low, and since they have conflicting results [45, 49], more evaluations are needed on the effects of adaptations on the availability and accessibility of healthier food products in the school setting [49].

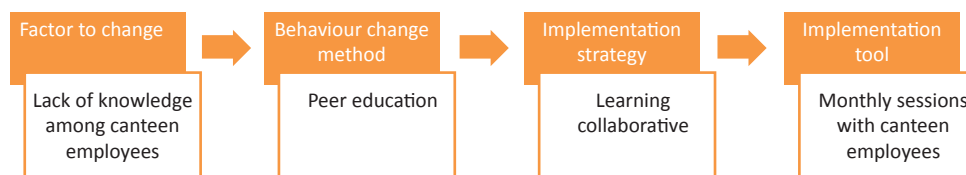
Although increasing attention is being paid to healthy food environments at schools, involved stakeholders experience difficulties in implementing such policies/guidelines [34, 39]. Implementation challenges experienced include costs, waste, kitchen equipment, support and other programmes interfering with the school food environment [36]. Previous research has shown that proper implementation support can improve the uptake, implementation, maintenance and effectiveness of school-based interventions, including school canteen regulations [50-52].

### **Implementation of healthier school canteens**

Implementation is the process in which settings integrate or start using innovations such as policies or evidence-based interventions [53]. In this process, implementation tools support stakeholders to perform the intervention as intended [54, 55]. These tools are (tailored) activities or materials offered to involved stakeholders, such as an information brochure, training, or providing a helpdesk. Since multiple needs will be identified to implement an intervention, there is a need to develop a mixture of supportive tools which together form a single implementation plan [56]. The process of creating such a balanced implementation plan is not merely a practice or evidence-based trajectory: on the one hand, to be able to align the tools to the needs of practice, involvement of future stakeholders is important [57, 58]; and, on the other hand, a structured theory-based development is likely to increase the sustained effect of the intervention [59]. Consequently, a combined approach with input from practice and the use of theory during the complete process of developing and evaluating the implementation plan increases the likelihood that the plan will be used in practice, that the intervention is performed as intended and, consequently, that the intervention has the assumed effect [60].

In the last decade, implementation science has recognised the need for theories, models and frameworks as the basis for the development and evaluation of implementation interventions. This resulted in several theories and frameworks to guide the development of implementation tools [59, 61]. Although the steps involved differ, the overall concept is to start by establishing the (expected) needs of the involved stakeholders during implementation. It is therefore important to first gain insight into the barriers and facilitators with regard to the implementation of the innovation, as experienced by involved stakeholders [60]. Next, the most important identified barriers or facilitators, also known as factors to change, need to be connected to behaviour change methods [58]. Using behavioural change taxonomies increases the likelihood that the tools really change the targeted factors [62-64]. For example (Figure 1.1), in order to improve knowledge as a factor

to change, offering information or peer education are opted methods [64]. These methods have to be translated into implementation strategies. To facilitate the use of evidence-based strategies and to be able to compare the used strategies across interventions, a general evidence-based implementation strategy compilation (ERIC) has been created [65, 66]. In the case of knowledge as a factor to change and peer education as a method, using this compilation results in a learning collaborative as a potential strategy [65]. Finally, this strategy has to be extended into a tool: the specified material or activity fitting the target group and intervention. All selected tools should be clearly described, including the aim, dose, target group, and timing [54]. In case of the example of a learning collaborative, this could take the form of monthly sessions with peers to discuss their experiences.



**Figure 1.1.** Steps to follow, with examples, from the identified factor to change to an implementation tool.

With regard to implementation of school canteen policies or guidelines, researchers from several countries have investigated the related needs and the effectiveness of implementation strategies and tools. The general implementation strategy compilation (ERIC) has recently been adapted to be more feasible in the school context (SISTER) [65, 67], facilitating its application in school-based implementation interventions. In addition, several contextual factors related to school-based implementation have already been identified [52, 68]. Thus, as factors regarding the community, the organisation, the intervention/innovation, and the available support interact with each other, they need to be taken into account collectively when developing an implementation plan. Consequently, the possibility of adapting the support to the schools' situation is important [50, 68].

In general, success factors identified during the implementation of school canteen policy are ownership, good collaboration, clear communication, support of management and sufficient time and staff [36, 39, 69-71]. Related practical and feasible strategies, such as education, training, modelling and incentives, have been shown to support the implementation of school-based health promotion interventions [50, 51]. However, as mentioned, implementation tools are more effective if they are aligned to the intervention, the context and (the needs of) the target group. That increases the likelihood of the use and uptake of interventions, so makes it important to gain insight into the stakeholders involved, their specific needs, and into the schools' context towards the implementation of school canteen guidelines.

### Healthy school canteens in the Netherlands

Similar as the international developments with regard to healthier school food environments and supportive implementation, attention has also been paid to healthier school canteens and proper support in the Netherlands. Dutch adolescents consume approximately 15%

of their daily intake at school [4]. Although it is common that students (aged 12-18 years) bring their lunch from home [19, 32], they can buy complementary snacks or drinks as most schools offer food and drinks for sale in a cafeteria and/or vending machines. As schools have autonomy with regard to arrangements for food and drinks, they are free to choose if they offer food and drinks, the nature of the offering, and how they organise this. Schools determine the number of days per week they sell food and where they sell it (e.g. vending machines and/or cafeteria or tuck shops). They also determine who arranges the catering (e.g. the school itself, an external catering company, or a combination).

Since 2003, the Netherlands Nutrition Centre has coordinated the “Healthy School Canteen Programme”, which is financed by the Dutch government [72]. This programme supports secondary (vocational) schools in creating healthier school canteens [73, 74]. As schools have autonomy in terms of how they arrange their food and drinks, this programme is voluntary, though the only formal guidance available for school canteens. Over the years, the programme has evolved and has been updated in response to insights from practice and science, and to new governmental policies. To illustrate, in 2009 the Dutch Ministry of Health, Welfare and Sports acted in response to the resolution of parliamentarian Kees Vendrik, accepted by the house of representatives in 2009, to have healthy canteens in all Dutch secondary schools (approximately 1500) by 2015 [75]. In 2015, this was extended to 2017 by means of the accepted resolution by parliamentarian Agnes Wolbert [76]. These resolutions functioned as a boost for the programme, but the targets have not yet been achieved. More recently, the National Prevention Agreement (2018) included the target of having healthy school canteens in 50% of all secondary (vocational) schools, by 2020 [77].

Since 2009, due to the increased governmental support, the Netherlands Nutrition Centre has been able to improve the implementation by introducing school canteen advisors (“Schoolkantine Brigadiers”): nutritionists who visit, advise and support schools and caterers towards a healthier canteen. Besides these advisors, the programme also includes a website with information about how to create a healthier canteen, a roadmap with the steps to follow and examples of healthier canteens; newsletters with inspiring examples and information; and information brochures. A school that has created a healthier canteen also has the possibility to apply for a school canteen award each year. The Healthy School Canteen Programme has evaluated positively in 2013 [73].

Based on practical experiences and further developed scientific insights about for example nudging the need to expand and reformulate the criteria that were used at the time emerged. In response to this need, the Netherlands Nutrition Centre developed in collaboration with experts in the field of nutrition and health behaviour the Guidelines for Healthier Canteens in 2014, and updated them in 2017 [78]. They were based on the Dutch nutritional guidelines, experiences with the Dutch Healthy School Canteen Programme thus far and available research in influencing food choices [73, 78, 79]. The Guidelines for Healthier Canteens are applicable not only to school canteens but also to sports canteens and worksite cafeterias. They aim to support stakeholders creating healthier canteens through three incremental levels: bronze, silver and gold, although only the levels silver and gold are sufficient to be designated a healthier school canteen. The guidelines combine the offer of healthier products (availability) with the promotion and placement of these healthier products (accessibility) (Figure 1.2). In addition, in all healthier canteens,

drinking water should be stimulated and an anchoring policy needs to be available.

As a consequence of the development of the Guidelines for Healthier Canteens, the question of how to implement these guidelines in schools arose: in what extent are the supportive tools of the Healthy School Canteen Programme suitable, and how could the programme be improved? Another need also emerged: to determine the level of a canteen in terms of the guidelines in such a way that every stakeholder involved in implementing the guidelines, such as caterer, canteen employee, or school representative, is able to adhere to the guidelines. A tool to assess the level of the canteen independently, and to get automatic insight into directions for improvements, was therefore needed.

Basic Conditions	Bronze	Silver	Gold
1. In each offered food group a healthier product is offered		Required	
2. Healthier products are placed at the most eye-catching spots		Required	
3. Encouragement to drink water		Offering water is required	
4. Policy is anchored		Required	
Additional Conditions	Bronze	Silver	Gold
Fruit and vegetables offer		At least fruit <b>or</b> vegetables	Fruit <b>and</b> vegetables
Availability of healthier food and drinks in cafeteria	No further requirements	60-79%	≥80%
Availability of healthier food and drinks in vending machines		60-79%	≥80%
Accessibility of healthier food and drinks		60-79%	≥80%

Figure 1.2. The Guidelines for Healthier Canteens [78].

### Involved stakeholders to create healthier school canteens in the Netherlands

In the Netherlands, multiple stakeholders and organisations at national, local and school level are involved in supporting or implementing the Healthy School Canteen Programme. At the national level, as mentioned previously, the Dutch Ministry of Health, Welfare and Sports endorses healthier school canteens, and the Netherlands Nutrition Centre has been designated to coordinate the programme. Due to this governmental support, the Netherlands Nutrition Centre is able to offer free support to all Dutch schools. Within the Netherlands Nutrition Centre, a team of school canteen advisors supports schools personally to help them to create a healthier school canteen. This support has been divided into regions of the Netherlands, with an advisor for each region. This facilitates local collaborations, with, for example, Community Health Services and local governments. As there are approximately 1500 secondary schools covering different educational levels in the Netherlands and roughly 95 percent of these schools offer food or drinks to their students, in potential the programme could reach approximately one million students between the ages of 11 and 19 years [80].

A healthier school canteen is also part of the national “Healthy School Concept”, actively promoted by the Dutch National Institute for Public Health and the Environment (RIVM)

[81]. This concept, which aims to strengthen health promotion in primary, secondary (vocational) education, is based on four pillars: 1) health education; 2) early identification of students' health problems; 3) school environment that stimulates healthy behaviour; and 4) health policy. Schools can earn a Healthy School Certificate for eight different health themes if they meet the criteria defined for each pillar within the health theme. The health themes include, among others, sport and physical activity; social well-being; drugs, alcohol and smoking prevention; and nutrition. The healthier school canteen is part of the nutrition theme, within the pillar healthy school environment. Schools are awarded a "Healthy School Nutrition Certificate" if they have a healthier canteen and fulfil the criteria defined for the other three pillars.

At the local level, in particular the Community Health Services are involved in the implementation of the "Healthy School Approach" and healthier school canteens. In the Netherlands, Community Health Services implement the local health policies which determine the capacity of the Community Health Service to support schools. Also, with regard to the school health promotion including a healthier canteen. Consequently, their involvement differs per municipality, ranging from annual visits to intensive guidance. The Netherlands Nutrition Centre collaborates with the Community Health Services by exchanging knowledge and examples, and aligning their support to schools.

At the school level, as schools have the freedom to choose how they organise their canteen, there are many differences in terms of which and how many stakeholders are involved in creating healthier school canteens. In case the canteen is arranged by the school itself, it is organised by parents, students, or employees of the school. Making it particularly important to involve all those stakeholders in the process.

Since schools can also contract a catering company to arrange their school canteen, catering companies are another party involved in the implementation of the Guidelines for Healthier Canteens. At the same time, collaboration with other stakeholders in the school, like students, parents and teachers also remains important. Catering companies can organise the offering in school cafeterias, in vending machines, or use both. Some companies only operate in one or a small number of schools, while others operate in several schools. The national organisation JOGG ("Young people at a healthy weight") coordinates the "Akkoord Gezonde Voeding op Scholen" (in English: "Agreement Healthy Nutrition at Schools") for catering companies, suppliers and producers [82]. In this agreement, involved parties have committed contributing to healthier school canteens. The actions of these parties are regularly monitored by the school canteen advisors, and inspiration sessions and shared activities are organised. The Netherlands Nutrition Centre and JOGG collaborate with respect to this agreement.

As has been shown, multiple stakeholders, with different roles, and from multiple organisations are involved in the process of creating healthier school canteens. Reasonably, all have a different organisational context, aims, tasks, obligations and face different challenges. To increase implementation of healthier school canteens, these have to be taken into account while developing support. This can only be achieved by involving the different stakeholders during the development and evaluation of the implementation tools.



## **Aim of this thesis**

The aim of this thesis was to investigate how schools can be supported to improve implementation of the Guidelines for Healthier Canteens in secondary schools, thereby creating healthier canteens. The main research question was: *Is support for the implementation of the Guidelines for Healthier Canteens helpful in creating healthier school canteens in the Netherlands?*

This thesis consists of two parts to answer this main question, where the following research questions are addressed:

### **Part I: Development of the support to implement healthier school canteen guidelines**

1. How to develop and evaluate an implementation plan to support practice creating a healthier school canteen? (chapter 2)
2. What are stakeholders' needs and aligned implementation tools, including the Canteen Scan, to support implementation of healthier school canteen guidelines in secondary schools? (chapter 3 and 4)

### **Part II: Evaluation of the support to implement healthier school canteen guidelines**

3. What is the effect of the offered support aimed at implementation of healthier canteen guidelines on the availability and accessibility of healthier food and drinks in canteens and purchase behaviour of students? (chapter 5)
4. What is the effect of the offered support aimed at implementation of healthier canteen guidelines on changes in determinants related to implementation, as perceived by stakeholders? (chapter 6)
5. How did the involved stakeholders evaluate the quality of each implementation tool? (chapter 6)

## **Outline of this thesis**

Chapter 2 describes briefly how we developed the plan to support implementation of the “Guidelines for Healthier Canteens” in Dutch secondary schools, paying attention to the collaboration with practice and alignment to science. It further illustrates how we planned to evaluate this plan in practice on effect and process level.

The implementation plan is described in more detail in Chapter 3. First, the identified factors that, according to stakeholders, hindered or facilitated the implementation of a healthier canteen are described. Next, how these factors were translated into implementation tools via behavioural change methods and implementation strategies are also described. Further, it describes each implementation tool, in detail, including action(s), aims and target group.

One of the implementation tools is the “Canteen Scan”: an online tool to provide insight into, and directions for, improvement of healthier food and drink products in canteens. Chapter 4 describes the development, content validity and usability of this scan.

Next, Chapter 5 presents the effect evaluation of the implementation plan aimed to support secondary schools in creating a healthier canteen. This effect was evaluated at canteen level by the health level of the canteen and at student level by self-reported purchase behaviour of students.

Besides the effect evaluation, the implementation of the guidelines in secondary schools has also been evaluated at process level. Chapter 6 presents this process evaluation, explaining if stakeholders perceived changes on factors affecting implementation, and how they evaluated the implementation tools on quality measures like dose and satisfaction.

A general discussion of the thesis and its conclusions is provided in Chapter 7. Points worthy of note, methodological considerations and implications for research, practice and policy are discussed. The results of our study to the validity and reliability of the Canteen Scan are included in this discussion. Finally, the findings of all studies are integrated into an overall conclusion.

# PART I

Development of the support to implement  
healthier school canteen guidelines



# CHAPTER 2

Development and evaluation of  
the implementation of Guidelines  
for Healthier Canteens in Dutch  
secondary schools: study protocol  
of a quasi-experimental trial

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## **ABSTRACT**

### **Introduction**

To encourage healthier food/drink choices, the 'Guidelines for Healthier Canteens' were developed by the Netherlands Nutrition Centre. This paper describes (1) how we developed a plan to support implementation of the 'Guidelines for Healthier Canteens' in Dutch secondary schools, and (2) how we will evaluate this plan on process and effect level.

### **Methods**

The implementation plan (consisting of several tools) was developed in cooperation with stakeholders. Barriers/facilitators to implement the guidelines were identified by 14 interviews and prioritised during one expert meeting. Thereafter, these barriers were translated into implementation tools using behavioural change methods and implementation strategies. The implementation plan consists of the tools: tailored advice provided via an advisory meeting and report, based on a questionnaire about the stakeholders'/school's context and the 'Canteen Scan', an online tool to assess the product availability and accessibility; communication materials; an online community; newsletters; a fact sheet with students' wishes/needs.

This implementation plan will be evaluated on process and effect in a 6-month quasi-experimental controlled design with 10 intervention and 10 matched control schools. Process outcomes will be measured: 1. factors affecting implementation and 2. the quality of implementation, both collected via a questionnaire among involved stakeholders. Effect outcomes will be collected pre/post intervention with: 1. self-reported purchase behaviour among around 100 students per school; 2. the 'health level' of the school canteen. Linear and logistic two-level regression analyses will be performed.

### **Discussion**

The implementation tools are developed by combining a theory and practice-based approach, with input from different stakeholders. If these tools are evaluated positive, it will support schools/stakeholders to create a healthier school canteen.

## INTRODUCTION

Prevention of overweight and obesity during childhood is important because of the high prevalence worldwide and associated short and long-term physical, social and mental health problems [7, 12, 83, 84]. Although prevention should start in early life, adolescence is also a critical period for prevention, because adolescents start to deal with more responsibilities, and develop their own identity and habits in eating behaviour, which may persist in later life [10, 14]. To promote healthy dietary behaviour, it is important to change the food environment to stimulate individuals towards healthier food choices [15, 74, 85, 86]. For adolescents, schools are a key setting to encourage healthy eating as schools have a pedagogical task and a large reach, and adolescents spend a lot of time there [15, 87]. Although schools are increasingly aware of their role in obesity prevention and the need for a healthier school canteen, there is room for improvement [32, 33, 36]. Schools often experience barriers to implement a healthier school canteen and need support to implement and continue actions regarding a healthier school canteen [36, 39]. Hence, improvements in the canteen like removing the marketing of less healthy products and increasing the offer of healthier food and drinks in vending machines remain difficult [32, 33].

Decreasing the availability of low-nutrient, energy-dense foods/beverages in comparison to high-nutrient, low energy foods/beverages in the school canteen and vending machines, and formulating relevant school food policy, are examples of promising strategies to change the food environment and reduce consumption of low nutritious foods, and increase purchases of favourable foods/beverages [27, 38, 42, 88]. The Dutch Ministry of Health, Welfare and Sport has set a policy target to increase the number of schools with a healthier canteen [75]. The Netherlands, has around 1500 secondary schools, which offer different educational levels for youth between the ages of 11 to approximately 18 years. Most schools offer food or drinks for sale as substitute to the food/drink's students bring from home. In 2014, the Netherlands Nutrition Centre developed the "Guidelines for Healthier Canteens" in consultation with future users and experts in the field of food and behaviour change [78]. These guidelines are based on studies which investigated influences on making choices, the Dutch Nutritional guidelines "The Wheel of Five", and experiences with the "Healthy School Canteen" programme [73, 79]. According to the "Guidelines for Healthier Canteens" school canteens should offer a majority of healthier products. Healthier products are defined as foods and drinks that are included in the Dutch "Wheel of Five", such as whole wheat bread, fruit and vegetables, and products that are not included, but contain a limited amount of calories, saturated fat and sodium [79]. In addition, the canteen should promote healthier products by applying "accessibility criteria", such as placing the healthier products at the most eye-catching spots and attractive presentation of fruit and vegetables. Further, drinking water should be encouraged and in its written policy, the school should state that their canteen meets the guidelines [78].

Stakeholders need support to implement the guidelines in their school [39, 52, 89]. Such an implementation support plan will be better aligned to the needs of practice, and thereby more feasible, if the needs and wishes of stakeholders are taken into account [86, 90, 91]. Therefore, during the development and evaluation stage, collaboration with these stakeholders is recommended [90, 91]. It is also recommended to apply theory, such as the use of a structural framework for the development and evaluation of the

implementation plan, the use of behaviour change models to translate the need of practice into implementation strategies and the use of a combination of implementation tools [58, 92]. The collaboration with practice in combination with the use of theory will increase the likelihood of a feasible and effective implementation. To succeed over time, implementation of new guidelines should allow adaptations to local circumstances but, nonetheless, be conducted with rigor and consistency. This article describes: 1) how we developed a plan to support implementation of canteen guidelines in Dutch secondary schools; and 2) how we will evaluate this implementation plan on process and effect level. The process will be evaluated on factors affecting implementation perceived by stakeholders and the quality of implementation. The effect will be evaluated by determining changes in the health level of canteens and in the self-reported purchase behaviour of adolescents.

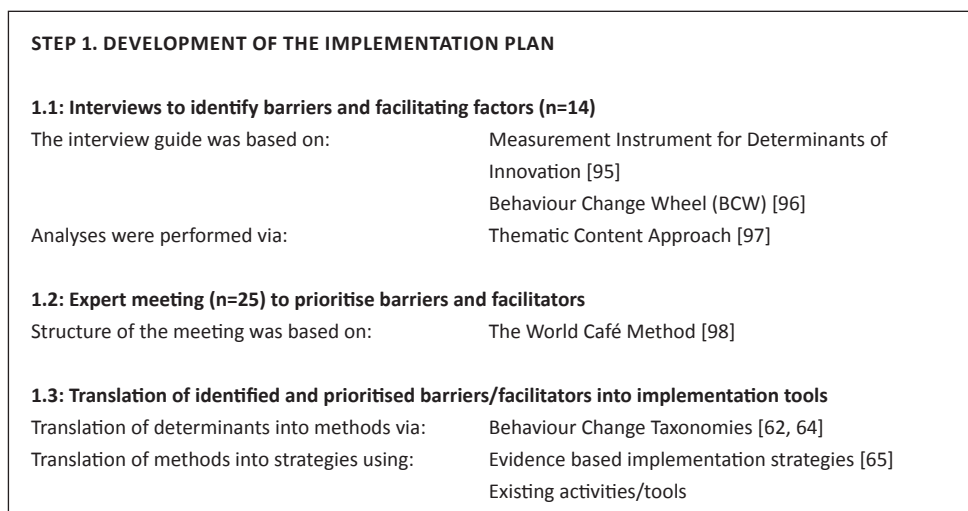
The input of practice during the development and evaluation of our implementation plan will give insights to researchers about working elements. We hypothesize that this approach will increase future uptake and effect of the implementation plan. With our implementation plan we aim to facilitate the process to create a healthier school canteen, and thereby to stimulate Dutch adolescents to purchase healthier foods and beverages during school time.

## METHODS

Many approaches to support the development and evaluation of implementation interventions exist and have corresponding steps [57, 58, 92]. In this study the “Grol and Wensing Implementation of Change Model” (2006, updated in 2016) was used to develop and evaluate the implementation plan to disseminate the Guidelines for Healthier Canteens in secondary schools [92]. A strength of this model is that it combines several approaches and has been improved over time. It consists of six steps from developing a proposal for change when new guidelines are developed to continuous evaluation and adaptation of the implementation plan. The first two steps are not applicable as the guidelines already exist. The last step falls outside the scope of this research but will be aimed to perform in the future. Hence, this paper describes the application of the three middle steps: 3) the needs assessment of the target group and setting, 4) the selection of corresponding implementation strategies, and 5) the development, testing and executing of the implementation plan. In the selection of implementation strategies, characteristics of the Intervention Mapping approach are used [58]. We divided our study into two phases: first the development, which has already been performed, and second the evaluation of the implementation plan. These phases and a timeline are presented in Figure 2.1 and explained below. To report this study design, the SPIRIT 2013 Statement was used, if applicable [93]. As a full description of an implementation plan makes it possible to use it in practice, to compare results and to enhance reproducibility [54], this article explains how we developed and will evaluate the implementation plan, while a separate article will describe the content of the implementation plan. Namely, by describing the factors aimed to change with the plan, the behavioural change methods, implementation strategies and an explanation of the implementation tools.

## 1. Development of the implementation plan

We developed the implementation plan in three steps. We started with interviews, to gather information on barriers and facilitators regarding a healthier school canteen according to relevant stakeholders of policy and practice. Next, experts from research, policy and practice prioritised the identified barriers and facilitators and came up with solutions. Subsequently, behaviour change methods and implementation strategies were assigned and translated into implementation tools, corresponding to the most important barriers/facilitators identified.



**Figure 2.1.** Steps and used theories to develop the implementation plan

### 1.1. Interviews to identify barriers and facilitating factors

*Design, participants, data collection:* The aim of this qualitative study was to identify barriers and facilitators, both experienced and expected, by users and stakeholders of the school canteen due to the Guidelines for Healthier Canteens. Furthermore, they came up with possible solutions for the perceived barriers. These insights helped to develop an intervention that was aligned to the need of practice and their daily practice. Semi-structured interviews were conducted among purposive sampled users and stakeholders on organisation level. Users were defined as persons responsible for the school canteen and who will use the Guidelines for Healthier Canteens in the future (e.g. a schools' facility manager, a coordinator, or a caterer). In addition, school canteen advisors were included as "users". They are dieticians of the Netherlands Nutrition Centre who visit, advise and support Dutch schools and caterers aiming to achieve healthier school canteens. Stakeholders on organisation level were the managers of schools and caterers.

Participants were recruited via the school canteen advisors of the Netherlands Nutrition Centre. Fifteen stakeholders and users were invited for the interviews by e-mail or telephone; one stakeholder was unable to attend because of organisational changes. Experiences of school canteen advisors of the past years showed that some organisations just started,



while others were already experienced to create a healthier canteen. To get more insight into these differences, we included participants spread among the Rogers' diffusion of innovation theory [94]. The included participants were spread among innovators (n=5), the majority (n=7) and laggards (n=2). The Guidelines for Healthier Canteens were sent to the participants and informed consent was signed before the interview. A researcher (IE) trained in qualitative interview methods conducted the interviews and a second researcher was present to make notes. After the interviews, a member check was conducted. As the last interviews did not reveal any new information, we concluded that data-saturation was reached.

*Interview topics:* The fourteen interviews were structured around open-ended questions. The topic list was compiled using the most important determinants of the Measurement Instrument for Determinants of Innovation (MIDI) and the Behaviour Change Wheel (BCW) [95, 96]. The MIDI includes 29 determinants of innovation categorised into determinants of users, organisation, innovation, and social political environment. The BCW describes capability, opportunity and motivation (all of which interact with each other) as most important determinants that are needed for behavioural change. The topic list consisted of the main-topics: context, experience, opinion about the guidelines, desired support and solutions and completion. After each interview the topic list was optimised, based on experience with the earlier interviews.

*Data analysis:* All interviews were audio-taped and transcribed verbatim. The thematic content approach was used for data collection and data analysis [97]. Three steps were undertaken to analyse the interviews; open, axial and selective coding. Coding process was performed by two researchers, in alignment with each other and with a third researcher (IE). Thereafter, results were discussed with the project team.

## **1.2. Expert meeting to prioritise barriers and facilitators**

*Design and participants:* As many factors were identified from the interviews, it was needed to discuss together with different stakeholders which factors should be affected at least by the intervention. To prioritise the identified barriers and facilitators an expert meeting was organised with attendees from research, policy and practice. A total of 30 experts were invited, e.g. managers at school/caterers, health promoters from the Community Health Services and the Healthy School Concept, school canteen advisors, and researchers in the field of implementation, nutrition and behaviour. A total of 25 experts participated, divided over research (n=10), policy (n=4), and practice (n=11).

*Data collection:* The expert meeting consisted of two parts. First, the 41 barriers and facilitators retrieved from the interviews were prioritised to create focus which factors needed to be changed with the implementation plan. Each participant first ranked all barriers and facilitators individually, thereafter plenary all factors were discussed and consensus about the prioritisation was reached. Second, solutions to strengthen facilitators and reduce barriers were identified and discussed in six subgroups, based on the World Café Method [98]. To provide participants already with ideas, all groups received a list with current implementation tools, and solutions suggested by participants of the interviews. The results of the expert meeting were multiple ideas to influence the highest-ranked facilitating and impeding factors.

### 1.3. Translation of identified and prioritised barriers/facilitators into implementation tools

The prioritised barriers and facilitating factors were translated into corresponding implementation tools through behaviour change methods (techniques) and implementation strategies [62, 64, 65]. This theory-based translation was needed as it is important to choose strategies that – from a theoretical perspective – are likely to change the prioritised factors. The implementation plan consists of a mix of activities and tools, so called implementation tools, aiming to change the crucial and most important impeding and facilitating factors that affects implementation [92]. The choices made for implementation tools were grounded in evidence-based theory, existing (and previously used) tools and activities of the Netherlands Nutrition Centre, and by balancing the expected effect and investment (financial, time-consuming, effort, commotion) [62, 64]. The tools were developed in collaboration with the project team, and organisations which will support implementation in the future (e.g. the Netherlands Nutrition Centre, the Amsterdam Community Health Service, and “Young People at a Healthy Weight (JOGG)”).

## 2. Evaluation of the implementation plan on process and effect level

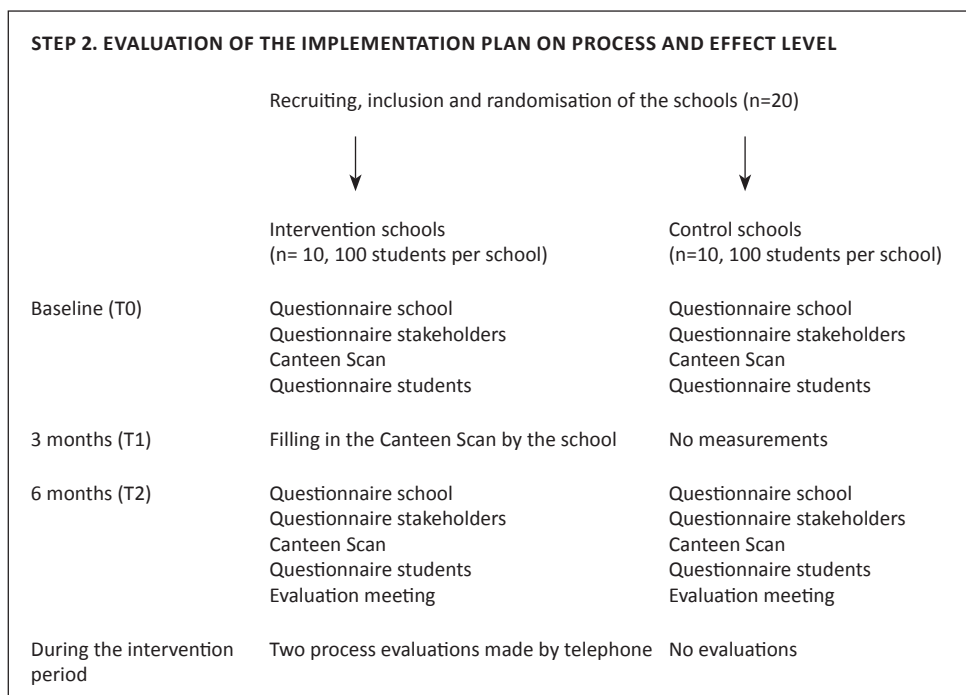
### Setting and study design

To evaluate both the process and effect of the developed implementation plan, a 6-month quasi-experimental controlled design will be used with 10 intervention and 10 matched control schools (See Figure 2.2). The included schools will have a variety of characteristics, so the results can be translated to other Dutch schools. Control schools will be matched by the main characteristics: how the catering is provided (i.e. by a catering company, or the school itself), school size (<1000 and  $\geq$ 1000 students), level of secondary education (vocational, senior general and pre-university), availability of (many) shops near the school, and whether or not the school has a policy for students to stay on the schoolyard during breaks. Intervention schools will receive the developed implementation plan to support implementation of the Guidelines for Healthier Canteens, whereas the control schools will receive the guidelines only. Control schools will receive these guidelines in a short meeting and on paper after the baseline measurements. After the intervention period, control schools will receive the intervention. This quasi-experimental study will be carried out according to: 1) the project application (Nr: 50-53100-98-043, date: 2 December 2014) approved by funding organisation ZonMw, 2) the study protocol approved by the VU University Medical Centre (WC2015-008 and 2015.331), and iii) registration in the Dutch Trial Register (NTR5922).

### Study population and recruitment

*Schools:* We will recruit schools that are situated in the western and middle part of the Netherlands, via the Netherlands Nutrition Centre and caterers by email and telephone. The inclusion criteria are: a) presence of a canteen, b) willingness to make their school canteen healthier, c) and willingness to provide time and space for the investigators to measure outcomes in students, employees and canteen workers. The exclusion criteria are: a) the school had already started to implement the recent developed Guidelines for Healthier Canteens, and b) in 2015, the school canteen had already been advised about how to reach a healthier canteen, by school canteen advisors. After 6 months of participation in all measurements, all schools will receive a small financial incentive.

*Stakeholders:* In the participating schools, all stakeholders involved in implementing a healthier school canteen will be asked to fill in questionnaires at baseline and after the intervention. These stakeholders will be identified by our contact of the school. The number of stakeholders and their function will differ per school, due to organizational differences between schools. Involved stakeholders may include: teachers, students, representatives of the school board/school canteen, students and health promoters of the Community Health Service.



**Figure 2.2.** Evaluation of the implementation plan on process and effect level.

*Students:* In each of the participating schools, 100 second or third-year (aged 13-15 years) students will be included. Therefore, approximately four second-year classes will be invited to participate, reflecting the education levels offered at the school. Students will be asked to fill in a questionnaire, at baseline and after the intervention. Two weeks prior to the questionnaires, parents and students will receive an information letter, and the option to decline participation. Per school, four vouchers of €25 (for an online goods shop) will be raffled off among all participating students.

### Intervention

The implementation plan, consisting of various implementation tools, was developed as described before. Some existing tools were adapted and others were newly developed in collaboration with stakeholders from research, policy and practice. This resulted in a mix of implementation tools (Table 2.1): a questionnaire to gain insight in stakeholders’

and schools' specific context; the Canteen Scan (an online tool that provides insight and advices regarding the availability and accessibility of food and drink products in their canteen); an advisory meeting and written report in which stakeholders receive tailored advice; communication materials; an online community; newsletters; and a fact sheet with students' needs and wishes. During the intervention all schools will be encouraged to involve their students in the process to change their canteen. The implementation tools will be provided by school canteen advisors of the Netherlands Nutrition Centre, in collaboration with the Vrije Universiteit Amsterdam. Within our research, the advisors will use the developed implementation tools to support the intervention schools.

**Table 2.1.** Description of the tools for implementation of the Guidelines for Healthier Canteens.

Implementation tool	Action and targets	Target group	Period
1. Insight into the current situation			
<i>1.1: Questionnaire school</i>	The results of the online questionnaire to assess the characteristics of the school [95, 99] are given back to the stakeholders.	Coordinator of the school, all involved stakeholders	Before/during the advisory meeting
<i>1.2: Questionnaire stakeholders</i>	The results of the online questionnaire to assess stakeholders' characteristics, individual and environmental determinants [95, 99] are given back to the stakeholders.	All involved stakeholders	Before/during the advisory meeting
<i>1.3: 'Canteen Scan'</i>	An online tool that provides insight into and directions for improvement of availability and accessibility of food and drink products in canteens [100].	Performed by a school canteen advisor of the Netherlands Nutrition Centre. Results and advise are given to all involved stakeholders.	Before the advisory meeting
	To create ownership and insight into the changes so far, the school receives information to fill out the Canteen Scan by themselves if they wanted.	Performed by the school coordinator.	After three months
<i>1.4: Advisory meeting and report</i>	In one advisory meeting per school, all involved stakeholders are advised about how to improve the canteen by a school canteen advisor of the Netherlands Nutrition Centre. Based on the aims of the school and the points of attention, identified with the two questionnaires and the Canteen Scan a concrete action plan will be developed during the meeting. As this action plan is created together, ownership and collaboration will be increased. After the meeting, a written report based on this meeting will be distributed by email.	All involved stakeholders	At the start of implementation

*table continues*

Implementation tool	Action and targets	Target group	Period
2. Communication materials	A brochure about the Guidelines for Healthier Canteens, an overview of the steps to take, a personalised poster, a banner for the schools' website. To create motivation and increase and apply knowledge. Content: information, examples of healthier products, how to place products, and healthier canteens.	Coordinator of the school, who will be asked to share this with other stakeholders.	At the start and halfway of implementation
3. Online community	A closed Facebook community for stakeholders to share their experiences, ask questions and support each other.	All stakeholders	Continuous
4. Digital newsletter	A regularly newsletter send by email, consisting of information and examples regarding the healthier school canteen.	All stakeholders	Every 6-weeks.
5. Students' fact sheet	A summary of their students' wishes and needs regarding a healthier school canteen, to receive insight into the opinion of their students and how their students want to be involved.	Coordinator of the school, who will be asked to share this with other stakeholders.	Once, 2-4 weeks after the start.

## Outcomes

*Process evaluation:* All stakeholders involved in implementing the healthier school canteen will be asked to fill in an online questionnaire pre and post intervention. Demographics will be measured of stakeholders (e.g. age, gender) and school (e.g. offered education level, number of students).

The first process evaluation outcomes are perceived individual factors of the stakeholders and environmental factors that can affect the implementation process. Pre and post intervention, these individual factors (e.g. knowledge, self-efficacy and attitude regarding a healthier school canteen), as well as environmental factors affecting implementation (e.g. need for support, innovation and organisation) will be measured, based on the validated Theoretical Domain Framework questionnaire [99] and the Measurement Instrument for Determinants of Innovations [95] (Table 2.2).

The second process evaluation outcome is the quality of implementation. After 6 months, all stakeholders in the intervention group will be asked to evaluate the quality of each implementation tool. With an online questionnaire, quantitative process evaluation measures derived from the methodology of Saunders et al. [101] and Steckler and Linnan [102] will be measured. Fidelity will be measured with dose delivered and dose received. In addition, satisfaction will be measured. *Dose delivered:* Number of stakeholders to whom the tool was provided by the school canteen advisors. *Dose received:* Number of stakeholders who received and used the tool. *Satisfaction:* Participant's satisfaction with each tool. Additionally, objective data collection will be conducted by digitally logging the delivery and use of each online implementation tool. Moreover, after the intervention via open-ended questions in the questionnaire and during an evaluation meeting, all stakeholders will be asked to: explain their satisfaction score; give a short evaluation per implementation tool; give their positive and negative experiences overall; and to give their suggestions for improvements (qualitative data).

**Table 2.2.** Overview of the process and effect evaluation measures, assessed at stakeholders, students or canteens.

<b>Process evaluation measures <sup>a</sup></b>			
<i>Questionnaire for stakeholders (measured at T0 and T2)</i>			
<b>Measure</b>	<b>Response options</b>	<b>Concepts</b>	<b>Example</b>
Demographics	Frequencies, Multiple choice, Open question	Age, Gender, Function, Offered education level at school, Number of students	What is your main function at work?
Individual factors affecting implementation of the healthier school canteen	5-point Likert scale	Knowledge, Attitude, Self-efficacy, Social influence, Motivation, Routine, Intention, Skills, Professional Role, Behavioural Regulation	I have enough knowledge to create a healthier school canteen.
Environmental factors affecting implementation of the healthier school canteen	5-point Likert scale	Need for support, Innovation, Organisation, Current behaviour for school canteen	I need (more) support to adequately perform my activities for a healthier school canteen.
Overall evaluation of the implementation process <sup>b</sup>	Open-ended question	Positive experiences, Negative experiences, Suggestions for improvements	What suggestions would you give to a school that is just starting to create a healthier school canteen?
Quality of implementation <sup>a,b,c,d</sup>	Dichotomy and 5-point Likert scale	Dose delivered, Dose received, Satisfaction	Have you read/used the [implementation tool]? (yes/no) How satisfied are you with the [implementation tool]? (1-10)
<b>Effect evaluation measures</b>			
<i>Questionnaire purchase behaviour and determinants of purchase behaviour of students (measured at T0 and T2)</i>			
<b>Measure</b>	<b>Response options</b>	<b>Concepts</b>	<b>Example</b>
Demographics	Frequencies, Multiple choice	Age, Gender, Education level.	What is your current age?
Purchase behaviour of foods and drinks	Frequencies	In school at the counter In school at vending machines	How often per week do you buy fruits at the school counter?
Behavioural determinants of healthy purchase behaviour at school	5-point Likert scale	Attitude Perceived behavioural control Subjective norm	Next month, I intend to buy healthier products in the school canteen.
Environmental determinants of healthy eating behaviour during school time	Multiple choice	Breakfast behaviour Money spending at school Food and drinks brought from home Food and drinks bought outside school	I bring foods to school (0 - >5) times a week.

*table continues*

<i>Canteen Scan (measured at T0 and T2)</i>			
Measure	Response options	Concepts	Example
Health level of the canteen (availability and accessibility of healthier food and drinks)	Multiple choice	Basic conditions for all canteens	Encourages the school canteen people to drink water? (i.e. by water tap)
	Open Question	Percentage of available healthier food and drinks on display	Please enter all products on display (at the counter, in display cases and on racks) in the school canteen
	Open Question	Percentage of available healthier food and drinks in vending machines.	Please enter all products in the vending machine.
	Multiple choice	The canteen's accessibility criteria (to motivate people to select a healthier option)	Does the school canteen present fruit or vegetables in an attractive manner?

<sup>a</sup> Asked for each implementation component.

<sup>b</sup> Only measured at T2.

<sup>c</sup> Only measured by the stakeholders of the intervention schools.

<sup>d</sup> Also measured by logging the use digital.

*Effect evaluation:* The effectiveness of the implementation process will be evaluated by measuring at baseline and at follow-up after 6 months via 1) the self-reported purchase behaviour of students, and 2) the “health level” of the school canteen (Table 2.2).

The questionnaire to assess the primary outcome self-reported purchase behaviour of students, the behavioural determinants of purchase behaviour (Perceived behavioural control, attitude, and subjective norm of healthy eating in school) and the environmental determinants (like food brought from home, purchases during but outside school) is derived from existing validated Dutch questionnaires [103-107]. The frequency of food/beverage purchases per week in the school canteen/vending machines of products that are the ‘healthier products’ and products which should be consumed only occasionally, will be asked [78, 79]. The questionnaire will be reviewed and discussed on face validity and content validity by all project members involved. Thereafter, it will be pretested by respondents of the same age as the target group using the cognitive interview method think-aloud [108]. The aim of this pre-test is to get insight into respondents’ comprehensibility and the length of the questionnaire, to be able to adapt questions if needed [108]. The questionnaire will be administered digitally in a classroom setting in the presence of a teacher or researcher.

The secondary outcome “health level” of the school canteen will be measured with the online tool, “the Canteen Scan”. This tool was developed and improved and improved in an iterative process through a collaboration of researchers, professionals, schools, caterers, and experts on nutrition and health behaviour, and tested on its validity and inter-rated reliability [100, 109]. The Canteen Scan checks to what extent a canteen meets the Guidelines for Healthier Canteens and subsequently provides tailored advice for improvements. The three parts of the guidelines can be entered in this tool: 1) a set of basic conditions for all canteens, 2) the food and drink available on display and in vending machines, and 3) the accessibility of healthier food and drink products [78, 100].

Subsequently, the school canteen's current overall level (silver or gold), and a level for all three individual parts (in percentages) is indicated. Consequently, the health level of the canteen can be defined as: the available basic conditions, the available healthier food and drinks and meeting the accessibility criteria in the school canteen. The Canteen Scan will be filled out in all intervention and control schools by a school canteen advisor. Intervention schools will receive the outcome and feedback as part of the intervention. On the contrary, the control schools will not receive the results or feedback from the Canteen Scan.

### **Sample size**

The power calculation was based on the primary outcome, i.e. the self-reported purchase behaviour of healthier products per week. In this calculation we included an 80% power and a 5% significance level [110]. To detect a 10% difference in the proportion of purchasing healthier versus unhealthier products per week (dichotomous variable) between the intervention and control group, with the expected multi-level structure between schools (correlation of 0.05 between schools), and to obtain sufficient power (80%), we calculated that 1,505 students spread among 10 intervention and 10 control schools are needed. The increase of 10% in purchase behaviour of healthier products is based on results of comparable studies in schools [37]. Consequently, we aimed to recruit 20 schools and 100 students per school, based on an expected dropout rate of 10% [111].

### **Statistical analysis**

*Process evaluation:* To test for differences in factors affecting implementation perceived by stakeholders (dependent variable) between the intervention and control group (independent variable) after the intervention (6 months), linear two-level regression analysis will be used. The used levels will be: stakeholders (level 1) and schools (level 2) and we will adjust for baseline measurements. This analysis will be performed for each individual (e.g. knowledge, attitude, self-efficacy) and environmental factor (e.g. need for support, innovation). When these analyses show no significant difference between school variance, a linear regression analysis will be performed [110]. We hypothesize that the stakeholders in the intervention group will positively change their perceived factors due to the support in implementation.

To investigate the quality of implementation quantitatively (dose delivered, dose received and satisfaction) of each implementation tool, descriptive statistics will be used. This information will be complemented by qualitative data about the overall experiences of stakeholders. This data will be analysed in three rounds, following the thematic content approach [97]. First, answers will be labelled with descriptive codes. Second, the codes will be split or merged and interpretative codes will be created. Third, codes will be compared and overarching themes defined.

*Effect evaluation:* After the intervention, differences in the primary outcome 'purchase behaviour' of students (dependent variable) between the intervention and control group (independent variable) will be analysed with two-level regression analysis (intention-to-treat). Here, we will correct for correlations of students (level 1) nested within schools (level 2). We will adjust for confounders related to students (e.g. groups of sociodemographic characteristics, behavioural determinants, and environmental determinants). In addition, the moderation effect of gender will be taken into account by stratifying the analyses,



based on literature [112]. We hypothesize that students in the intervention group will achieve a healthier purchase behaviour.

After the intervention period, differences in the secondary outcome 'health level' of the canteen between the intervention and control schools will be investigated with descriptive statistics. Thereafter, to gain insight into the effect of the health level of canteens and purchase behaviour of students, we will include the health level of canteens in a per protocol analysis. This model will be built similar as the explained intention-to-treat analysis. All information is being gathered with rigor, so these analyses will show which factors make a difference in student behaviours, including implementation features. We hypothesize that intervention schools will improve their health level of the canteen, and that a healthier canteen will lead to healthier purchases. Statistical analyses will be performed using the IBM SPSS statistics version 24.0. MLwiN 2.36 software will be used to conduct the multilevel regression analyses. For all statistical analyses, a two-tailed and 5% significance level will be applied [110].

## DISCUSSION

This study design describes how we developed and will evaluate a plan to implement guidelines to create healthier canteens in secondary schools using a systematic theory and practice-based approach. The study aims to contribute to a feasible and effective implementation of healthier school canteen policy in secondary schools. We hypothesise that schools which will receive support to implement the guidelines, will offer healthier food and beverages and that these products will be more easily accessible in the canteens compared to schools that will not receive support. In addition, we hypothesize that this will be associated with healthier purchase behaviour of students in intervention schools.

Implementation of policy to limit the availability of less healthy food in schools is recommended [88] and seems effective [89]. However, it also faces challenges, like conflicts with time demands for other school activities, different interests of the stakeholders (e.g. financial profit vs. healthiness), or that the implementation materials will not be used as intended. These challenges may influence the feasibility and the effectiveness of the implementation process. Although these challenges will always be present, the involvement of stakeholders during the development phase and the combination with evidence-based knowledge, frameworks and behaviour change methods will result in a plan that effectively intervenes on identified challenges [58, 90]. Also, the proper process evaluation will inform us about the extent of these issues. Based on all knowledge this research creates, we are able to further improve the implementation plan.

A strength of this study is the involvement of stakeholders from research, policy and practice, which increases the support for and feasibility, usability and impact of the intervention [52, 86, 91]. As recommended, stakeholders were included in the development of the implementation plan and will be asked to share their experiences during implementation, in order to adapt the implementation tools if required [92]. Acknowledged by Shea et al. it is important to have specific competencies to participate in community-engaged dissemination and implementation research [113]. In the past years, the school canteen

advisors of the Netherlands Nutrition Centre have already built robust partnerships with relevant stakeholders regarding healthier canteens. On the one hand, our research project will benefit from the competencies, experiences and partnerships of the advisors. On the other hand, the existing school canteen programme will be improved based on the insights and results of this study.

In addition to stakeholders involvement, each school will be advised to include students in their implementation process. This because involvement of the target group facilitates implementation [70] and most students appreciate such involvement [17]. We can recommend, but not prescribe how schools should involve their students, as each school has its own culture and organizational structure. The fact sheet with students' needs and wishes will offer the schools insight into the opinion of their students and how they want to be involved. Our process evaluation will provide insight whether the school involved students in the implementation process.

Another strength is that we will evaluate the implementation plan using both effect and process outcomes. The effect of implementation will be measured at two levels, i) at the student level by assessing self-reported purchase behaviour and ii) at the school level by using the Canteen Scan to measure the availability and accessibility of food and drinks in the canteen. In the process evaluation, frequently used concepts of process evaluation (dose delivered, dose received, including use and satisfaction) will be used [101, 102]. In addition, changes in factors affecting implementation will be assessed, in accordance with the demand for this knowledge [51]. By this process evaluation we will be able to get some insight into which tools seem to contribute most to the implementation process. Although these conclusions should be interpreted carefully, as the tools are offered together and will probably also create a reinforcing effect.

Some limitations also need to be addressed. Measurement of the purchase behaviour of students will be based on self-reporting. Alternative methods to measure purchase behaviour (e.g. sales data, food measurement via observation and weighting of foods, or photographing the selected foods) have been investigated in previous studies [38, 114]. However, they were considered infeasible in our study because of the time and people involved, and the differences in registration yielding incomparable sales data. Moreover, questionnaires to measure purchase behaviour are commonly used in relation to consumption [88]. Nevertheless, sales data and purchase behaviour can be incongruent [38]. The second outcome, the level of the canteen will be measured with the Canteen Scan. This tool is able to measure the level of the canteen and to give tailored feedback how to improve this level. All intervention schools will receive the feedback as an implementation tool. It can be a limitation that the same tool is used as measurement and implementation tool. However, in this study the school canteen advisors will fill out the scan, and only the intervention schools will receive the results and tailored feedback.

This study provides an example how the identified needs of stakeholders can be combined with evidence-based theory to develop an implementation plan. This study will show the impact of implementing guidelines to create healthier canteens in Dutch secondary schools, with support of the developed implementation plan, on the canteen's health level and on the purchase behaviour of students. Also, the evaluation will show the appreciation, use

and recommendations of the implementation tools, according to stakeholders involved in the process of creating a healthier canteen. These insights will be used to improve the existing school canteen programme by supporting stakeholders to create a healthier school canteen.

### **List of abbreviations**

MIDI: Measurement Instrument for Determinants of Innovation [95]

BCW: Behaviour Change Wheel [96]

### **Acknowledgements**

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### **Contribution to the field statement**

Healthier school food environments encourage healthier food and drink choices among adolescents. The Netherlands Nutrition Centre developed the “Guidelines for Healthier Canteens” to improve the availability and accessibility of healthier food and drinks in canteens. Schools often experience barriers and need support to implement canteen guidelines and more knowledge is needed. This article describes: 1) how we developed a plan to support implementation of canteen guidelines in Dutch secondary schools; and 2) how we will evaluate this implementation plan on process and effect level. The process will be evaluated on factors affecting implementation perceived by stakeholders (e.g. caterers, school managers, canteen employees) and the quality of implementation. The effect will be evaluated by determining changes in the health level of canteens and in the self-reported purchase behaviour of adolescents.

To develop and evaluate the implementation plan, we used a theory and practice-based approach, with involvement of stakeholders throughout the process. This study will provide an example how the identified needs of stakeholders can be combined with evidence-based theory to develop an implementation plan. The evaluation will show the appreciation, use and recommendations of the implementation tools, according to stakeholders involved at the process of creating a healthier canteen. In the Netherlands, results of this study will be used to improve the existing programme by supporting stakeholders to create a healthier school canteen.









# CHAPTER 3

## What do secondary schools need to create healthier canteens? The development of an implementation plan

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## **ABSTRACT**

### **Introduction**

The Netherlands Nutrition Centre developed guidelines to improve the availability and accessibility of healthier food products in Dutch canteens. This paper describes the development of an implementation plan to facilitate implementation of Guidelines for Healthier Canteens in Dutch secondary schools.

### **Methods**

In cooperation with stakeholders (i.e. school/caterer managers/employees, school canteen advisors, researchers) and based on theory, we developed an implementation plan in three steps. First, we identified factors that impede/facilitate stakeholders to create a healthier school canteen during 14 interviews. Second, 25 experts discussed and prioritized these identified factors in an expert meeting. Third, by making use of behaviour change taxonomies and evidence-based implementation strategies, we translated these factors into tools to be included in the implementation plan.

### **Results**

The plan aims to support stakeholders in implementing a healthier school canteen and consists of five tools: 1) a tailored advice based on an online questionnaire to assess schools' and stakeholders' context and the Canteen Scan (i.e. an online tool to assess the availability and accessibility of food/drink products); 2) communication materials with information and examples; 3) online community for support by sharing experiences/questions; 4) digital newsletter as reminder/support; 5) fact sheet with students' needs/wishes to tailor the canteen.

### **Discussion**

This study illustrates how collaboration with science and practice resulted in a tailored implementation plan aimed to support schools to adhere to school canteen policy. This development serves as a good example for researchers, policymakers, and health practitioners how to create an implementation plan that fits the needs and tasks of stakeholders.



## INTRODUCTION

Despite the known benefits of healthy nutrition, most people including adolescents do not comply with dietary recommendations [8, 115]. It is known that early recommendations, including in adolescence, play an important role in developing and maintaining healthy eating habits that track into adulthood [10, 14]. Healthy school food environments encourage adolescents to make healthier choices and thereby improving their dietary behaviour [27, 38]. In this context, school food policy has been shown promising to positively influence adolescent dietary behaviour [37]. Since many students purchase and consume multiple drinks, snacks and meals during their school day, a healthier school canteen plays a role [116]. Studies in the Netherlands found that youth (aged 9-18) eat 15% of their total food and drink intake per day at school [4] and that, even though most Dutch students (aged 12-18 year) bring their own lunches from home, they buy complementary foods (snacks and drinks) in the school canteen [32].

The Dutch Healthy School Canteen Programme supports secondary schools in the creation of healthier school canteens [73]. In the programme, school canteen advisors (nutritionists) from the Netherlands Nutrition Centre visit schools to provide information and advice, send regular newsletters and maintain a website with information and examples about a healthier canteen. This programme has been evaluated positively [73, 74]. As the government increased their focus on healthier canteens [75, 76], the Netherlands Nutrition Centre developed the “Guidelines for Healthier Canteens” in 2014 [78]. These guidelines, applicable to school canteens, canteens of sports clubs and worksite cafeterias, aim to improve the availability and accessibility of healthier food and drink products [78]. However, it is known that insufficient implementation results in meagre use and effectiveness of policy/guidelines [36, 39, 74, 117]. Besides, until now, the specific support needed to implement the guidelines in Dutch secondary schools remains unknown.

Research suggests that practical and feasible implementation support plans can improve the uptake, implementation, maintenance and effectiveness of school canteen policy [50, 89, 118, 119]. While numerous partly overlapping theories and frameworks can be used to guide and improve this process [59-61], a theory-based implementation plan needs to take into account schools’ contextual factors, as well as the needs of different involved stakeholders [120-122]. An effective implementation plan therefore consists of a combination of a range of implementation tools, based on evidence-based implementation strategies affecting these identified changeable factors [56, 58, 60]. Although studies have shown that tailored implementation strategies can support schools in improving their food environment, for example through education, modelling, training, monitoring and feedback [50, 51, 89, 123], knowledge about which specific strategies are needed to support Dutch schools in implementing the Guidelines for Healthier Canteens remains unknown. To enhance reproducibility, allow for comparison with other studies, and to increase use in practice a full description of the development and content of an implementation plan is necessary [54, 56, 65]. The purpose of this paper is to describe the development of and tools for such an implementation plan to facilitate implementation of the Guidelines for Healthier Canteens in Dutch secondary schools.



## METHODS

This study, conducted between January and October 2015, involved three steps to develop the implementation plan guided by the “Grol and Wensing Implementation of Change Model” [60] and the Intervention Mapping protocol [58] (see Figure 3.1). Both models integrate and emphasize the use of theory, evidence and stakeholder involvement and have overlapping steps [58, 60]. The Implementation of Change Model was chosen because it provides clear guidance for the needs assessments and selection of determinants to change, while the Intervention Mapping approach provides a more extensive guide to selecting behaviour change methods, strategies and materials. To understand which factors stakeholders perceive as impeding or facilitating the implementation of the canteen guidelines, we first performed a qualitative study consisting of semi-structured interviews. The Measurement Instrument of Determinants in Innovations (MIDI) [95] and the Behavioural Change Wheel (BCW) [96] were used to develop the interview guide. Second, to reach consensus about the factors that should be addressed by the implementation plan, we prioritized the identified factors through an expert meeting using the World Café Method [98]. Third, to create implementation tools that influence these factors, we used Behavioural Change Taxonomies [62, 64] to select behavioural change methods and evidence-based implementation strategies [65], which were then specified into tools and together formed the implementation plan.

<b>Step 1: Identification of factors that impede or facilitate implementation</b>	
<i>What</i>	<i>Input</i>
To recruit participants based on their level of experience:	- Rogers' diffusion of innovation theory [94]
To define the interview guide:	- Measurement Instrument for Determinants of Innovation [95]
	- The Behavioural Change Wheel [96]
<b>Step 2: Prioritization of factors</b>	
<i>What</i>	<i>Input</i>
To organise the factors to let stakeholder prioritise them:	- Stage Theory of Organizational Change [125]
To structure the discussion among stakeholders:	- World Café Method [98]
<b>Step 3: Selecting evidence-based implementation strategies and tools</b>	
<i>What</i>	<i>Input</i>
To translate factors into methods:	- Using Behaviour Change Taxonomies [62, 64]
To translate methods into strategies:	- Evidence-based Implementation Strategy Compilation [65]
To specify the strategies into tools:	- Input from international studies to implementation of school health promotion, among others school canteens policy/guidelines
	- Input from experts in the field of health promotion policy, practice and science
	- Use of existing tools of the Dutch Healthy School Canteen Program

**Figure 3.1.** The three-step approach used to develop the implementation plan.

## The Dutch Guidelines for Healthier Canteens

The implementation plan was developed to support implementation of the ‘Guidelines for Healthier Canteens’ in Dutch secondary schools. According to these guidelines, school canteens should offer a majority of healthier products and promote these products through accessibility criteria [78]. Healthier products are defined as the foods and drinks included in the Dutch nutritional guidelines the “Wheel of Five”, such as fruits, vegetables, whole grain bread, low fat dairy and water [79], and products that, while not included in the “Wheel of Five”, contain a limited amount of calories, saturated fat and sodium . In addition, accessibility is defined by nine criteria to promote these healthier products, such as placement of healthier products in the most eye-catching locations and attractive presentation of fruit and vegetables [78].

Several stakeholders are involved in creating a healthier canteen. Which and how they are involved can differ. Dutch school canteens can be run by the school itself, by an external catering company, or by a combination of these two. As mentioned, schools can receive support from school canteen advisors from the Netherlands Nutrition Centre and, in some municipalities, local community health promoters also support schools. In most schools, a teacher or facility manager coordinates the involved activities in consultation with the school management. The school canteen itself is mostly run by the canteen manager or canteen employee, of the school itself or an external caterer. Sometimes, students and/or parents are involved in volunteering in the canteen or contribute to the preparation of food.

As mentioned, the development of the implementation plan consisted of three steps. These were: 1) identification of factors that impede or facilitate implementation; 2) prioritization of these factors; and 3) development of implementation strategies and tools.

### Step 1: Identification of factors that impede or facilitate implementation Participants

We conducted 14 semi-structured interviews with 18 different stakeholders to identify experienced and expected factors that may impede or facilitate creating a healthier school canteen using the guidelines. Invitations were sent to 15 stakeholders, one of whom was unable to attend due to organizational changes. Four other participants proposed being interviewed together with an involved colleague. In order to collect a range of experiences and opinions, participants were sampled as “users” (i.e. people who decide about the product offer and product display and will potentially use the “Guidelines for Healthier Canteens”), and “stakeholders on organization level” (i.e. school and caterer managers). Users included school canteen advisors of the Netherlands Nutrition Centre (n=2), school canteen employees (n=1), and school canteen managers (n=5). “Stakeholders on organization level” included caterers (n=7), school directors (n=2), and a food supplier (n=1). During recruitment, participants experiences with a healthier canteen were also taken into account in order to recruit participants, based on Rogers’ diffusion of innovation theory [94], innovators (n=6), majority (n=10), and laggards (n=2).

### Instrumentation and procedure

After written informed consent was obtained, participants received the guidelines. The topic list, which drew upon the MIDI and the BCW [95, 96], was optimized on the

basis of the interviews. The main topics were context, experiences, opinions about the guidelines, desired support and solutions and completion. The interviews were performed by a trained researcher (*Blinded for review*), with a second researcher taking notes during the interviews. The audio-taped interviews were between 59 and 88 minutes, and took place between March and May 2015. As the last two interviews did not reveal any new information, it was decided that data-saturation was reached. The interviews were transcribed verbatim, and the summary was validated by each participant.

### **Data analysis**

The thematic content approach was used to analyse the data in three steps: open (label excerpts of the transcripts with descriptive codes), axial (create codes that reflects multiple text fragments and create interpretative codes) and selective coding (compare codes between interviews, to look for correlations) [97, 124]. This coding process was performed by two researchers, in alignment with each other and with a third researcher (*Blinded for review*), and discussed in the project team.

## **Step 2: Prioritization of factors**

### **Participants**

To prioritize all identified factors and to generate potential solutions, an expert meeting was organized. Of the 30 experts invited, 5 were not able to attend. Of the 25 experts who did, experts worked in research (n=10), in policy (n=4), and in practice (n=11). Attendees included researchers in the field of implementation science and nutrition, school canteen advisors from the Netherlands Nutrition Centre, school facility managers, and representatives of caterers. The expert meeting was led by an external chair and minutes were taken by a fellow researcher.

### **Instrumentation and procedure**

In preparation for the expert meeting, we organized the identified factors that may impede or facilitate creating a healthier canteen into three stages derived from the Stage Theory of Organizational Change [125]: 1) awareness; 2) preparation; and 3) action. During the expert meeting, for each of these three stages of change consensus was achieved about which factors were most important and modifiable and should be addressed with the implementation plan [60]. This was performed by first individually ranking. In addition, missing factors were added by each stakeholder. Next, consensus about the factors was reached during a plenary discussion. Thereafter, a World Café Method [98] was used to reveal and discuss potential actions. This method involved that six subgroups came up with activities to change one of the six highest ranked factors. Subsequently, each subgroup provided their feedback, before finally presenting their proposed actions.

## **Step 3: Development of implementation strategies and tools**

### **Procedure and data analysis**

To translate the prioritized factors into implementation tools, we performed three sub-tasks [58, 60]. First, the identified factors were translated into behaviour change methods, which are methods that can influence determinants of behaviour and environmental conditions of the target population [58]. For example, to increase the determinant attitude, the method Elaboration was selected [62]. To select a behaviour change method which really addresses the identified factors, behaviour change taxonomies were used [62, 64].

So, guided by these taxonomies and in discussion with three researchers, the prioritised factors were linked to behaviour change methods. Second, the behaviour change methods were linked to corresponding and effective implementation strategies, techniques to enhance the adoption, implementation and sustainability of a programme/guideline [54]. In our study, we selected strategies as defined by Powell et al (2015) [65]. Third, the chosen strategies were specified into implementation tools by defining the mode of delivery, actor, dose, and the target group [54, 126]; using the input from the step 2 expert meeting; and reviewing evidence-based implementation strategies and plans and the current materials of the Healthy School Canteen Programme [52, 73, 117, 127, 128]. To select strategies and specification of tools, one researcher made a proposal, which was then discussed in the project team. During the selection of strategies and tools, the effectiveness and investment for practice were taken into account (e.g. financial, time consumption, alignment with stakeholders' work processes) [52, 60]. To ensure that all prioritized factors are part of the implementation plan, a variety of strategies were chosen. We also aimed for inclusion of a mixture of dose (e.g. once, 6-weekly, or if needed), mode of delivery (e.g. real life, paper-based, internet-based or email) and users (e.g. management, coordinator of school, canteen employee) [60, 126, 129]. Final decisions about the chosen strategies and tools were made during discussions with the researchers, organizations and stakeholders in the field; the Netherlands Nutrition Centre, the Community Health Service Amsterdam, "Young People at a Healthy Weight (JOGG)", caterers and schools. All tools were then bundled into the implementation plan.

## RESULTS

### **Step 1: Identification of factors that impede or facilitate implementation**

As Table 3.1 shows, the interviews resulted in four themes related to creating a healthy school canteen: (1) individual determinants, e.g. lack of knowledge about the canteen guidelines and healthier food options, and insight into the current level in the canteen; (2) commitment of and collaboration with involved stakeholders, both inside and outside the school, including canteen employees, school management, parents, students, caterer and school canteen advisors; (3) school conditions, such as maintaining the initiated policy, keeping the management involved and receiving enough support, financial and time; and (4) environmental conditions, such as the tension between the school canteen and suppliers outside the school.

**Table 3.1.** Factors and related quotes identified during the interviews and prioritized during the expert meeting, arranged by theme.

<b>Theme</b>	<b>Related factor <sup>a</sup></b>	<b>Related quote from the interviews</b>
Individual determinants of involved stakeholders	<ul style="list-style-type: none"> <li>- <b>Being motivated and enthusiastic to work towards a healthier canteen (quote 1).</b></li> <li>- <b>Having insight into individual/organizational characteristics.</b></li> <li>- <b>Having insight into the level of their canteen (availability and accessibility) (quote 2).</b></li> <li>- <b>Having insight into options how to improve their canteen (quote 3).</b></li> <li>- <b>Having and applying knowledge, to create a healthier canteen (quote 4).</b></li> <li>- <b>Having a positive attitude towards a healthier canteen.</b></li> <li>- Having positive self-efficacy to perform activities with regard to a healthier canteen.</li> <li>- Having a coordinator/management of the school who takes the lead in getting a healthier canteen.</li> <li>- Being able to create an action plan to create a healthier canteen.</li> <li>- Knowing where to get support.</li> </ul>	<p>(1): "The enthusiasm of the staff is very important."</p> <p>(2): "For me it is unclear, which product I can/cannot place in our canteen. [...] Like a bread with cheese on it, is that ok to offer that in the canteen?"</p> <p>(3): "The canteen is clean and tidy, but doesn't have an attractive presentation to buy food and drinks like a shop. At this moment, I have no idea how to change this."</p> <p>(4): "It is difficult [to decide what a healthier/less healthy product is], you hear conflicting stories."</p>
Broad commitment of and collaboration with involved stakeholders inside and outside school	<ul style="list-style-type: none"> <li>- <b>Having/maintaining good collaboration/support with/from students, parents, teachers, management, caterer, canteen employee (quote 5).</b></li> <li>- <b>All stakeholders having a sense of ownership.</b></li> <li>- <b>Developing healthy school (canteen) policy together.</b></li> <li>- Having/maintaining good collaboration/support with/from school canteen advisors (quote 6), community health service, caterer, food supplier (quote 7).</li> <li>- Having a school canteen working group with different stakeholders (quote 8).</li> <li>- Sharing ideas, aims and experiences about a healthier school canteen inside/outside school (quote 9).</li> <li>- Having insight into the target group (students).</li> </ul>	<p>(5): "If you want to have behavioural change, you need to have a conversation with parents, students and staff from the school to tune it together."</p> <p>(6) "I think I have very good contact with them [school canteen advisors] [...] I found them very pleasant to work with."</p> <p>(7) "[...] full fat yogurt is not really what I want to serve because then I do not comply with the requirements. So, they [suppliers] offer us a low-fat yogurt alternative, they did it for us."</p> <p>(8): "It is important that the caterer involves the students. If the caterer creates wonderful things but the students do not like it, it won't not be a success. So, in that respect I think it's good that all three of us [also school] attend."</p> <p>(9): "I do not know what students really want. I'm really curious because I think there are opportunities."</p>
Schools conditions	<ul style="list-style-type: none"> <li>- <b>Maintaining and monitoring the canteen/activities.</b></li> <li>- <b>The management remains involved, supports the initiated policy and acknowledges that the school has a responsibility to their students to offer a healthier canteen (quote 10).</b></li> </ul>	<p>(10): "There is no time, no money and no interest. [...]. We spoke to different facility managers who said they have suggested and proposed ideas but it is simply not on the agenda."</p>

*table continues*

Theme	Related factor <sup>a</sup>	Related quote from the interviews
Schools conditions	<ul style="list-style-type: none"> <li>- Having positive finances in a feasible business model (<i>quote 11</i>).</li> <li>- Having and perceiving sufficient time, money, employees and facilities to work towards a healthier school canteen (<i>quote 12</i>).</li> <li>- Having confidence and good relationship between school and caterer.</li> </ul>	<p>(11): "I notice that there are no revenue targets for a school. Actually, the goal is to break even, the canteen should not cost money. But the caterer has a revenue model because they need to earn a living."</p> <p>(12): "Sometimes you lack time, and then you get a "It's okay like this" attitude."</p>
Environmental conditions	<ul style="list-style-type: none"> <li>- Collaboration between nearby food providers and school (<i>quote 13</i>).</li> <li>- Having broad support in all school activities (<i>quote 14</i>).</li> <li>- Providing a canteen that can compete with food provisions outside school.</li> </ul>	<p>(13): "I think it is mission impossible if there are supermarkets around the school that sell all sorts of tempting stuff, but you cannot close your school."</p> <p>(14): "I also think it depends on location. It depends on whether there are a lot of tempting places in the area or none at all, but a closed square policy would be the best."</p>

<sup>a</sup> In bold, the factors prioritized highest in the expert meeting.

## Step 2: Prioritization of factors

Factors were prioritized according to the stage of change a school could be in (i.e. awareness, preparation or action). For the awareness stage, experts emphasized the importance that involved stakeholders are motivated, enthusiastic and have a positive attitude towards creating a healthy canteen. Next, consensus was reached that, at the preparation stage, stakeholders need insight into the current canteen's/organizational situation, and that the stakeholders in the school need support from students, parents and colleagues. The management need to facilitate this support. Finally, it was mentioned that, at the action stage, stakeholders need to be able to apply the knowledge to create a healthy, balanced canteen with regard to the offering and accessibility. In addition, they need to be able to create a financial plan, to maintain the intended policy and to collaborate with students, parents and teachers.

For the whole process of creating a healthier school canteen, the experts emphasized that it is important: to create ownership by stakeholders in the school; to assign responsible people to each action in the school; that involved stakeholders receive support from their organization; and to involve multiple stakeholders in each school in the implementation process, including a visible, committed leader and students. To achieve this, they discussed possible activities to inform step 3, such as measuring the current level of the canteen, providing tailored advice, providing examples of healthy canteens and healthier products, and enabling schools to share their experiences to learn from each other's successes and challenges. These options were taken into account in step 3.

## Step 3: Development of implementation strategies and tools

Describing the prioritized factors as objectives, we translated them into behavioural change methods, implementation strategies and finally specified them into implementation tools (Figure 3.2). These steps led to multiple implementation tools, that are a combination of adapted existing and new developed tools. These are outlined in Table 3.2: a questionnaire to assess the schools' and stakeholders' context, an online 'Canteen Scan', an advisory

meeting and report, communication materials, an online community, a digital newsletter and a students' fact sheet. Advisors of the Netherlands Nutrition Centre are advised to offer all implementation tools to all school. The tools chosen were created so as to be suitable for different stages of change: some schools are starting, while others are more experienced in implementing a healthier canteen. The tools can also be tailored to the context of the school and the needs of the stakeholders. For example, the content of the advisory meeting is guided by the results of the Canteen Scan and accompanying actions are formulated together.

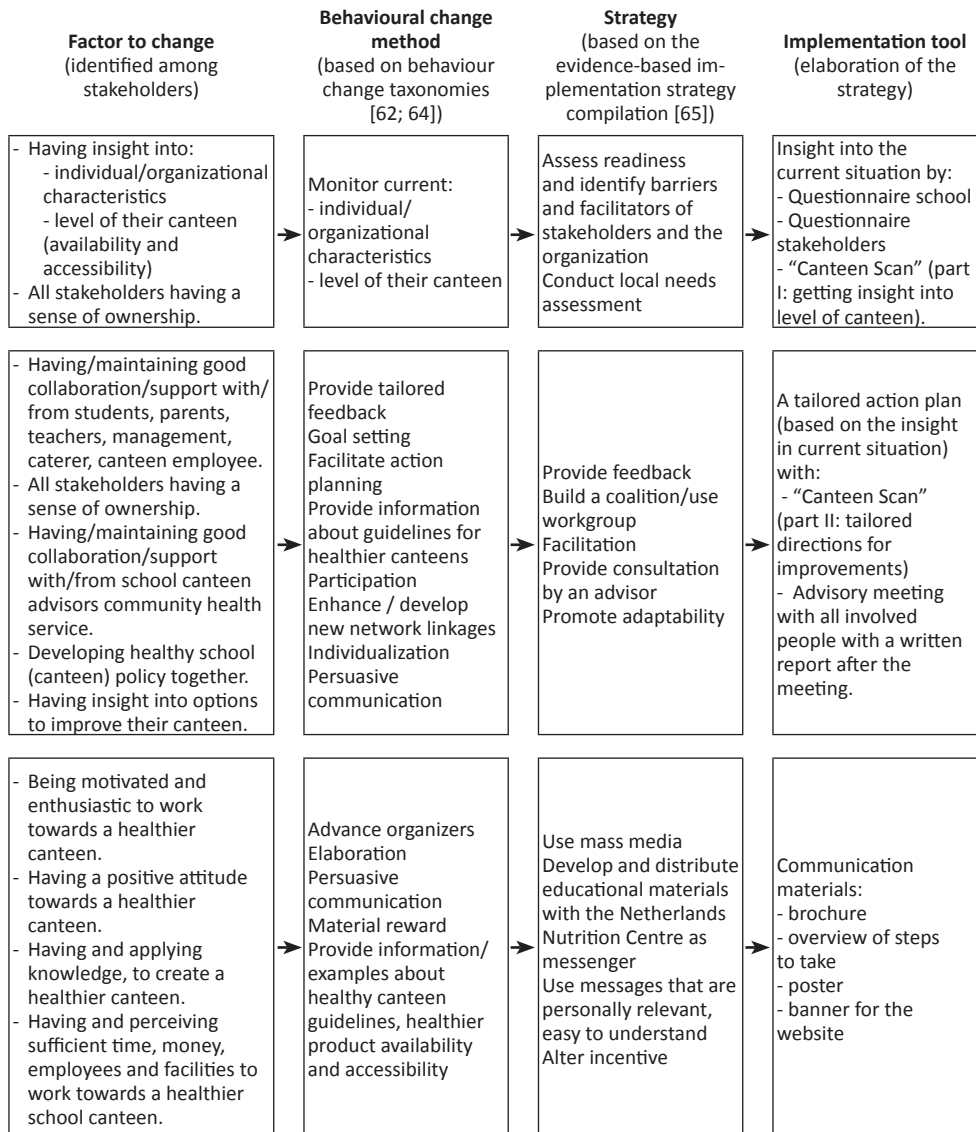
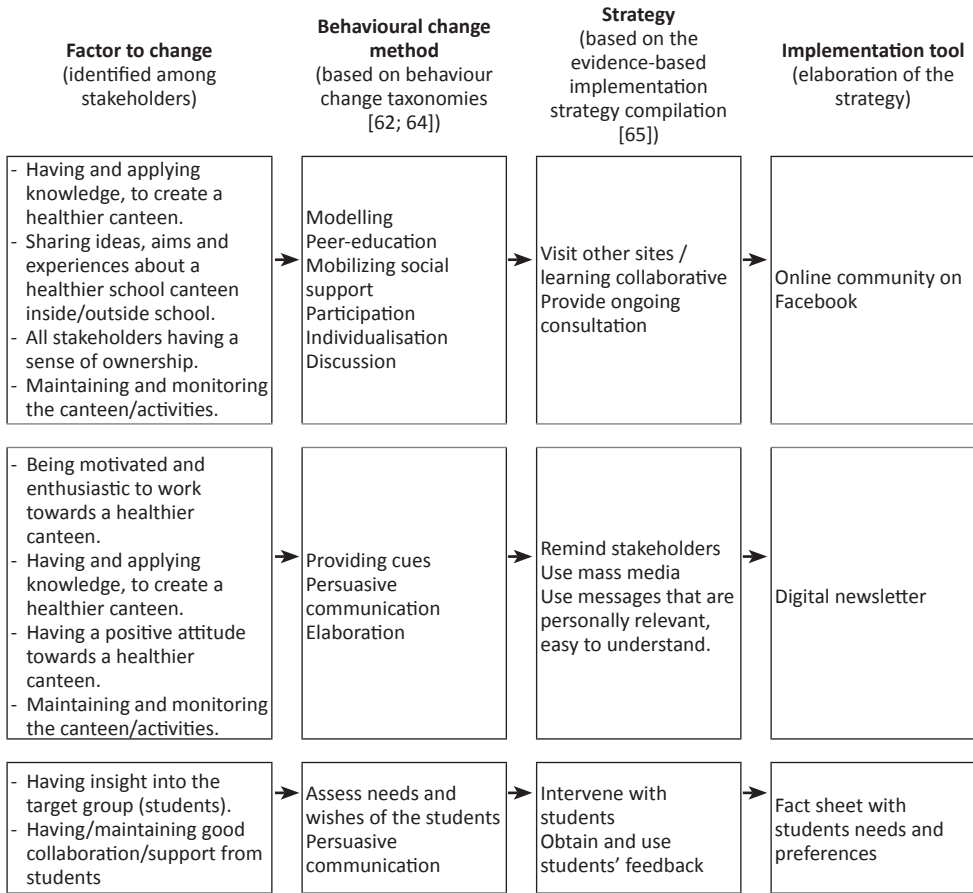


figure continues



**Figure 3.2.** Overview of the translation from factors to implementation tools, via behavioural change methods and strategies.



**Table 3.2.** Description of the implementation plan to implement the Guidelines for Healthier Canteens<sup>a</sup>.

<b>Implementation tool</b>	<b>Action and targets</b>	<b>Target group</b>	<b>Period</b>
<b>1. Insight into the current situation</b>			
<i>1.1: Questionnaire, school</i>	An online questionnaire to assess the characteristics of the school. The school specific results provide input for the advisory meeting.	Coordinator of the school	At the start, before the advisory meeting
<i>1.2: Questionnaire, stakeholders</i>	An online questionnaire to assess stakeholders' characteristics, and their individual and environmental determinants. The school specific results provide input for the advisory meeting.	All involved stakeholders	At the start, before the advisory meeting
<i>1.3: 'Canteen Scan'</i>	An online tool to assess the level of the canteen. It provides (I) insight into, and (II) directions for improvement of, the availability and accessibility of food and drink products of the school canteen[100].	Performed by a school canteen advisor of the Netherlands Nutrition Centre. Results and feedback are provided to all involved stakeholders.	At the start, before the advisory meeting
	To create ownership and insight into the changes so far, the school receives information to fill out the Canteen Scan by themselves if they wanted.	Performed by the school coordinator.	After three months
<i>1.4: Advisory meeting and report<sup>†</sup></i>	In one advisory meeting per school, all involved stakeholders are advised about how to improve the canteen by a school canteen advisor of the Netherlands Nutrition Centre. Based on the points of attention, identified with the two questionnaires and the Canteen Scan a concrete action plan will be developed during the meeting. This action plan is created together it will increase ownership and collaboration. After the meeting, a written report based on this meeting is distributed by email.	All involved stakeholders	At the start of implementation
<b>2. Communication materials<sup>†</sup></b>	Several materials are handed to each school: A brochure about the Guidelines for Healthier Canteens; an overview of the steps to take; a personalized poster; a banner for the schools' website. The materials aim to create motivation and to increase and apply knowledge.	Coordinator of the school, who is asked to share this with other stakeholders.	At the start and halfway implementation

*table continues*

3. Online community	A closed Facebook community for stakeholders, to share their experiences, ask questions and support each other.	All stakeholders	Continuous
<b>Implementation tool</b>	<b>Action and targets</b>	<b>Target group</b>	<b>Period</b>
4. Digital newsletter <sup>†</sup>	A regularly newsletter sent by email. It consists of information and good examples regarding the healthy school canteen. It aims to support, remind and motivate stakeholders.	All stakeholders	Every 6-week.
5. Students' fact sheet	A summary of each schools' own students' wishes and needs with regard to a healthier school canteen, based on the results of a student's questionnaire. It gives schools insight into the opinions of their students and how their students want to be involved.	Coordinator of the school, who is asked to share this with other stakeholders.	Once, 2-4 weeks after the start.

<sup>‡</sup>This table is adapted from the version published in the design paper [130].

<sup>†</sup>This tool was an existing tool of the Healthy School Canteen Program, but was improved/adapted to support implementation of the Guidelines for Healthier Canteens.

## DISCUSSION

In this study we systematically developed a plan to facilitate implementation of the Guidelines for Healthier Canteens in Dutch secondary schools. We integrated the involvement of stakeholders and school canteen advisors, the use of behaviour change taxonomies, evidence-based implementation strategies and experiences with the Healthy School Canteen Programme in the Netherlands. This resulted in a plan consisting of several tools, supported by practice and evidence, and aligned to the needs of schools. In order to optimize the effectiveness and usability of the implementation plan, the tools cover a range of different doses, modes of delivery and target groups [60, 126, 129].

The implementation plan is designed to address multiple factors which enable or impede implementation of the Guidelines for Healthier Canteens. These factors were identified by different stakeholders. Identification of the needs of stakeholders in implementing school canteen guidelines is an important first step in developing implementation tools [58]. In addition, it aims to create a positive environment, which is likely to improve the uptake of the developed implementation plan [129]. Our study identified the following factors that can impede or facilitate implementation of healthier canteen guidelines: (1) individual determinants (e.g. positive motivation, attitude towards a healthier canteen); (2) commitment of and collaboration with involved stakeholders; (3) school conditions (e.g. support of management, monitoring the canteen); and (4) environmental conditions (e.g. collaboration with nearby food suppliers). These results are comparable to identified factors that enable health promotion in schools in general, for example good collaboration, clear communication, support of management and sufficient time/staff [69-71]. Supporting ownership is a common and important factor that may facilitate the implementation of school health policy [50]. Stakeholders in our study also identified ownership as a need to create a healthier canteen. Such ownership can be increased by creating goals and actions aligned to and in participation with stakeholders and receiving tailored feedback [58, 131]. Consequently, in our plan it is advised to invite all stakeholders to the advisory

meeting, in order to create aims and actions together, based on the insight received into their characteristics, the school's context and the level of the canteen.

Our implementation plan uses implementation strategies that have shown positive results in support implementation in previous studies, such as audit, feedback, monitoring, education, information, incentives and sharing knowledge and experiences [50, 89]. Mclsaac (2016) also emphasized the importance of tailoring tools to the individual needs of schools to support implementation [50], as it is easier for schools to perform and maintain actions aligned to their system, organizational culture and circumstances [50, 70, 129]. Whether our plan will indeed support implementation needs investigation through the planned effect and process evaluation [132].

A strength of our study is that we developed implementation tools that can be tailored to the needs of a specific school, to the school's context and to the implementation phase, as some schools are just starting with implementing a healthy school canteen while others have been involved in the healthy school canteen for years. One example of an implementation tool that can be tailored is the advisory meeting. This meeting aims to align the actions to the school by discussing common aims, actions and actors for implementation with the involved stakeholders, such as school managers, caterers, school canteen employees and involved teachers.

Another strength of our study is its use of existing theoretical frameworks to guide the development of implementation tools. To be able to perform our study systematically and to integrate this with practical experiences, we used a combination of two intervention development frameworks in the development of the tools: "Grol and Wensing Implementation of Change Model" and the Intervention Mapping approach [58, 60].

In addition, we used the "Measurement Instrument of Determinants in Innovations" (MIDI) and the "Behaviour Change Wheel" (BCW) to guide the interviews. Using these frameworks, enabled identification of factors that hinder or facilitate implementation on multiple levels: individual, organizational, innovation and environmental. To improve proper implementation, we addressed all these factors in the implementation plan [133].

A third strength of our study is the detailed description of the development of our implementation plan. Such a comprehensive description enables comparison of results between studies, and gaining further knowledge about selection of implementation strategies [54, 65, 66, 122]. A clear description of the development and content of the implementation tools can also increase its use in practice [122]. A review of effective strategies to improve implementation of school-based health programmes recommends performing high quality studies to improve the evidence of effective implementation of school canteen policy [51]. This study contributes to this area of knowledge.

Although it is widely recommended and has proven to be effective, collaboration with practice during the development of an implementation plan is not always applied, [52, 56, 70]. Therefore, another strength of our study is the intensive collaboration with stakeholders with a diverse background in research, policy and practice throughout each step of our development process [56, 58]. This breadth revealed factors that varied across stakeholders' function and stage of change. This comprehensive insight led

to an implementation plan that is usable and feasible for a wide range of schools and stakeholders [129]. Besides, the implementation plan is aligned with the existing Healthy School Canteen Programme, in which school canteen advisors support schools towards a healthier canteen [73, 127]. Connecting to daily practice facilitates more sustainable implementation [70, 129].

### **Limitations**

One limitation of our study is that we did not involve students as stakeholders during the development of our implementation plan. Since involvement of students in creating a healthier canteen was identified as a need in our study, and also in previous research [70], and valuing their input is found to be important [17], we advise schools to take into account students' opinions and needs in the process of creating a healthier canteen. We facilitate this by offering the student fact sheet with school-specific information about students' needs and wishes. In addition, during the advisory meeting, schools are encouraged to involve students, although how to do this is not specified to allow for local tailoring. While this freedom for schools to choose how they want to involve students can be regarded as a strength, as schools can align this to their own cultural and organizational habits, it could also be a potential limitation, as schools are not supported in this process.

Another possible limitation is that our implementation plan does not consider the outside school environment, such as supermarkets and cafeterias, which may encourage students to consume unhealthy foods and drinks during or around school time. As interviews with stakeholders identified concerns about this outside school environment, in the advisory meeting we encourage schools to address this topic. One example of a solution was to create policy to oblige students to stay in the school yard during breaks. Another identified point of concern, and possible limitation was the influence of parents, who have a major influence on and are also responsible for their children's nutritional behaviour [134]. Good collaboration with and involvement of parents is therefore important. Although our implementation plan advises schools to involve parents, they indicate that they perceive this as difficult. Future studies should investigate how parents can be reached and how they can be involved in creating a healthier canteen [70].

### **Implications for policy and practice**

School canteen guidelines can support schools to make such changes in a canteen. However, it is well known that support of implementation tools is required to ensure that the guidelines are properly applied in practice [39]. This article describes how we combined identified needs of stakeholders with evidence-based theory to develop stepwise an implementation plan. This development serves as a good example for other researchers, policymakers, and school health practitioners how create an implementation plan aligned to the needs of various stakeholders.

The described implementation plan consists of multiple tools, which together aims to support stakeholders in creating a healthier canteen. The tools can be tailored, so it is possible to deliver each school the support they need. Also, each stakeholder can choose to use the tool that fits their practice. Although some tools described in this manuscript will be translatable to other regions and settings, we advise users also to include their local

stakeholders in order to make an implementation plan tailored to their own end users.

### **Conclusions**

This study illustrates the application of a stepwise systematic method for the development of an implementation plan. This resulted in an evidence-based implementation plan, that allows tailoring, aimed to support secondary schools in creating a healthier canteen. Future studies to investigate the effects of this implementation plan in practice are planned. Although this plan needs to be adjusted for the use in other contexts, this study can be used as an example approach to develop an implementation plan that is supported by both science and practice.

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# CHAPTER 4

## Development of the “Canteen Scan”: an online tool to monitor implementation of healthy canteen guidelines

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## ABSTRACT

### Introduction

To improve the availability and accessibility of healthier food and drinks in schools, sports and worksites canteens, national Guidelines for Healthier Canteens were developed by the Netherlands Nutrition Centre. Until now, no tool was available to monitor implementation of these guidelines. This study developed and assessed the content validity and usability of an online tool (the “Canteen Scan”) that provides insight into and directions for improvement of healthier food products in canteens.

### Methods

The Canteen Scan was developed using a three-step iterative process. First, preliminary measures and items to evaluate adherence to the guidelines were developed based on literature, and on discussions and pre-tests with end-users and experts from science, policy and practice. Second, content validity of a paper version of the Canteen Scan was assessed among five end-users. Third, the online Canteen Scan was pilot tested among end-users representing school canteens. Usability was measured by comprehensibility, user-friendliness, feasibility, time investment, and satisfaction.

### Results

The content validity of the Canteen Scan was ensured by reaching agreement between stakeholders representing science, policy and practice. The scan consists of five elements: 1) basic conditions (e.g. encouragement to drink water and availability of policy regarding the guidelines), 2) product availability offered on displays (counter, shelf) and 3) in vending machines, 4) product accessibility (e.g. promotion and placement of products), and 5) an overall score based on the former elements and tailored feedback for creating a healthier canteen. The scan automatically classifies products into healthier or less healthy products. Pilot tests indicated good usability of the tool, with mean scores of 4.0-4.6 (5-point Likert scale) on the concepts comprehensibility, user-friendliness and feasibility.

### Conclusion

The Canteen Scan provides insight into the extent to which canteens meet the Dutch Guidelines for Healthier Canteens. It also provides tailored feedback to support adjustments towards a healthier canteen and with the scan changes over time can be monitored. Pilot tests show this tool to be usable in practice.

## INTRODUCTION

Although average life expectancy has increased, in general people have more unhealthy life-years, particularly due to an increase in premature non-communicable diseases including cardiovascular diseases, diabetes and cancer [11, 135, 136]. An unhealthy diet is one of the drivers of this trend [6]. Dietary behaviour has shown an unfavourable change, influenced by factors on the individual level like behavioural determinants and demographic factors as well as factors within the food environment [137, 138]. Public food settings have tended to increase the offer (availability), placement and promotion (accessibility) of unhealthy calorie-dense food and beverages [16]. These changes encourage people to consume these foods and drinks more frequently [139-142]. It is important to change the unhealthy food environment into one that helps individuals to make healthier food choices [25].

In recent years, efforts have been made to create healthier food environments. Attention increased towards school food policy formulation, research on food environment measurements, and environmental interventions in settings as home, school and worksite [15, 27, 28]. Increasing the availability and/or accessibility of healthier products has proven to be effective in stimulating healthier food choices (e.g. by placing more fruit/vegetables on display, advertisement for vegetables, or reducing the number of less healthy products at the point of purchases) [25, 42, 47, 48, 143, 144]. Altering the environment to make the healthier option the easier, default option, without restricting the consumer's freedom of choice, is also known as "nudging" [24]. Nudges are cheap to perform and require minimal effort. Examples of effective nudging strategies are: to offer a variety of healthier products instead of just one (e.g. different types of fruits), to position healthier products more attractively along the shopping route, and to increase the convenience of healthier products (e.g. sliced fruit instead of a single piece) [44, 46]. Especially in public settings, like school/sports canteens and worksite cafeterias, where people spend much time and may consume a significant amount of their daily caloric intake, nudging has received consumers' approval and has the potential to positively affect customers' dietary behaviour [29, 31, 142]. Moreover, visitors address the need for a larger range of healthy products [145] and schools, sports associations and companies have become increasingly interested in offering a healthier canteen by making use of nudges [146, 147].

The Dutch Ministry of Health, Welfare and Sport has set a policy target to increase the number of schools with a healthier canteen [75, 76]. Due to the absence of international consensus on how to define a "healthy canteen" [148], the "Guidelines for Healthier Canteens" were developed by the Netherlands Nutrition Centre in collaboration with experts in the field of nutrition and health behaviour [78]. These guidelines are based on Dutch nutritional guidelines, experiences with the Dutch school canteen programme, and general research on influencing food choices [73, 79]. The Guidelines for Healthier Canteens aim to change the food environment in school/sports canteens and worksite cafeterias by improving the availability and accessibility of healthier foods. Availability is defined as the presence of products that can be bought. Accessibility is defined as product promotion and placement [78]. The next step is to implement these guidelines throughout the Netherlands. This requires effective infrastructure and support [39, 149, 150]. Therefore, we aimed to develop a user-friendly online tool that i) helps stakeholders to understand and implement the guidelines, ii) facilitates monitoring of the canteen's status

and changes over time regarding availability and accessibility of food/beverages, and iii) that provides tailored feedback and advises how to make the canteen healthier [15, 151]. In addition to the Netherlands, also in several other countries efforts have been made to create school food policies, such as guidelines, procedures or rules to enable a healthier school food environment [149, 152]. However, often the actual implementation of these policies can be improved and surveillance is recommended to monitor implementation over time [39, 149, 153]. Therefore, tools to monitor the implementation of these policies are required [39, 152, 154, 155].

Various measurement tools are available to assess product availability/accessibility in the consumer food environment [28, 148, 156, 157]. For example, in the United States the Nutrition Environment Measurement Survey for Stores (NEMS-S) and Restaurants (NEMS-R) are regularly used to assess the food environment and have also been tested on reliability and validity [158, 159]. The NEMS started as a tool to assess the availability, price and quality of products in stores, and to assess the availability, facilitators, barriers, pricing and signage/promotion in restaurants. Meanwhile, a version for vending machines is also available [160]. Unfortunately, none of the available tools were suitable to monitor Dutch canteens due to differences in nutritional guidelines and definitions of accessibility [28, 157]. Also, Dutch canteens differ from other countries regarding the products sold because in the Netherlands, most children bring their lunch from home, so in school canteens snacks are the main purchase. Moreover, the psychometric properties of these instruments have not always been properly evaluated [28, 157].

One of the first properties that should be assessed is the degree to which the content of the instrument is an adequate reflection of the construct to be measured (content validity) [161]. In addition, to facilitate the use of the tool by different stakeholders and to ensure clear and usable feedback is provided by the tool, it is recommended to develop it in a close collaboration between science and practice [162, 163]. Therefore, this paper describes the development (in close collaboration between practice and research) and assessment of the content validity and usability of the “Canteen Scan”.

## METHODS

### **Guidelines for Healthier Canteens as a conceptual framework**

The Guidelines for Healthier Canteens consist of three predefined ambition levels bronze, silver, gold; these correspond to an increasingly healthy range of foods and drinks being available and accessible [78]. The levels are awarded based on four constructs: A) a set of basic conditions. This is a mix of availability, accessibility and policy items, all of which need to be present in a healthier canteen. B/C) the percentage of healthier products on display and in vending machine, i.e. healthier products that are available in the total range of products. D) a score on the accessibility of healthier products (see Figure 4.1). Healthier and less healthy products are classified according to the Dutch Food-Based Dietary guidelines, based on five food groups known as the Wheel of Five [79]. In the Guidelines for Healthier Canteens, healthier products are defined as foods that are included in the Wheel of Five such as whole wheat bread, fruits and vegetables, semi-skimmed milk, and low fat cheese, and small portions of less healthy foods with limited calories, saturated and

trans-fat, sodium and added sugar [78, 79]. These four constructs formed the conceptual framework of the tool to be developed. Further, as no additional criteria to assess the four constructs were defined in the guidelines, further operationalisation was necessary to measure adherence to the guidelines.

CONSTRUCTS	ITEMS	AMBITION LEVELS			
A. Basic conditions	A.1. In each offered food group a healthier product is offered A.2. Healthier products are placed at the most eye-catching spots A.3. Encouragement to drink water A.4. Policy is anchored	no level	bronze	silver	gold
		Less than four items met	All four basic conditions met		
B/C. Availability of healthier food and drinks on display and in vending machines	B/C.1. Classification of products B/C.2. Number of products		60-79% healthier products available + At least fruit or vegetables	≥80% healthier products available + Fruit and vegetables	
D. Accessibility of healthier food and drinks	D.1. The majority of the canteen shows a healthy environment and healthier products are easily accessible; healthier products are placed visibly; mostly healthy items on the menu and promotions		60-79% score on accessibility of healthier products	≥80% score on accessibility of healthier products	

**Figure 4.1.** Conceptual framework for the Canteen Scan based on the Guidelines for Healthier Canteens.

**Study design and setting**

The study was conducted between December 2014 and January 2016. We used a 3-step iterative process of drafting, and continuous evaluation and revision. This design was based on recommendations for developing and evaluating measurement instruments [161-164]. They emphasize to develop a measurement instrument in an iterative process based on a clear definition of the construct to be measured, with people who have expertise in the field and to keep the practical application in mind [162-164]. The tool was therefore developed in multiple cycles of development, evaluation and adaptations and each cycle was properly evaluated based on input of different experts (representing research, policy and practice) and end-users. End-users of the Canteen Scan are experienced school canteen advisors, representatives of caterers (who provide the foods and designs of the canteens in several schools) and canteen managers/employees. Both qualitative and quantitative methods were used to provide complementary information and to improve the rigour of the study [163]. After each step, research results were discussed in the project team and the Canteen Scan was further improved.

In the Netherlands, most students bring their own food and drinks from home and buy food or drinks at school only as complementary foods (snacks and drinks). School canteens can consist of a point-of-sale display (where people ask for, or take, a product from a display/cooler/shelf and pay at the cash register), and/or vending machines for food/drinks. The school canteen can be run by an external catering company, the school itself, or by a combination of these two.

## **Study procedure**

### **1. Development of a paper draft of the Canteen Scan**

#### *1a. Creating the draft tool*

To operationalise the four constructs of the guidelines (basic conditions, availability on display and in vending machines, and accessibility), the project team generated a proposition for the methods and measurable items, based on earlier experience, scientific literature, and consultation with experts in nudging and social marketing. The project team consisted of seven multidisciplinary researchers in the fields of childhood obesity, nutrition, prevention and public health, nutritional professionals, and a school canteen advisor of the Netherlands Nutrition Centre. Discussed were: possibilities to make use of an existing database to classify products into healthier/less healthy products according to the current Dutch nutritional guidelines, different methods to assess the quantity of products [165, 166], and items to assess the accessibility of products using several nudging strategies.

#### *1b. Expert meeting*

A first concept of the Canteen Scan was discussed with experts to reach consensus about the proposed methods, items and response options. Whilst ensuring the scientific evidence, the practical feasibility was taken into account. The expert meeting was attended by 19 of 22 invited experts from research and policy on nudging, nutrition and health behaviour, and professionals representing school, sport and worksite organisations/caterers. Prior to the meeting, attendees received the draft tool by email and were invited to add additional ideas to be discussed. The draft tool consisted of two parts: one part with a proposal to quantify food products and another with proposed items to assess accessibility. An external chairperson directed and structured the meeting that was audio-recorded and minuted. NW reviewed and summarised the results and this was checked by EV and CR. All attendees received the consensus document of the meeting and were asked to check the content.

#### *1c. Interviews and expert meetings with canteen managers/caterers and canteen advisors*

To acquire feedback from end-users about the relevance, comprehensiveness and feasibility of the developed methods, items and response options, six semi-structured interviews and two expert meetings were held. The interviews were semi-structured in that specific questions of interest were posed but allowed the trained interviewer to probe questions if answers needed more explanation.

The interviews were conducted with two canteen managers and four representatives of caterers, representing different school canteens with diverse education levels throughout the Netherlands. During these semi-structured interviews (each lasting  $\pm$  120 min) the Canteen Scan was filled out for the respective canteen. After completion, the relevance,

comprehensiveness and feasibility of each proposed measurement method to assess availability and the criteria for accessibility were assessed with structured questions [161-163]. Examples of questions are: *“Is it possible to classify the offered products in the right food group?”*; *“What is your opinion about and which barriers/facilitators do you expect regarding selling fruit at the check-out counter?”* Furthermore, participants could add extra items they considered important. The feedback on each element of the Canteen Scan was sorted, reviewed and summarised by NW and checked by EV and CR.

During two expert meetings (with six and four school canteen advisors, respectively) from the Netherlands Nutrition Centre, the proposed methods and items were rated on feasibility (yes, maybe, no), barriers/facilitators were discussed and any suggestions for adaptations were addressed. The ratings on feasibility were counted and a summary of discussion points per Canteen Scan element was made. Afterwards, all attendees received and approved the conclusions that emerged. The results of the interviews and expert meeting were discussed in the project team and used to improve the tool.

Based on the three steps (1a, 1b, and 1c), a paper version of the Canteen scan was developed.

## **2. Assessing content validity of the paper draft of the Canteen Scan**

It is important to assess content validity to be able to review whether users understand the questions as intended. To gain insight into the content validity, we assessed the concepts relevance, comprehensibility and comprehensiveness [161-163]. The paper draft of the Canteen Scan was assessed by four different end-users (canteen managers and representatives of caterers) in four schools with a medium size canteen. Schools differed in canteen operator (n=2 by the school itself, n=2 by a caterer) and expected healthfulness of the canteen (n=2 healthier canteen, n=2 not healthy). End-users were instructed to conduct the Canteen Scan in their canteen, which included two options to quantify the available products. First counting the numbers of products and second counting the rows per product (called “facings”). Subsequently, a structured interview was performed to review the content validity by the concepts relevance (does the instrument contain only relevant aspects?), comprehensibility (are all aspects understood as intended, and are the response options appropriate?), and comprehensiveness (are no important aspects missing?). In addition, feasibility and recommendations were assessed [161-163]. Each concept was questioned per construct of the Canteen Scan. E.g. *“Which method, counting or facings, represents the offer on display the best?”* and *“Is it feasible to select products you see first while moving along the route through the canteen?”*. At least, general open questions were stated, e.g. *“What is your opinion about the amount of time needed to fill-out the Canteen Scan?”* In addition to the structured questions, the trained interviewer (NW) was allowed to probe questions if answers needed more explanation. NW sorted, reviewed and extracted the results, and this was checked by EV and CR. The summarised findings were discussed in the project team and used to further refine the Canteen Scan.

## **3. Pilot testing the online version of the Canteen Scan**

The refined paper version of the Canteen Scan was translated into an online tool which was pilot tested for its usability among four end-users from four different school canteens, which differed in canteen operator and expected healthfulness of the canteen. Pilot testing

improves the adaptation of the tool by practice. It reveals missing items, interpretation problems and gives insight in how long it takes to fill out the tool [162]. End-users were invited to fill out the online Canteen Scan using an iPad in their canteen. Meanwhile, respondents were asked to think out loud as they filled in the Canteen Scan. This cognitive interview technique ‘think aloud’ was used to understand respondent’s comprehensibility and to reveal areas for improvements [108, 163]. Although this method is time-consuming, subjective, and its validity questionable, in combination with other methods, it can support the development of new tools [108]. In addition, the researcher asked questions if their thoughts were not clear. Thereafter, the usability of the online Canteen Scan was assessed by the concepts comprehensibility, user-friendliness (i.e. easy to understand), feasibility (i.e. practically applicable), time-investment and overall satisfaction [161, 162]. Questions (answered on a 5-point Likert scale, ranging from 1 not feasible at all, to 5 very feasible) were asked to assess comprehensibility, user-friendliness and feasibility, structured within the five Canteen Scan elements; basic conditions (n=2), availability on display and vending machines (n=17), accessibility (n=28), and result and feedback (n=8), together with an overall opinion (n=3). In addition, questions were asked with respect to the investment of time (n=3), e.g. “The amount of time required to fill out the Canteen Scan was worth it” (5-point Likert scale: 1 totally disagree to 5 totally agree); the actual amount of time it took to fill out the Canteen Scan (minutes); and overall satisfaction (n=1) (“In general, how satisfied are you with the Canteen Scan”, 5-point Likert scale: 1. very unsatisfied to 5. very satisfied). Mean scores were calculated and the “think aloud” results were summarised per element of the Canteen Scan by NW, and checked by EV and CR. These results were discussed in the project team to improve the tool.

**Table 4.1.** Proposition and revisions per step and per construct of the Canteen Scan.

Element	Step 1: Development (expert meeting n=19; interviews n=6; second expert meeting n=10)	Step 2: Content validity of paper scan (n=4)	Step 3: Pilot testing the online scan	
			Translation into online scan	Pilot testing the online scan (n=4)
Basic conditions	- 2 automatically assessed questions - 2 multiple choice questions		- 2 multiple choice questions were split into two different sets of questions.	- Improve formulation of the questions
Availability of food and drinks - <i>method to classify products</i>	Link the tool with the Dutch Branded Food database <sup>1</sup>	- Link with the Dutch Branded Food database was evaluated positive		- Optimise the database - Buttons were difficult to find - Added the option to adapt entered composite products.
Availability of food and drinks - <i>method to assess quantity</i>	- Measuring relative shelf space - Combination of counting facings and product numbers on displays, racks, coolers	- A product list with common products was suggested, to reduce time to enter a product	- Two separate elements were created for “food and drink on display” and “food and drinks in vending	- Difficult to fill in the Canteen Scan during opening hours as the assortment changes.

*table continues*



Element	Step 1: Development (expert meeting n=19; interviews n=6; second expert meeting n=10)	Step 2: Content validity of paper scan (n=4)	Step 3: Pilot testing the online scan	
			Translation into online scan	Pilot testing the online scan (n=4)
	- Counting facings in vending machines	- Counting facings on displays (racks, shelf) was infeasible. In coolers facings was feasible - Counting facings in vending machines was feasible	machines" to increase clarity. - The combination of facings and numbers in displays was technically infeasible, so all products need to be counted	- Numbers of product above 30 go in steps of 5.
Accessibility criteria	- Experts suggested to add "not applicable" to the response options - Reformulations were suggested - 3 Price items were proposed, but reduced to 1 on advice of experts, because infeasible/too costly for practice - 2 Items about prominent placing were split into three to improve comprehensiveness - A portion size item was suggested and rejected - Finally, 10 items were proposed	- Item for attractive presentation of fruit and vegetables was added [108] - 11 Items remained	- Three items for prominent placing were reduced to one item, to ensure equal contribution of placing regarding all accessibility items - 9 Items remained	- Add examples in text or picture, of the criteria - Questions to assess whether products are placed on the most eye-catching spot is reformulated
Results and feedback	- A score per construct and an awarded level - A general advice and a specific advice with all entered and classification of products - Portion size and pricing were added to the advice			- Improved the advises of the accessibility criteria

<sup>1</sup>The Dutch Branded Food database is an existing database with most of the Dutch sold food/drink products, including their nutritional value [167].

## RESULTS

Measurement methods, items and response options belonging to the four constructs (basic conditions, availability on display and in vending machines, and accessibility) were proposed, evaluated and refined in collaboration with experts, end-users and the project team during several rounds. The proposed items and main revisions during development are shown in Table 4.1.

### 1. Development of the paper draft of the Canteen Scan

During the first step, experts recommended to add a separate result and feedback section to make actions to improve the canteen very clear for people in practice. Experts agreed to

count each number of products on display, and to count each facing for vending machines. Moreover, they recommended using the school canteen as priority setting during the development, due to the differences between the school, sport and worksites settings. Worksite cafeterias and sports canteens differ with respect to the products offered and physical size, compared to school canteens.

Pricing (e.g. offering healthier option at a lower price compared to less healthy options) and offering different portion sizes are highly potent strategies to stimulate healthy eating [168-170]. However, during the expert meeting (step 1b) schools and caterers reported these to be infeasible since the buying-in costs are higher for healthier options. Therefore, instead of adding this as an item, these strategies were included as a suggestion to improve the healthiness of the canteen in the feedback element.

## **2. Assessing content validity of the paper draft of the Canteen Scan**

The second step showed a positive evaluation of the approach to count numbers of products on display and to count product facings in vending machines. Evaluation in four schools showed that the Dutch Branded Food database (LEDA) is able to classify the entered products in the correct product group. 90% of the offered products on display could be classified into the correct product group, and for 96% in vending machines respectively. However, it was suggested to add a list with common products to reduce the time required to complete the scan. Regarding accessibility one item was added to stimulate attractive placement of fruit and vegetables.

## **3. Pilot testing the online version of the Canteen Scan**

During the translation of the paper draft into the online tool, it became clear that it was necessary to split the construct of availability into two sections: availability on display, and availability in vending machines. The pilot test with four canteen managers/representatives of caterers yielded an average score on the usability concepts comprehensibility, user-friendliness, feasibility, time investment and satisfaction of 3.4 to 4.6 (range 1-5, 5 represented very feasible) (Table 4.2). This indicates that on average all elements of the scan were evaluated positive (mean scores  $\geq 4.0$ , range 3-5), except for time investment (mean score 3.4, range 2-5). Filling out the Canteen Scan took on average 127.5 (range 105-165) min. The accompanying thinking-aloud method revealed that the tool could be improved by adding more detailed instructions, optimising the database, reducing the completion time and making minor technical adjustments (e.g. position of buttons).

## **Description of the Canteen Scan**

These three steps resulted in the online Canteen Scan consisting of five elements: A) basic conditions, B) availability of food and drinks on display, C) availability of food and drinks in vending machines, D) accessibility criteria, and E) results and feedback (Figure 4.2). All elements of the Canteen Scan include information buttons with detailed explanations and examples. The input can be copied and adapted to monitor changes over time.

### **Element A: Basic conditions**

The first element contains four basic conditions for a healthier canteen. Each condition can be scored as being present (25%) or not (0%), summed together to 100% (Figure 4.2). Two of the four basic conditions (A1. *"In each food group one healthier option is*

offered” and A2. “Healthier products are placed on an eye-catching spot”) are based on the information filled in under the availability and accessibility elements. The other two conditions (A3. “Encourage water drinking” and A4. “Availability of policy”) were assessed using 8 dichotomous and 3 multiple choice questions, respectively.

**Table 4.2.** Results of the pilot tests, per element of the Canteen Scan.

Concept	Basic conditions <sup>2</sup>	Availability <sup>3</sup>	Accessibility <sup>4</sup>	Result and feedback <sup>5</sup>	Overall opinion <sup>6</sup>
	Mean (range)	Mean (range)	Mean (range)	Mean (range)	Mean (range)
Comprehensibility <sup>1</sup>	4.0 (3-5)	4.1 (2-5)	4.0 (1-5)	4.2 (2-5)	4.0 (4-4)
User-friendliness <sup>1</sup>	4.3 (4-5)	4.5 (2-5)	4.3 (2-5)	4.5 (4-5)	4.3 (4-5)
Feasibility <sup>1</sup>		4.6 (1-5)	4.3 (3-5)	4.0 (4-5)	4.0 (4-4)
Time investment <sup>1</sup>					3.4 (2-5)
Satisfaction <sup>1</sup>					4.0 (3-5)

<sup>1</sup> All measured on a 5-point Likert scale from negative to positive (e.g. very incomprehensible to very comprehensible).

<sup>2</sup> Basic conditions were measured with 1 comprehensibility and 1 user-friendliness question.

<sup>3</sup> Availability was measured with 7 comprehensibility, 7 user-friendliness and 3 feasibility questions.

<sup>4</sup> Accessibility was measured with 12 comprehensibility, 9 user-friendliness and 7 feasibility questions.

<sup>5</sup> Results and feedback was measured with 4 comprehensibility, 1 user-friendliness and 3 feasibility questions.

<sup>6</sup> Overall opinions were measured with 1 question for each concept, except for time investment which was measured with 3 questions.

### Elements B and C: Availability of food and drinks

All available products can be entered in the scan by selecting the corresponding food group (11 food groups in total, e.g. vegetables, main course salads, fruits, sandwiches, bread, dairy), and selecting (in case of the most frequently sold products) or entering (typewriting) the product. Products are then automatically classified as a healthier or less healthy products, based on the linked Dutch Branded Food database [167]. If products are not present in the database, the product and their calorie content can be added manually. Composite products (sandwiches/salads) can be added manually by entering the individual constituents (e.g. of a “whole-wheat sandwich cheese” the kind and amount of bread, margarine, cheese, lettuce and tomatoes can be added). A composite product is categorized as a healthier product if the main ingredient (bread, salad) is a healthier product and the sandwich toppings are less than 30 grams, and sauces are limited to one eating spoon. The amount of each product (in case of displays/racks) or the number of facings of each product (in vending machines) has to be entered, on which the proportion of healthier products to the total number of products (or facings) is calculated.

### Element D: Accessibility criteria

Accessibility is assessed by nine items that are scored yes/no/not applicable (Figure 4.2). These items assess effective strategies to increase healthier choices through either product placement (5 items) or promotion (4 items) [42, 47, 48, 142, 147, 168, 171-179]. The score for accessibility is calculated as the percentage of fulfilled criteria (0%-100%) relative to all applicable criteria.

**Element E: Results and feedback**

The result section of the Canteen Scan consists of four separate percentages for each of the above-mentioned elements. All basic conditions need to be present and the lowest percentage among the scores for availability and accessibility determines the awarded level of either bronze, silver or gold.

In addition to the awarded level, both general and tailored feedback to improve the canteen is provided. For example, general advice regarding portion sizes and pricing is given, as well as an overview of all available products and their classification. A tailored advice is given for each basic condition or accessibility criteria which has not been met (e.g. “Place fruit and vegetable next to the cash desk and place less healthier products at another less visible place”).

ELEMENTS	ITEMS	
<p><i>Entering general school and canteen characteristics (address; number of students; canteen run by a catering company or the school itself; presence of display and/or vending machines)</i></p>		
<p>A. Basic conditions (0-100%)</p>	<p>A.1. In each offered food group one healthier option is offered (25%) Assessed automatically based on entered available products A.2. Healthier products are place on an eye-catching spot (25%) Assessed automatically based on entered accessibility criteria A.3. Water drinking is encouraged (25%) 8 Dichotomous questions (Yes/No) E.g. water is offered by a water cooler; water is not offered in the vending machine A.4. Policy is anchored (25%) 3 Multiple choice questions (Yes/No/I don't know): The organisation has a written vision about (1) offering at least one healthier option, (2) healthier options are placed on an eye-catching spot, (3) encouraging drinking water</p>	
<p>B. Availability of food and drinks on display (0-100%; percentage healthier products of the total offered products)</p>	<p><i>Linked to the Dutch Branded Food database</i></p>	<p>B.1. Classification of products Entering each offered and visible product: 1. choose food group, 2. choose from the given product options or enter the product manually B.2. Number of products Count each offered product on display and fill out the number</p>
<p>C. Availability of food and drinks in vending machines (0-100%; percentage healthier products of the total offered products)</p>	<p>C.1. Classification of products Entering each offered and visible product: 1. choose food group, 2. choose from the given product options or enter the product manually C.2. Number of products Count each offered and visible facing and fill out the number</p>	

*figure continues*

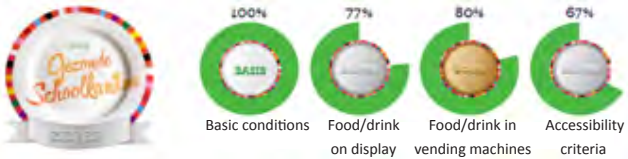
ELEMENTS	ITEMS										
<p>D. Accessibility criteria (0-100%; 11.11% per present indicator)</p>	<p>Nine indicators</p> <p>D.1. Healthier products are placed at the most eye-catching spot on displays, counters, racks</p> <ol style="list-style-type: none"> <li>1. Select which healthier products are prominently positioned (defined as: placing in front or upper half)</li> <li>2. Indicate if only these products or other products are positioned prominently as well</li> </ol> <p>D.2. Healthier products are placed at the most eye-catching spot in vending machines</p> <ol style="list-style-type: none"> <li>1. Select which healthier products are prominently positioned (defined as: placing in front or upper half)</li> <li>2. Indicate if only these products or other products are positioned prominently as well</li> </ol> <p>D.3. If food and drink is offered at the cash desk, this will only consist of healthier products</p> <p>D.4. Fruit and vegetables are presented in an attractive manner</p> <p>D.5. Healthier products catch consumer's eye first, as they move along the route through the canteen</p> <p>D.6. Special promotions or discounts are restricted to healthier products</p> <p>D.7. The majority of the food and drink items on the menu and/or pricelist are healthier products</p> <p>D.8. Visual materials featuring food and drink are restricted to healthier products</p> <p>D.9. Advertisements for specific brands or food and drink products on vending machines are restricted to products included in the Wheel of Five</p> <p><i>Questions D.3-D.9 are measured by one multiple choice question each (Yes / No / Not applicable)</i></p>										
<p>E. Results and feedback</p>	<p>Results:</p>  <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Basic conditions</td> <td>100%</td> </tr> <tr> <td>Food/drink on display</td> <td>77%</td> </tr> <tr> <td>Food/drink in vending machines</td> <td>80%</td> </tr> <tr> <td>Accessibility criteria</td> <td>67%</td> </tr> </tbody> </table> <p>Feedback given based on users input:</p> <ul style="list-style-type: none"> <li>- General feedback to improve the level of canteens (e.g. price and portion size)</li> <li>- Product list and classification of entered products per food group</li> <li>- Tailored advice for each basic condition / accessibility criteria which has not been met</li> </ul>	Category	Percentage	Basic conditions	100%	Food/drink on display	77%	Food/drink in vending machines	80%	Accessibility criteria	67%
Category	Percentage										
Basic conditions	100%										
Food/drink on display	77%										
Food/drink in vending machines	80%										
Accessibility criteria	67%										

Figure 4.2. Description of the Canteen Scan.

## DISCUSSION

The present study translated the Dutch Guidelines for Healthier Canteens into an online tool called the 'Canteen Scan' in a 3-step iterative process. The Canteen Scan provides insight into the level of compliance with the guidelines, and offers feedback with directions for improvement. The tool was developed for and with various users, e.g. (school) canteen advisors/managers/employees and caterers, as well as involving stakeholders representing science and policy. Pilot tests revealed that stakeholders evaluated the tool positive on its usability, with positive evaluations on the concepts comprehensibility, user-friendliness, feasibility and satisfaction.

Besides the Netherlands, other countries have developed guidelines or policies and accompanying tools to stimulate healthy eating behaviour in public settings [28, 152, 155, 157]. Unfortunately, none of the available tools were suitable to monitor Dutch school canteens due to the differences in goals, criteria and the definitions used. The Canteen Scan was specifically developed to evaluate compliance with the Dutch guidelines for canteens, according to Dutch nutritional guidelines, suitable for the products sold in Dutch school canteens and with the recommended definition (by stakeholders) of accessibility. However, the process of development and the content of the tool can be valuable to others developing a similar tool for their canteens.

To our knowledge, the Canteen Scan is the first online tool to translate policy for public food settings into a tool that combines assessments of the healthiness of products, the proportion of healthier products available in a canteen, and criteria for accessibility. In the present study, end-users evaluated the different elements of the Canteen Scan as positive on comprehensibility user-friendliness and feasibility. The combination of concepts (availability and accessibility) concurs with the recommendations of earlier tools developed to measure the consumer food environment [28, 157]. The tool can be used by a diversity of stakeholders: school managers, canteen employees, caterers, school canteen advisors and policy makers. In accordance with recommendations, the Canteen Scan combines the functions providing insight into the current level of compliance with guidelines, monitoring changes over time, and providing tailored feedback to improve the healthiness of the canteen [39, 144, 155, 157]. Moreover, since the adjustments with regard to accessibility/availability are immediately apparent in the result section of the tool, this may stimulate caterers and canteen managers to make changes. As the Canteen Scan is administered online, stakeholders could easily use the scan to monitor changes in healthiness over time.

Another strength of the Canteen Scan is that it is linked with the Dutch database that automatically classifies commonly sold food/drink products according to the current Dutch nutritional guidelines, based on the nutritional composition of products. The fact that users themselves do not have to classify products increases the usability of the tool [155, 180]. Moreover, this link allows to automatically include updates of the nutritional guidelines in the Canteen Scan. On national level, the (anonymized) online data might be used to monitor how many organizations implement and comply with the Guidelines for Healthier Canteens, although first more insight should be gained in the reliability and validity of the tool. The monitoring of implementation and compliance to guidelines is recommended to be able to evaluate the (un)intended effects of stated policy and to improve policy in

the future [155]. Taking all this together, the Canteen Scan appears to be a useful tool for practice.

A limitation of the tool and a possible barrier for implementation [90] is that the use of the Canteen Scan was perceived to be time-consuming. Other comparable tools assess a more limited range of food groups, which can decrease entry time [158, 180]. However, we chose to assess all food groups and products in order to obtain more comprehensive insight into the assortment, to be able to observe changes in the assortment, and to provide insight to users on whether replacement of certain foods actually improves their score. In addition, pilot tests showed that the investment of time was worthwhile and improvements in the database can decrease the amount of time required. Moreover, the second and subsequent uses of the scan will be less time-consuming because a previously entered scan can be copied and simply adapted.

Another limitation is that some of the items used to score accessibility are difficult to quantify and, therefore, to measure. For example, the item *“healthier products are placed at an eye-catching spot”* is liable to bias because *“eye-catching spot”* can be interpreted in different ways. Therefore, to reduce possible bias, additional explanation by text and pictures to each item might be a solution.

To increase usability in practice, collaboration of science and practice is recommended for the development of such a tool [162, 163]. However, one of the challenges was to balance the needs and wishes from practice and the scientific evidence and to be able to align this with the technical possibilities. Consequently, certain compromises had to be made. For example, although price- and portions sizes strategies are effective [168-170] they were not included as accessibility item in the tool. By practice, this was considered not yet feasible since the buying-in costs are higher for healthier options. As solution, these strategies were added as a suggestion in the general feedback. The limited number of participating stakeholders that were consulted could have influenced the results. However, we included a wide range of stakeholders (researchers, school canteen advisors, professionals representing caterers and schools) to receive a broad range of information.

The development of the Canteen Scan is a continuous process and the tool will be adapted based on input from experts and end-users. This study showed the first refinements of the measurement methods and items of the Canteen Scan based on the input of the experts and end-users. In a follow-up (quantitative) study, the criterion validity and reliability of the Canteen Scan will be investigated in a larger sample, which should lead to further improvements.

The Guidelines for Healthier Canteens are applicable in school/sports canteens and worksite cafeterias. During the expert meeting in the first step of the development of the Canteen Scan, experts advised us to focus on school canteens. Based on the noticed differences between the settings, e.g. different products, more meals on offer, and a different organisational structure (i.e. more volunteers in sports canteens). However, currently the Canteen Scan is already used in sport and worksite canteens. Based on these experiences, future refinements will be made to increase the Canteen Scan's usability also in other settings than the school setting, such as sports canteens and worksite cafeterias.



In the future, the Canteen Scan could be combined with measurements of the broader environment, e.g. in a daily life environment (such as home, neighbourhood or shops passed on the way home). In addition, investigating the relation between the objective consumer environment (measured with the Canteen Scan) and individual purchase and eating behaviour, health outcomes and perceptions of the environment (e.g. how important price is for the consumer) might increase knowledge on the food environment and the relation with individual behaviour and health [148, 181].

### **Conclusion**

The Canteen Scan was developed in collaboration with experts, end-users and researchers, thereby balancing scientific and practical considerations. The tool will provide stakeholders insight into the level of compliance with the Dutch Guidelines for Healthier Canteens and will offer instant tailored feedback to support adjustments towards healthier canteens. As well, pending confirmation of the reliability and validity of the tool, the tool may be useful for canteen managers to monitor improvements in the healthiness of their canteen or for monitoring implementation of the guidelines on a national level. Pilot tests showed this tool to be comprehensive, user-friendly and feasible in daily practice. Further research is needed to elucidate to what extent the tool actually supports schools and caterers to create and sustain healthy canteens.

### **Acknowledgements**

The authors thank all the participants who were willing to discuss or fill out draft versions of the Canteen Scan, which led to important insights and improvements of the Canteen Scan. In addition, we thank the web developers for creating the online Canteen Scan according to all wishes and specifications.



# PART II

Evaluation of the support to implement healthier school canteen guidelines



# CHAPTER 5

## The effect of supportive implementation of healthier canteen guidelines on changes in Dutch school canteens and student purchase behaviour

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## **ABSTRACT**

### **Introduction**

We developed an implementation plan including several components to support implementation of the “Guidelines for Healthier Canteens” in Dutch secondary schools. This study evaluated the effect of this plan on changes in the school canteen and on food and drink purchases of students.

### **Methods**

In a 6-month quasi-experimental study, ten intervention schools (IS) received support implementing the guidelines, and ten control schools (CS) received only the guidelines. Changes in the health level of the cafeteria and vending machines were assessed and described. Effects on self-reported purchase behaviour of students were analysed using mixed logistic regression analyses.

### **Results**

IS scored higher on healthier availability in the cafeteria (77.2%) and accessibility (59.0%) compared to CS (60.1%, resp. 50.0%) after the intervention. IS also showed more changes in healthier offers in the cafeteria (range -3 to 57%, mean change 31.4%) and accessibility (range 0 to 50%, mean change 15%) compared to CS (range -9 to 46%, mean change 9.7%; range -30 to 20% mean change 7% resp.). Multi-level logistic regression analyses on the intervention/control and health level of the canteen in relation to purchase behaviour showed no relevant relations.

### **Conclusion**

In conclusion, the offered support resulted in healthier canteens. However, there was no direct effect on students’ purchase behaviour during the intervention.



## INTRODUCTION

To support adolescents to make healthier food choices, many national governments have formulated food policies to encourage a healthy offering of foods and drinks in schools and their canteens [34]. To create healthier canteens, nudging strategies are used, by which the healthier option is made easier without restricting the freedom of choice [24]. Such strategies focus on availability and accessibility by offering mainly healthier products, discouraging the consumption of unhealthy foods by making them less readily available, making the healthier option the default, and promoting healthier products [38, 42, 46, 168]. Evaluations of such strategies show improvements in food and drinks offered in schools, which is likely to influence students' consumption of healthier foods and drinks [37, 38, 42, 46]. However, these results are only seen when the policy is implemented adequately [39, 117], which can be increased with supportive implementation tools [50, 51, 182]. The provision and type of such tools differ within and across countries, though training, modelling, continuous support such as helpdesks and incentives are commonly provided [50].

In the Netherlands, most schools have no tradition of offering school meals, but do offer complementary foods and drinks in a cafeteria and/or vending machines. Most students bring their lunch from home, and buy additional food and drinks at school, or at shops around the school [19]. The national Healthy School Canteen Programme of the Netherlands Nutrition Centre, financed by the Dutch Ministry of Health, Welfare and Sports, provides schools with free support to create healthier canteens (cafeteria and/or vending machine) [73, 74, 76]. This includes, for example, a visit and advice from school canteen advisors (i.e., nutritionists), regular newsletters, and a website with information about and examples of healthier school canteens. The programme has been shown to lead to greater attention to nutrition in schools and a small increase in the offering of healthier food and drinks in the cafeterias, but not in vending machines [33, 74, 127]. However, until then, the programme only included availability criteria.

Based on literature and in collaboration with future users and experts in the field of nutrition, the Netherlands Nutrition Centre developed the "Guidelines for Healthier Canteens" in 2014, and updated them in 2017 [78]. These guidelines include criteria on both the availability and accessibility of healthier foods and drinks (including tap water) and an anchoring policy. The guidelines distinguish three incremental health levels: bronze, silver and gold [78]. Only silver ( $\geq 60\%$ ) and gold ( $\geq 80\%$ ) are qualified for the label "healthier school canteen". These guidelines define healthier products as food and drinks recommended in the Dutch Wheel of Five Guidelines, and products that are not included but contain a limited amount of calories, saturated fat and sodium [79]. To increase dissemination of the guidelines, an implementation plan was developed, based on experience within the Healthy School Canteen Programme and in collaboration with involved stakeholders from policy, practice and science [183]. This study investigated the effect of this implementation plan to support implementation of the Guidelines for Healthier Canteens in schools on both changes in the health level of the canteen and in purchase behaviour of students. Moreover, the relation between the health level of the canteen and purchase behaviour is determined.

## METHODS

### Study design

The effect of the implementation plan was evaluated in a 6-month quasi-experimental controlled trial with 10 intervention and 10 control schools, between October 2015 and June 2016. The control schools were matched to intervention schools on the pre-defined characteristics: school size (fewer or more than 1000 students); level of secondary education (vocational or senior general/pre-university); and how the catering was provided (by a catering company or the school itself). Additionally, we aimed to match the control schools to intervention schools on contextual factors: the availability of shops near the school and the presence of school policy to oblige students to stay in the schoolyard during breaks. Intervention schools received support to implement the Guidelines for Healthier Canteens according to the plan (the intervention), while control schools received only general information about the guidelines, although they also received the support after the intervention period. Further details about the study design are provided in the study protocol [184]. This study was registered in the Dutch Trial Register (NTR5922) and approved by the Medical Ethical Committee of the VU University Amsterdam (Nr. 2015.331).

### Study population

The schools, in western and central Netherlands, were recruited via the Netherlands Nutrition Centre and caterers. Inclusion criteria were (a) presence of a cafeteria, (b) willingness to create a healthier school canteen, and (c) willingness to provide time, space and consent for the researchers to collect data from students, employees and canteen workers. The exclusion criteria were (a) the school had already started to implement the Guidelines for Healthier Canteens, and (b) the school had already received personalized support on implementing a healthier canteen from a school canteen advisor from the Netherlands Nutrition Centre in 2015. In all participating schools, we recruited students per class. In each school, we recruited 100 second or third-year Dutch-speaking students (aged 13–15 years), equally distributed over the school's offered education levels. Parents and students received information about the study and the option to decline participation. Figure 5.1 shows the flow diagram of the inclusion of the schools and students.

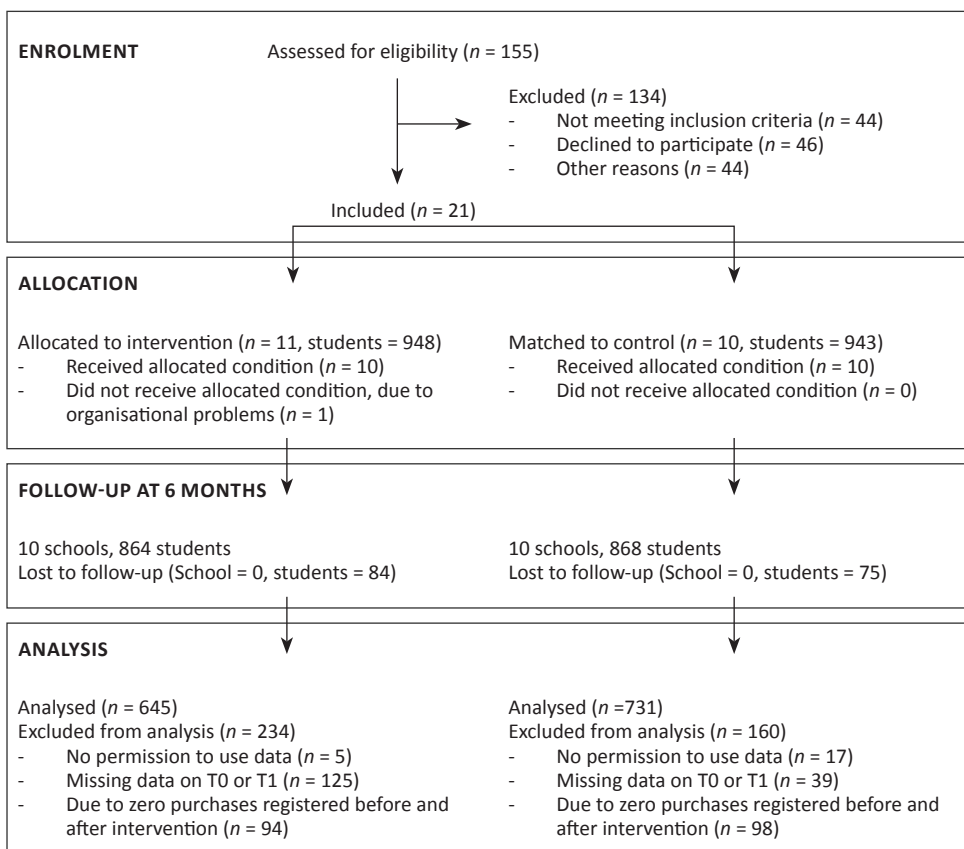
### Intervention

The intervention consisted of the implementation plan to support schools in creating a healthier school canteen, as defined by the Guidelines for Healthier Canteens. This plan was developed in a 3-step approach based on the “Grol and Wensing Implementation of Change model” [60] in collaboration with stakeholders, as described elsewhere [183], and delivered by school canteen advisors of the Netherlands Nutrition Centre, in collaboration with researchers of the Vrije Universiteit Amsterdam.

The intervention started with gaining insight into the context and current situation of the school and the canteen. For this purpose, involved stakeholders (e.g., teacher, school management, caterer, canteen employee) filled out a questionnaire on the schools' characteristics (educational level, number of students) and their individual (e.g., knowledge, motivation) and environmental (e.g., need for support, the innovation) determinants. School canteen advisors also measured the extent to which canteens met the Guidelines for Healthier Canteens, using the online tool “the Canteen Scan” [100]. Based on these



findings, school canteen advisors provided tailored advice in an advisory meeting where all involved stakeholders discussed aims and actions to achieve a healthier canteen. Stakeholders also received communication materials about the Guidelines for Healthier Canteens, including a brochure with examples of, and advice on, how to promote healthier products. All stakeholders of all intervention schools were invited to a closed Facebook community to share experiences, ask questions and to support each other. In addition, to remind and motivate stakeholders, a newsletter with information and examples was sent by email once every 6 weeks. Finally, to gain insight into their students' opinion, students were asked to fill in a questionnaire (the same as used for the effect evaluation), and the results were fed back to schools in an attractive fact sheet.



**Figure 5.1** The CONSORT flow diagram of the present study [185].

## Measurements

Measurements in the school canteens and among students were performed before and directly after the intervention period. The “health level” of the school canteen was measured in all participating schools using the online Canteen Scan [100], filled out by a school canteen advisor. The tool has been evaluated satisfactorily on inter-rater reliability and criterium validity if measured by a school canteen advisor, scoring  $> 0.60$  on Weighted

Cohen's Kappa [184]. Only intervention schools received the results of the Canteen Scan as part of the intervention.

Students reported their purchases via an online questionnaire filled out in a classroom under supervision of a teacher and/or researcher. Data on demographics and behavioural and environmental determinants were also collected [138]. The questions were derived from validated Dutch questionnaires [103-107], and the questionnaire was pretested for comprehensibility and length in a comparable population using the cognitive interview method think-aloud [108].

### **Health level of the school canteen**

The Canteen Scan assessed the extent to which a canteen complies with the four subtopics of the Guidelines for Healthier Canteens: (1) a set of four basic conditions for all canteens, (2) the percentage of healthier foods and drinks available in the cafeteria (at the counter, display, racks) and (3) in vending machines and (4) the percentage of accessibility for healthier food and drink products [78, 100]. According to these guidelines, a canteen is healthy if all basic conditions are fulfilled, if the percentage of healthier foods and drinks available is at least 60% in the cafeteria and in vending machines, if fruit or vegetables are offered, and if the percentage of fulfilled accessibility criteria is also at least 60%. As the basic conditions overlap with the availability and accessibility scores, this subtopic was not used in the analyses. For the other three subtopics, the change between pre- and post-measurement was calculated for each school.

In the Canteen Scan, all visible foods and drinks available in the cafeteria (counter, display, racks) and in vending machines were entered. The scan automatically identifies whether, according to the Dutch Wheel of Five Guidelines [79], an entered product is healthier or less healthy, and calculates the percentage of healthier products. In addition, to assess the accessibility for healthier foods and drinks, nine criteria (8 multiple choice, 1 multiple answer options) were answered, creating a score ranging from 0 to 90%. These questions relate to the attractive placement of healthier products in the cafeteria and vending machines; the offer at the cash desk; the offer at the route through the cafeteria; fruit and vegetables presented attractively; promotions for healthier products only; mostly healthier items at the menu/pricelist; and advertisements/visual materials only for healthier products. Questions include, for example, "Are only healthier foods and drinks offered at the cash desk?" and "Are fruit and vegetables presented in an attractive manner?"

### **Self-reported purchase behaviour of students**

Purchase behaviour was measured by assessing the frequency of purchases per food group (sugary drinks, sugar free drinks, fruit, sweet snacks, etc.) over the previous week, for the cafeteria and the vending machines separately. If students stated that they had bought less than once per week, they answered the frequency of purchases in the last month. Students who did not buy anything at both time points were excluded ( $n = 192$ ), as they do not provide information about the relation between the intervention and their purchases. Groups of foods and drinks were considered as healthier or less healthy, as defined by the Dutch Wheel of Five Guidelines [79]. All reported healthier purchases in the cafeteria and vending machines, respectively, were summed, as were the less healthy purchases. As the data were not normally distributed, we dichotomised the variable. Frequencies of the

pre- and post-intervention survey were subtracted and categorized into the dichotomous variable indicating a healthy or unhealthy change in purchase behaviour. A healthy score was defined as (1) a higher increase in healthier products compared with less healthy products; (2) a higher decrease in less healthy products compared with healthier products; or (3) purchases remained stable over time and consisted mainly of healthier products. An unhealthy score was defined as (1) a higher increase in less healthy products compared with healthier products; (2) a higher decrease in healthier products compared with less healthy products; (3) purchases remained stable over time and consisted mainly of less healthy products or an equal number of healthier and less healthy products.

### **Other student variables**

Demographic student variables included age (in years), gender and current school level (vocational (i.e., VMBO), senior general education (i.e., HAVO) or pre-university education (i.e., VWO)). Determinants of purchase behaviour included attitudes, subjective norms, perceived behavioural control and intention, all towards buying healthier products at school. For each variable, multiple questions (range 2–5) were asked on a 5-point Likert scale (answers ranging from, e.g., 1 = very unlikely to 5 = very likely) derived from existing validated Dutch questionnaires [103, 104]. The mean score of each variable was calculated and the reliability of the measurements was assessed with Cronbach's alpha [186]. The measured environmental determinants were having breakfast (Yes, No); amount of money spent on food/drink purchases at school per week (<€1, €1–2, ≥€2); external food/drink purchase behaviour (<1 times p/w, 1–3 times p/w, ≥4 times p/w); and foods/drinks brought from home (<4 times p/w, ≥4 times p/w).

### **Sample size**

The sample size was calculated based on the outcome purchase behaviour, an expected 10% drop out, 80% power and 5% significance level [130]. The calculation showed that 20 schools and 100 students per school were necessary to be able to detect a 10% difference in purchase behaviour of students (continuous variable), with the expected multi-level structure (students within schools, intra-class correlation of 0.05).

### **Statistical analyses**

Student baseline characteristics and pre- and post-intervention canteen outcomes and student purchase behaviour were described by means and standard deviations. Canteen outcomes included three subtopics of the health level of the canteen: healthier food and drinks available in the cafeteria, in the vending machines and accessibility of healthier food and drinks. Mean (SD) pre- and post-intervention values and mean changes were described and changes in the subtopics per school were presented in a chart.

A mixed logistic regression analysis [110] was performed to investigate the effect of the intervention (independent variable) on purchase behaviour (dependent variable). Correlated errors of student scores (level 1) nested within schools (level 2) were taken into account by including a random intercept for schools in all analyses (model 1). The analyses were stratified by gender, as boys seems to react more to environmental changes than girls [187]. Models were first extended with demographic variables (model 2), secondly with students' behavioural determinants (model 3) and thirdly with students' environmental determinants (model 4).

The effect of a healthier canteen (independent variable) on student purchase behaviour (dependent variable) was also assessed using mixed logistic regression analyses with a random intercept for schools for boys and girls separately. We used the health level of the canteen at follow-up for each of the three subtopics of a healthier canteen. Due to non-linearity with student purchase behaviour, again a dichotomous variable was created, based on the guidelines, which state that 60% or higher is a healthier availability and accessibility, respectively. Again, the model was extended with demographic variables (model 2) and students' behavioural (model 3) and environmental determinants (model 4). Statistical analyses were performed using the IBM SPSS Statistics version 24.0 (IBM corporation (IBM Nederland), Amsterdam, The Netherlands). Odds ratios and 95% confidence intervals (CI's) are presented.

## RESULTS

### Baseline characteristics

We included data from 645 students of the intervention schools and 731 students of the control schools in the analyses (Table 5.1). Both groups consisted of more girls than boys (56% and 53%, respectively). The included schools offered education at the vocational ( $n = 6$ ) level, the senior general/pre-university level ( $n = 5$ ), or a combination of both levels ( $n = 9$ ). The level of education was broadly similar for intervention and control schools. However, in intervention schools slightly more girls followed the vocational education level (46.6%) compared to boys (41.4%), while the opposite was the case in control schools (girls, 39.5%; boys 46.2%). Most students indicated that they did bring food and drinks from home to school four or more times a week (for food, intervention schools (IS) 91.8 and control schools (CS) 89.2%; for drinks, IS 90.4% and CS 88.5%). The majority of students reported that they bought foods or drinks in the school cafeteria (IS 55.5%; CS 64.4%) or vending machine (IS 63.6%; CS 61.1%) less than once per week. During school time, 62.2% and 67.6% of the students in the IS reported buying food or drinks outside school less than once a week, compared to 65.6% and 73.6% in the CS.

**Table 5.1.** Baseline characteristics of students divided by intervention or control school and gender.

	Intervention schools (N=10)			Control schools (N=10)		
	Total	Boys	Girls	Total	Boys	Girls
<b>Number of students – n (%)</b>	645 (46.9)	302 (46.8)	343 (53.2)	731 (53.1)	318 (43.5)	413 (56.5)
<b>DEMOGRAPHIC VARIABLES</b>						
<b>Age (years)- Mean (SD)</b>	13.39 (0.62)	13.35 (0.55)	13.42 (0.68)	13.35 (0.62)	13.38 (0.66)	13.33 (0.59)
<b>School Level n (%)</b>						
Vocational education	284 (44.0)	125 (41.4)	159 (46.4)	310 (42.4)	147 (46.2)	163 (39.5)
Senior general education	148 (22.9)	86 (28.5)	62 (18.1)	190 (26.0)	78 (24.5)	112 (27.1)
Pre-university education	213 (33.0)	91 (30.1)	122 (35.6)	231 (31.6)	93 (29.2)	138 (33.4)
<b>BEHAVIOURAL DETERMINANTS - Mean (SD)<sup>a</sup></b>						
<b>Attitude</b>	2.81 (0.84)	2.73 (0.84)	2.88 (0.84)	2.91 (0.86)	2.67 (0.88)	3.09 (0.80)
<b>Subjective norm</b>	2.39 (0.64)	2.32 (0.64)	2.44 (0.63)	2.39 (0.68)	2.31 (0.71)	2.46 (0.66)

*table continues*

	Intervention schools (N=10)			Control schools (N=10)		
	Total	Boys	Girls	Total	Boys	Girls
<b>Perceived behavioural control</b>	3.18 (0.92)	3.18 (0.95)	3.18 (0.89)	3.36 (0.89)	3.24 (0.93)	3.46 (0.84)
<b>Intention</b>	2.46 (0.94)	2.27 (0.97)	2.64 (0.88)	2.50 (0.89)	2.26 (0.87)	2.68 (0.87)
ENVIRONMENTAL DETERMINANTS – n (%)						
<b>Breakfast behaviour</b>						
Yes, sometimes or always	610 (94.6)	294 (97.4)	316 (92.1)	705 (96.4)	311 (97.8)	394 (95.4)
No, never	35 (5.4)	8 (2.6)	27 (7.9)	26 (3.6)	7 (2.2)	19 (4.6)
<b>Foods brought from home</b>						
Less than four times per week	53 (8.2)	23 (7.6)	30 (8.7)	79 (10.8)	39 (12.3)	40 (9.7)
4 or more times per week	592 (91.8)	279 (92.4)	313 (91.3)	652 (89.2)	279 (87.7)	373 (90.3)
<b>Drinks brought from home</b>						
Less than four per week	62 (9.6)	30 (9.9)	32 (9.3)	84 (11.5)	45 (14.2)	39 (9.4)
4 or more times per week	583 (90.4)	272 (90.1)	311 (90.7)	647 (88.5)	273 (85.8)	374 (90.6)
<b>Amount of money spent on food/drink purchases in school per week</b>						
<€1	91 (14.1)	45 (14.9)	46 (13.4)	131 (17.9)	56 (17.6)	75 (18.2)
€1-2	354 (54.9)	154 (51.0)	200 (58.3)	442 (60.5)	180 (56.6)	262 (63.4)
≥€2	200 (31.0)	103 (34.1)	97 (28.3)	158 (21.6)	82 (25.8)	76 (18.4)
<b>Food or drink purchases in school cafeteria</b>						
Less than once per week	358 (55.5)	167 (55.3)	191 (55.7)	471 (64.4)	183 (57.5)	288 (69.7)
1 time per week	151 (23.4)	76 (25.2)	75 (21.9)	137 (18.7)	66 (20.8)	71 (17.2)
2 or more times per week	136 (21.1)	59 (19.5)	77 (22.4)	123 (16.8)	69 (21.7)	54 (13.1)
<b>Food or drink purchases in school at vending machine<sup>b,c</sup></b>						
Less than once per week	410 (63.6)	196 (64.9)	214 (62.4)	447 (61.1)	183 (61.2)	264 (63.9)
1 time per week	123 (19.1)	48 (15.9)	75 (21.9)	147 (20.1)	62 (20.7)	85 (20.6)
2 or more times per week	112 (17.4)	58 (19.2)	54 (15.7)	101 (13.8)	54 (18.1)	47 (11.4)
<b>Food purchases outside school</b>						
Less than once per week	401 (62.2)	175 (57.9)	226 (65.9)	480 (65.6)	170 (53.5)	310 (75.1)
1 to 3 times per week	167 (25.9)	91 (30.1)	76 (22.2)	170 (23.3)	104 (32.7)	66 (16.0)
4 or more times per week	77 (11.9)	36 (11.9)	41 (12.0)	81 (11.1)	44 (13.8)	37 (9.0)
<b>Drink purchases outside school</b>						
Less than once per week	436 (67.6)	192 (63.6)	244 (71.1)	538 (73.6)	201 (63.2)	337 (81.6)
1 to 3 times per week	151 (23.4)	82 (27.2)	69 (20.1)	126 (17.2)	80 (25.2)	46 (11.1)
4 or more times per week	58 (9.0)	28 (9.3)	30 (8.7)	67 (9.2)	37 (11.6)	30 (7.3)

<sup>a</sup> Per variable, multiple questions (range 2-5) were asked on a 5-point Likert scale (answers ranging from e.g. 1= very unlikely to 5 = very likely).

<sup>b</sup> This variable was not used as confounder in the multi-level analyses, due to the similarity with the outcome variable purchase behaviour per week.

<sup>c</sup> On this variable, the control group has 40 students less (19 boys, 21 girls) as one school did not have a vending machine

### Intervention effect on health level of the canteen

Table 5.2 shows that intervention schools (IS) scored higher in terms of the healthier offering in the cafeteria (77.2%), compared to control schools (CS) (60.1%) after the intervention. Figure 5.2 confirms this and shows that nine of the ten IS increased the healthier offering (range of all IS: -3 to 57%, mean change 31.4%). In comparison, eight of the ten CS showed positive changes but the change (range of all CS: -9 to 46%, mean change 9.7%) was smaller compared to the IS. The healthier offering in vending machines increased in five of the ten IS (range of all IS: -15 to 33%, mean change 5.1%) and in three of the nine CS (range of all CS: -14 to 48%, mean change 5.3%) (Figure 5.3), although, on average, both groups made broadly similar changes in their offer (Table 2). With regard to the accessibility criteria, both groups showed overall increases, although two CS also showed decreases (Figure 5.4). The change in IS was higher compared to CS (range of all IS: 0 to 50%, mean change 15%; range of all CS -30 to 20%, mean change 7%), resulting in mean scores of 59% (IS) and 50% (CS) fulfilled accessibility criteria after the intervention.

**Table 5.2.** Sub scores of a healthier canteen pre- and post-intervention, stratified by intervention and control schools.

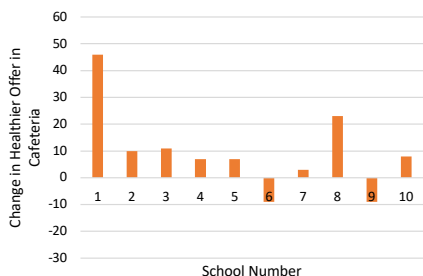
	Intervention schools (N=10)			Control schools (N=10)		
	T0	T1	Mean change	T0	T1	Mean change
Healthier products available in the cafeteria <sup>ab</sup>	45.80 (27.12)	77.20 (13.41)	31.4	50.40 (23.00)	60.10 (15.67)	9.7
Healthier products available at vending machine <sup>abc</sup>	44.70 (19.40)	49.80 (20.33)	5.1	38.89 (24.30)	44.22 (22.99)	5.3
Fulfilled accessibility criteria <sup>ad</sup>	44.00 (20.66)	59.00 (19.69)	15.0	43.00 (20.58)	50.00 (14.91)	20.0

<sup>a</sup> Mean score (SD).

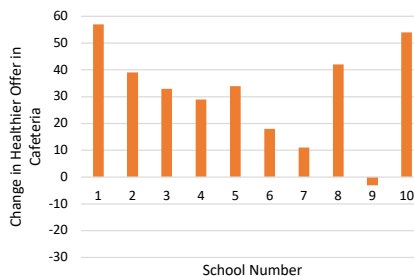
<sup>b</sup> Scored in percentage (0-100%).

<sup>c</sup> One control school did not have a vending machine (N=9, in control schools).

<sup>d</sup> Nine criteria could be fulfilled, scoring 10% per criteria (0-90%).

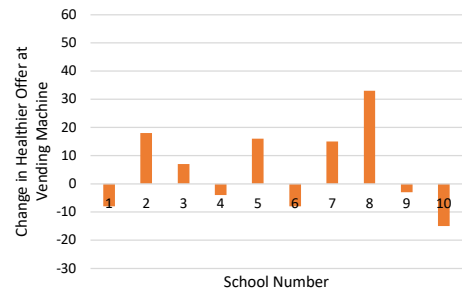
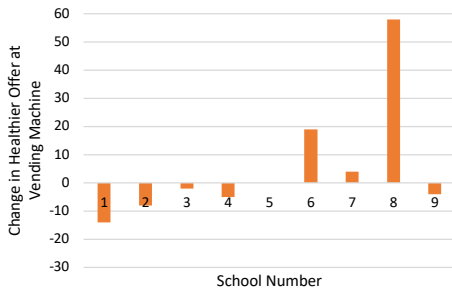


(a) Control Schools



(b) Intervention Schools

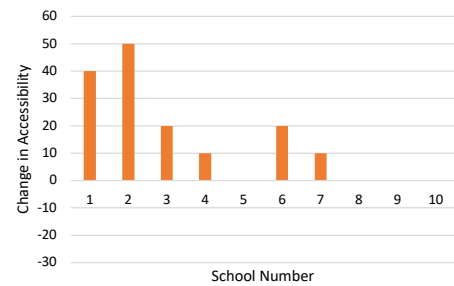
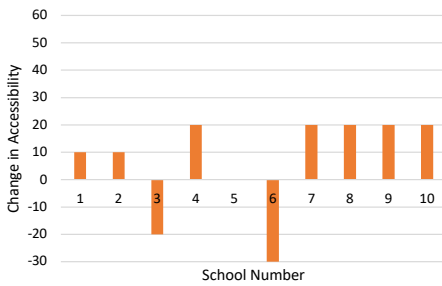
**Figure 5.2.** Histogram of the changes in healthier products available in the cafeteria.



(a) Control Schools

(b) Intervention Schools

**Figure 5.3.** Histogram of the changes in healthier products available at vending machines.



(a) Control Schools

(b) Intervention Schools

**Figure 5.4.** Histogram of the changes in fulfilled accessibility criteria.

### Purchases in the cafeteria

Data on self-reported purchase behaviour at the cafeteria were included in the analysis from 1213 students (548 boys, 665 girls) (Table 5.3). Mean purchases of all foods and drinks per week varied between 0.46 and 1.72 per person. Both boys and girls bought more “less healthy” than healthier products. With regard to changes in weekly purchases in the cafeteria after 6 months, 50% of the boys of the IS maintained or changed to healthier purchase behaviour (Table 5.3). In boys of the CS, this percentage was 51.5%. Among girls, 53.6% maintained or changed to a healthier purchase behaviour in the IS, compared to 46.5% in the CS.

### Purchases at the vending machines

Data on self-reported purchase behaviour at vending machines were available for 1217 students (542 boys, 675 girls) (Table 5.4). In the IS, the boys and girls, respectively, bought on average 0.79 and 1.48 healthier, and 0.88 and 1.40 less healthy products per week in vending machines after the intervention. Boys and girls in the CS bought on average 1.13 and 0.87 healthier, and 1.40 and 0.83 less healthy products per week in vending machines after the intervention, respectively. After 6 months, in both the IS and CS, half of the boys maintained or changed to a healthier purchase behaviour (both 49.3%). Among girls, approximately half of the girls in the IS (47.3%) and CS (52.0%) maintained or changed to a healthier purchase behaviour after 6 months.



**Table 5.3.** Weekly food and drink purchases in the cafeteria.

	Intervention schools				Control schools			
	Boys (n=276)		Girls (n= 308)		Boys (n=272)		Girls (n=357)	
	T0	T1	T0	T1	T0	T1	T0	T1
Weekly purchases of less healthy products, mean (SD)	1.50 (3.84)	0.92 (1.39)	1.41 (2.11)	1.39 (4.20)	1.43 (2.63)	1.72 (4.97)	0.91 (1.34)	1.04 (3.71)
Weekly purchases of healthier products, mean (SD)	0.85 (2.98)	0.51 (2.23)	0.80 (1.82)	1.17 (3.75)	0.82 (2.83)	1.17 (4.38)	0.46 (1.10)	0.59 (3.78)
Bought healthier products of total bought products, %	36.2%	35.7%	36.2%	45.7%	36.4%	40.5%	33.6%	36.2%
Changes in purchases per week over time								
Healthy score <sup>a</sup> , %	50.0%		53.6%		51.5%		46.5%	

<sup>a</sup> From each student, the difference between T0 and T1 has been calculated. Equal or bigger change in healthier products compared to less healthy products has been defined as a healthy score.

**Table 5.4.** Weekly food and drink purchases at the vending machine.

	Intervention schools				Control schools			
	Boys (n=270)		Girls (n= 311)		Boys (n=272)		Girls (n=364)	
	T0	T1	T0	T1	T0	T1	T0	T1
Weekly purchases of less healthy products, mean (SD)	1.41 (3.03)	0.88 (2.34)	1.60 (2.84)	1.40 (3.31)	1.51 (2.44)	1.40 (4.21)	0.94 (1.78)	0.83 (1.37)
Weekly purchases of healthier products, mean (SD)	1.11 (3.13)	0.79 (2.36)	1.43 (2.40)	1.48 (3.59)	1.26 (2.59)	1.13 (2.85)	0.97 (1.49)	0.87 (1.45)
Bought healthier products of total bought products, %	44.1%	47.3%	47.2%	51.4%	45.5%	44.7%	50.8%	51.2%
Changes in purchases per week over time								
Healthy score <sup>a</sup> , %	49.3%		47.3%		49.3%		51.6%	

<sup>a</sup> From each student, the difference between T0 and T1 has been calculated. Equal or bigger change in healthier products compared to less healthy products has been defined as a healthy score.

### Purchase behaviour analysed by mixed logistic regression analyses

The results of the performed mixed logistic regression analyses showed that the odds for a healthier purchase behaviour compared to less healthy purchase behaviour is approximately equal for students in the intervention and control schools (Table 5.5). In boys, we found odds ratios of 0.92 (95% CI 0.62; 1.36) for cafeteria purchases and 1.02 (95% CI 0.62; 1.67) for vending machine purchases. Girls showed an odds ratio of 1.29 (95% CI 0.85; 1.96) for the cafeteria and 0.84 (95% CI 0.62; 1.14) in vending machines purchases. Adjustment for demographic (model 2), behavioural (model 3) and environmental variables (model 4) did not materially change the results.

The analyses to the effect of a healthier canteen (healthier versus less healthy (ref. group) availability in the cafeteria, vending machine or accessibility) on purchase behaviour showed OR's ranging from 0.87 (95% CI 0.61–1.26) for combined purchases in girls, to

1.27 (95% CI 0.75–2.17) for purchases in vending machines in boys (Table 5.6). Adjustment for demographic (model 2), behavioural (model 3) and environmental variables (model 4) again did not materially change the results.

**Table 5.5.** Mixed logistic regression analyses of the effect of the intervention (ref. group is control group) on changes in purchase behaviour.

		Model 1 <sup>b</sup>		Model 2 <sup>c</sup>		Model 3 <sup>d</sup>		Model 4 <sup>e</sup>	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Purchases cafeteria <sup>a</sup>	Boys (n=548)	0.92	0.62; 1.36	0.94	0.67; 1.32	0.96	0.68; 1.35	0.92	0.63; 1.34
	Girls (n=665)	1.29	0.85; 1.96	1.29	0.83; 1.96	1.31	0.85; 2.02	1.30	0.85; 2.00
Purchases vending machine <sup>a</sup>	Boys (n=542)	1.02	0.62; 1.67	1.00	0.60; 1.67	1.03	0.62; 1.69	1.03	0.62; 1.71
	Girls (n=675)	0.84	0.62; 1.14	0.81	0.59; 1.11	0.85	0.61; 1.19	0.85	0.58; 1.23

<sup>a</sup> Dichotomous outcome: Healthier vs. less healthy changes in purchases over time.

<sup>b</sup> Model 1 = Mixed logistic regression analysis, corrected for school.

<sup>c</sup> Model 2 = Model 1, plus corrected for demographic variables (age, education).

<sup>d</sup> Model 3 = Model 2, plus corrected for behavioural determinants (attitude, subjective norm, perceived behavioural control, intention).

<sup>e</sup> Model 4 = Model 3, plus corrected for environmental determinants (amount of money spent in school p/w, breakfast, food purchases outside school, drink purchases outside school, food brought from home, drinks brought from home).

**Table 5.6.** Mixed logistic regression analyses to the effect of a healthier canteen (ref. group not healthy) on changes in purchase behaviour.

		Model 1 <sup>e</sup>		Model 2 <sup>f</sup>		Model 3 <sup>g</sup>		Model 4 <sup>h</sup>	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Purchases cafeteria <sup>ab</sup>	Boys (n=548)	0.93	0.60; 1.44	1.02	0.69; 1.52	1.03	0.69; 1.53	1.01	0.66; 1.55
	Girls (n=665)	1.13	0.70; 1.83	1.14	0.70; 1.86	1.14	0.70; 1.88	1.13	0.69; 1.86
Purchases vending machine <sup>ac</sup>	Boys (n=542)	1.27	0.75; 2.17	1.18	0.67; 2.05	1.18	0.68; 2.03	1.21	0.69; 2.12
	Girls (n=675)	1.06	0.74; 1.50	1.14	0.77; 1.69	1.18	0.79; 1.75	1.15	0.75; 1.78
Purchases cafeteria and vending machine <sup>ad</sup>	Boys (n=620)	1.17	0.84; 1.62	1.19	0.83; 1.73	1.19	0.83; 1.70	1.14	0.79; 1.65
	Girls (n=756)	0.87	0.61; 1.26	0.89	0.61; 1.28	0.90	0.62; 1.30	0.90	0.61; 1.34

<sup>a</sup> Dichotomous outcome: Healthier vs. less healthy changes in purchases over time.

<sup>b</sup> Healthier canteen, measured with the subtopic healthier products available in cafeteria (≥60%, <60% (ref. group)).

<sup>c</sup> Healthier canteen, measured with the subtopic healthier products available at vending machines (≥60%, <60% (ref. group)).

<sup>d</sup> Healthier canteen, measured with the subtopic fulfilled healthier accessibility criteria (≥60%, <60% (ref. group)).

<sup>e</sup> Model 1 = Mixed logistic regression analysis, corrected for school.

<sup>f</sup> Model 2 = Model 1, plus corrected for demographic variables (age, education).

<sup>g</sup> Model 3 = Model 2, plus corrected for behavioural determinants (attitude, subjective norm, perceived behavioural control, intention).

<sup>h</sup> Model 4 = Model 3, plus corrected for environmental determinants (amount of money spent in school p/w, breakfast, food purchases outside school, drink purchases outside school, food brought from home, drinks brought from home).

## DISCUSSION

We investigated the effect of support in implementing the “Guidelines for Healthier Canteens” on changes in the school canteen (cafeteria and vending machine) and in food and drink purchases of students. Our results show that the support has led to actual changes in the availability and accessibility of healthier products in the canteen. We did not observe changes in students’ purchase behaviour. The large majority of the students (90%) reported that they usually bring food or drinks from home. Most (approximately 80%) students reported buying food or drinks in school only once a week or less.

Schools that received support showed a larger increase in the availability of healthier products in the cafeteria compared to control schools. The intervention schools also complied with more criteria for the accessibility of healthier products than the control schools. These results are in line with previous studies which also showed that implementation support is likely to increase the use of guidelines, especially if it consists of multiple components and is both practice and theory-based [56, 60]. The support we offered was targeted at different stakeholder-identified impeding factors related to implementation of the guidelines, such as knowledge and motivation. The process evaluation already showed that our implementation plan favourably influenced these factors [132].

With regard to vending machines, changes were smaller and present in fewer schools compared to changes in the cafeteria. This result may be explained by the fact that schools do not always own nor regulate the content of the vending machines themselves, but outsource them to external parties such as caterers or vending machine companies. Some schools were therefore unable to change the offering and position of products in the machine within the study period. Previous research showed that vending machines were healthier if appointments about the healthy offer were included in agreements with caterers or vending machine companies [188]. Making agreements about the availability and accessibility of healthy products in the machines is therefore recommended.

In contrast to the changes in the canteen, we did not observe relevant differences in change of healthier purchases between students in intervention and control schools, nor between students from schools with a healthier canteen compared to students from schools with a less healthy canteen. An explanation for these results might be that the duration of the intervention was between four to six months, which proved to be short for the schools to make changes, as we noticed that in most canteens changes were made just before the post-measurements. As a result, students did not have enough time to get used to the new situation and to adapt their purchases. The effects of a healthier canteen on students’ purchases remain therefore unknown. Our results are in contrast with many other studies that show that increasing the offering of healthier products and changes in placement and promotion in favour of healthier products are likely to lead to healthier food choices among customers [21, 25, 42, 43, 45]. However, reviews identified that investigations yielded contradictory results [49], and they emphasize the low quality of the studies [45],

making more research needed.

Changing dietary behaviour is complex and affected by multiple individual, social and environmental factors [15, 41, 189]—for example, the palatability, price and convenience of foods offered in environments that youth visit regularly, including the school canteen and shops around schools [15, 17, 19]. During adolescence, many factors that influence youth's dietary choices are changing: they become more independent, parental influence decreases and influence of peers increases, living environments expand, and they have more money to spend [190, 191]. These changes provide opportunities to develop healthy dietary habits which are likely to sustain over time [10]. Even though our study did not show a relation between a healthier canteen and healthier purchase behaviour, we would recommend that healthier food choices should be facilitated in school canteens, including vending machines, a place that students visit regularly and where students can autonomously choose what they buy. This might influence student purchase behaviour directly at the school canteen or in shops around schools, and foresees in educating adolescents on healthy norms [192]. This enables all youth to experience that healthy eating is important, tasty and very common, which they can use throughout their life.

A strength of our study is that the support consisted of multiple implementation tools which stakeholders could decide to use, as well as when and how. Moreover, our study included tailored advice. Previous research has shown that both a combination of components and tailored advice could increase the likelihood of an effective implementation plan [56, 193]. Other strengths of our study are the measurement of outcomes both on the canteen and student level and the separate analyses for boys and girls. In general, boys are more likely to make impulsive, intuitive changes [25]. In contrast, girls are more likely to overthink their choices, limiting the effect of an attractive food offering. In our study, subtle differences across gender were observed, with boys indicating buying food and drinks outside the school more often. However, this finding should be further explored in future studies.

There are also some study limitations that should be mentioned. First, the use of self-reported questionnaires to investigate purchase behaviour. These measurements are potentially subject to reporting bias and socially desirable answers, likely leading to smaller number of reported purchases overall and larger number of reported healthier products. Possibilities to measure the dietary behaviour of student more objectively and regularly include, for example, the use of meal observations, sales data or Ecological Momentary Assessment (EMA) [194, 195]. We could not use these options due to feasibility constraints, e.g., making use of sales data was not possible as due to different registration systems. Another limitation is the study duration, which was four to six months. A study duration of at least one school year will align to the schools' daily practice and will give schools the opportunity to create a team of involved people, to embed actions and to make changes.

The fact that the intervention was individualized to the contextual factors and needs of each school is both a strength and limitation. Alignment of the advices to a school's situation might lead to a more useful support but can also make it more difficult to compare results between different intervention schools. Therefore, it is important to (1) describe the core intervention functions of each tool of the implementation plan to be able to support schools with the same support and (2) to measure if the tools has been delivered and used as

planned [50, 90, 101]. In our case, the core elements of the intervention have been described in the study design [130]. In addition to the effect evaluation, we also evaluated the quality of implementation to assess whether schools received each implementation tool [132].

A final limitation includes the fact that, due to the skewness of our purchase data and the non-linearity of some of the relations under study, we decided to dichotomize our data. This negatively influenced the power, and led to some loss of information.

Based on our results, we recommend that future studies investigate the sustainability of supportive implementation of food environment policy. In addition, we recommend longer-term studies that assess changes in students' purchases inside, and in shops around, school, that appear after an adaptation period.

Our results confirm that adolescents in the Netherlands bring most food and drinks from home and additionally buy their food inside as well as outside school. Attention to the home environment and the environment around school is therefore needed. The complexity of the food environment at schools within this broader food environment makes the use of whole system-based approaches important [19, 41]. Different relevant stakeholders such as parents, shopkeepers, and local policy makers should be actively involved in this approach. Moreover, a healthy school environment not only consists of a healthy canteen, including vending machines, but also includes food education, and integration with other health promotion school policies [196]. This is important, as schools contribute to the personal development of youth, wherein learning about making choices with regard to a healthy lifestyle in an obesogenic environment is an essential part.

## Conclusions

This study investigated the changes in Dutch school canteens and self-reported student purchase behaviour after support to implement the Guidelines for Healthier Canteens compared to no support. We conclude that such support appears to contribute to healthier canteens. Our results did not show an effect of the implementation on healthier students' purchase behaviour, perhaps due to the short time between the changes made in the canteen and our follow-up measurements. Due to the fact that this study was performed in collaboration with the Netherlands Nutrition Centre and involved stakeholders, our research results are likely to lead to implementation in daily practice. More system-based approaches are warranted to be able to influence students' dietary behaviour. Additionally, long-term research to investigate the effects of healthier school canteens are needed.

## List of abbreviations

CS	Control schools
IS	Intervention schools

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# CHAPTER 6

## Implementation of Guidelines for Healthier Canteens in Dutch secondary schools: a process evaluation

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## ABSTRACT

### Introduction

The Netherlands Nutrition Centre has developed 'Guidelines for Healthier Canteens'. To facilitate their implementation, implementation tools were developed: stakeholders' questionnaires, the 'Canteen Scan' (an online tool to assess product availability/accessibility), a tailored advisory meeting/report, communication materials, establishment of an online community, newsletters, and a fact sheet with students' wishes/needs. In this study, we investigated the effect of these tools in secondary schools on (a) factors perceived by stakeholders as affecting implementation; (b) the quality of implementation.

### Methods

In this six months quasi-experimental study, ten intervention schools implemented the guidelines, supported by the developed implementation tools. Ten control schools received the guidelines without support. School managers, caterers, and canteen employees ( $n = 33$ ) reported on individual and environmental factors affecting implementation. Implementation quality was determined by dose delivered, dose received, and satisfaction.

### Results

Stakeholders ( $n = 24$ ) in intervention schools scored higher on the determinants' knowledge and motivation and lower on need for support ( $p < 0.05$ ). Dose received (received and read) and satisfaction was highest for the advisory meeting/report (67.9%, 64.3%, 4.17), communication materials (60.7%, 50.0%, 3.98), and fact sheet (80%, 60%, 4.31). Qualitative analyses confirmed these quantitative results.

### Conclusion

In conclusion, a combination of implementation tools that includes students' wishes, tailored information/feedback, reminders and examples of healthier products/accessibility supports stakeholders in creating a healthier school canteen.

## INTRODUCTION

School is a useful setting in which to stimulate healthy dietary behaviour in adolescents [197, 198]. National or regional policy focused on provision of healthier foods and drinks in canteens and vending machines in schools seems to encourage adolescents to eat more healthily during school time [27, 38, 199]. In the Netherlands, students bring most foods and drinks from home, as schools do not provide meals in the absence of a national/regional school meal plan. Most schools have a canteen and/or vending machines, where students buy substitutional snacks or drinks. Due to the absence of national guidance and international consensus on how to define a "healthier canteen", the Netherlands Nutrition Centre developed the Dutch "Guidelines for Healthier Canteens" [78]. These guidelines were developed in collaboration with future users and experts in the field of nutrition and health behaviour and are based on Dutch nutritional guidelines, experiences with the Dutch Healthy School Canteen Programme, and research on influencing food choices and nudging [25, 73, 79]. These canteen guidelines aim to assist stakeholders in school, sports, and worksite canteens to create a healthier canteen. According to these guidelines, a healthier canteen increases the offer (availability) and presentation/promotion (accessibility) of healthier products, by using three incremental levels: bronze, silver, and gold [78].

As stakeholders need support to increase compliance with guidelines [39, 52], an implementation plan based on their perceived factors that hamper or enable implementation is needed [63]. The implementation plan to support implementation of the Guidelines for Healthier Canteens was developed in collaboration with stakeholders and based on behaviour change models and implementation strategies [62, 64, 65, 130]. Stakeholders gave their input about their experienced or expected barriers or facilitators regarding implementation of school canteen guidelines. The implementation plan aims to address these factors. To evaluate the impact of the implementation plan, changes in these factors should be studied [51]. Such involved barriers or facilitators can arise within the person, as motivation, attitude, and skills or can arise from the environmental context of school or the guidelines, as support from the organisation and the possibility to adjust the guidelines to your own context [99]. To date, the impact of supportive implementation of school based policies on changes in individual or environmental factors is seldom assessed [51].

Studies have shown that implementing school based interventions as intended (fidelity) is a challenge, and that better implementation results in greater effect [120, 200]. Insight into the quality of implementation through process evaluation concepts such as fidelity and dose received (completeness) is therefore useful [101, 201], as proper evaluation can reveal why an intervention is (not) effective and how it can be optimized [122]. This study evaluated in Dutch secondary school canteens: (a) the effect of the combination of implementation tools on individual and environmental factors affecting implementation as perceived by stakeholders; and (b) the quality of implementation of each tool.

## METHODS

### Design

We used a quasi-experimental study design involving twenty Dutch secondary schools. Ten intervention schools were asked to implement the recently released “Guidelines for Healthier Canteens” for six months (October 2015 to June 2016). Ten matched control schools received only general information about the “Guidelines for Healthier Canteens”. It was aimed to spread intervention schools equally on the main school (canteen) characteristics: catering by a company or by the school itself, schools with below or above and including 1000 students, different levels of secondary education (vocational, senior general, pre-university). To include comparable control schools, control schools were matched on these main and, if possible, on some additional characteristics; availability of shops near the school; and policy for students to stay on the schoolyard during breaks. Sample size calculation showed 20 schools should be included, with 100 students per school. This calculation was based on the effect outcome: students’ purchase behaviour, with a multi-level structure of students within schools (with a correlation of 0.05 between schools), an expected 10% drop-out, 80% power, and 5% significance level. Detailed information about the study design, intervention, and effect evaluation has been described previously [130]. The study protocol was approved by the Medical Ethical Committee of the VU University Amsterdam (Nr. 2015.331) and registered in the Dutch Trial Register (NTR5922).

### Study population

With support of the Netherlands Nutrition Centre and school caterers 155 schools were asked to participate. In total 21 secondary schools (in the Netherlands, schools for students aged between 12 and 18 years) were included. After inclusion, one school dropped out due to organisational problems. The inclusion criteria were: (a) presence of a canteen, (b) intention to make the school canteen healthier, and (c) willingness to provide time and space for the investigators to measure outcomes among students, employees, and canteen workers. The exclusion criteria were: (a) the school had begun implementing the Guidelines for Healthier Canteens and (b) in 2015, the school canteen had received on site support from school canteen advisors of the Netherlands Nutrition Centre. Included schools were located in the central and western part of the Netherlands. All schools received a small financial incentive after completing the study, as notified beforehand.

In all participating schools, the contact (the “school coordinator”) identified the stakeholders involved in their school canteen. These were: teachers, representatives of the school board/school canteen or caterer, community health promoters, and students. Due to organisational differences, the number of stakeholders and their function differed per school. Besides, in the intervention schools, the community health promoters wanted to be involved from the start, and in control schools, they wanted to be involved after the research.

## Intervention

We developed an implementation plan by a 3-step approach based on the “Grol and Wensing Implementation of Change model”. In short, this model supports a stepwise development of implementation plans by offering six steps, ranging from the development of guidelines to continuous evaluation and improving the implementation process [60]. Our implementation plan consists of several tools aimed to implement the Guidelines for Healthier Canteens in Dutch secondary schools. First, to identify perceived barriers and facilitators to creating a healthier school canteen, semi-structured interviews were conducted among different stakeholders. Second, these factors were prioritized through an expert meeting with 25 attendees from research, policy, and practice. Third, using behaviour change taxonomies and implementation strategies, the factors were translated into implementation tools [62-65]. This implementation plan was built upon the healthy school canteen programme [73]. Table 6.1 summarises each intervention tool. A more detailed explanation is available separately [130]. The tools were offered by a school canteen advisor of the Netherlands Nutrition Centre, in collaboration with the Vrije Universiteit Amsterdam. Control schools received only information about the study procedure, the measurements, and general information about the guidelines. After the study, control schools received the same implementation plan as the intervention schools.

**Table 6.1.** Description of the implementation plan to implement the Guidelines for Healthier Canteens<sup>a</sup>.

Implementation Tool	Action and Targets	Target Group	Period
1. Insight into the current situation			
1.1. <i>Questionnaire, school</i>	The results of the online questionnaire to assess and provide insight into the characteristics of the school [95, 99].	Coordinator of the school	Before the advisory meeting
1.2. <i>Questionnaire, stakeholders</i>	The results of the online questionnaire to assess and provide insight into stakeholders’ characteristics, individual and environmental determinants [95, 99].	All involved stakeholders	Before the advisory meeting
1.3. <i>‘Canteen Scan’</i>	An online tool that provides (I) insight into and (II) directions for improvement of availability and accessibility of food and drink products in canteens [100]. All available products can be entered, the tool will automatically classify product in healthier/less healthy product, according to the Dutch nutritional guidelines. Closed questions assess the accessibility, availability of water, and presence of policy.	Performed by a school canteen advisor of the Netherlands Nutrition Centre and by the school coordinator. Results and feedback provided to all involved stakeholders.	Before the advisory meeting
	To create ownership and insight into the changes so far, the school receives information to fill out the Canteen Scan by themselves if they wanted.	Performed by the school coordinator.	After three months

*table continues*

Implementation Tool	Action and Targets	Target Group	Period
1.4. <i>Advisory meeting and report</i>	In one advisory meeting per school, all involved stakeholders are advised about how to improve the canteen by a school canteen advisor of the Netherlands Nutrition Centre. Based on the aims of the school and the points of attention, identified with the two questionnaires and the Canteen Scan a concrete action plan will be developed. This action plan is created together to increase ownership and collaboration. After the meeting, a written report based on this meeting is distributed by email.	All involved stakeholders	At the start of implementation
2. Communication materials	A brochure about the Guidelines for Healthier Canteens, an overview of the steps to take, a personalized poster, a banner for the schools' website. To create motivation and increase and apply knowledge.  Content: information, examples of healthier products, how to place products, and healthier canteens.	Coordinator of the school, who is asked to share this with other stakeholders.	At the start and halfway through implementation
3. Online community	A closed Facebook community for stakeholders was established to share their experiences, ask questions and support each other.	All stakeholders	Continuous
4. Digital newsletter	A regular newsletter sent by email, consisting of information and examples regarding the healthy school canteen. To support, remind and motivate stakeholders.	All stakeholders	Once every 6 weeks (4 in total).
5. Students' fact sheet	A summary of their students' wishes and needs with regard to a healthier school canteen, to gain insight into the opinions of students and how students want to be involved.	Coordinator of the school, who is asked to share this with other stakeholders.	Once, 2–4 weeks after the start.

<sup>a</sup> This table is adapted from the version published in the design paper [130].

## Data collection

Before and after the intervention, school coordinators and the stakeholders completed an online questionnaire about their characteristics and perceived individual and environmental factors affecting implementation based on the validated “Theoretical Domains Framework Questionnaire for Implementation (TDF)” [99] and the “Measurement Instrument for Determinants of Innovations (MIDI)” [95]. The school coordinator was also asked to provide general (organisational) information about the school. After the intervention, the questionnaire for stakeholders of intervention schools was extended with questions based on Saunders (2015) and the MRC [101, 122] to evaluate each implementation tool. These answers were discussed in an evaluation meeting. Finally, objective online registered data about the delivery and use of each online tool (schools' and stakeholders' questionnaire, the online community, and the newsletter) was collected. For example, for Facebook the

amount of sent invitations, registrations, posts, reads were counted. Table S6.1 and S6.2 provides the questions.

## Measures

### School characteristics

Assessed school characteristics were: number of students, education streams at the schools (Vocational/Senior General/Pre-university education), existence of healthy food policy of the school (Yes/No/I do not know), organisation of the canteen (arranged by: external catering organisation/school), presence of vending machines (Yes/No), whether students purchase in the school surroundings such as supermarkets or snack bars (Yes/No/I do not know), presence of a healthier school canteen team or action plan (No/No but intended/Yes). Information about the encouragement of drinking water (Yes/No) and availability of policy for a healthier school canteen (Yes/No) was retrieved from the Canteen Scan (on online tool to assess the availability/accessibility of food and drink products offered in the canteen, see Table 6.1) completed by the school canteen advisor.

### Factors affecting implementation

The implementation plan aimed to change factors which hinder implementation, identified by interviews with stakeholders. These perceived factors that can affect implementation, were assessed by stakeholders with questions derived from the TDF [99] and the MIDI [95]. In accordance with these models, both perceived individual factors, including determinants such as knowledge, self-efficacy, motivation and attitude and perceived environmental factors, including determinants such as need for support, innovation and organisational support, were measured with a five point scale (from 1 = totally disagree, to 5 = totally agree) with 31 and 12 questions respectively. Determinants consisting of more than one item were tested on reliability with Cronbach's Alpha and analysed separately if lower than  $p < 0.70$  [186]. Table S6.1 provides this information.

### Quality of implementation

To evaluate the quality of each implementation tool, different process evaluation concepts were measured quantitatively [101, 122]. Fidelity was measured by dose delivered and dose received. To assess dose delivered, the number of stakeholders provided with the tool by the school canteen advisors or researcher was recorded. Dose received was measured by asking whether stakeholders had received, read, and used the implementation tool. Participant satisfaction with each tool was measured on a 5-point Likert scale (from 1 = totally disagree, 5 = totally agree). Depending on the complexity of the tool, multiple questions were used. Reliability of composite concepts was tested with Cronbach's Alpha and analysed separately if lower than  $p < 0.70$  [186]. Open-ended questions in the stakeholders' questionnaire and during an evaluation meeting collected additional information: an explanation of the satisfaction score; a short evaluation per tool; an overall evaluation, positive and negative experiences of the total implementation plan; and suggestions for improvements (Table S6.2). This qualitative data aimed to clarify the quantitative data.

In addition, objective online registered data about the delivery and use of each online tool were collected. For the questionnaires, the number of sent, started and completed questionnaires were registered automatically. For the online community, Facebook



recorded the number of invited and subscribed people and amount of reads per post. For each newsletter, statistics have been recorded of the number of people which have been: 1) sent the newsletter, 2) read it, 3) clicked on a topic to read more. As the online community and the newsletter contained several posts/newsletters, an average has been taken separately for each registered item.

### Statistical analysis

School characteristics were described, and linear mixed model analyses were performed to identify differences in factors affecting implementation (dependent variable) between the intervention and control groups (independent variable). The analyses were done at both stakeholder (level 1) and school level (level 2) by including a random intercept for school in all analyses, because of the assumption that stakeholders within one school were more similar to each other, compared to stakeholders of other schools. We adjusted for the baseline measurement because of any potential differences between groups at baseline. Since the mixed model analyses revealed negligible between schools variance (threshold ICC < 0.20) [110], linear regression analyses were performed.

For the quality of implementation, mean scores were calculated for each implementation tool, per evaluation concept, and complemented by information collected by open-ended questions. These data were analysed qualitatively by hand using Microsoft Excel, by two researchers independently, following the Thematic Content Approach [97]. First, answers were labelled with objective, descriptive codes; second, codes were split, merged, and interpretative codes were created; third, codes were compared, correlations identified, and overarching themes were formed. Statistical analyses were performed with MLwiN version 2.36 (Centre for Multilevel Modelling, University of Bristol, Bristol, England) and IBM SPSS Statistics version 24.0 (IBM corporation (IBM Nederland), Amsterdam, The Netherlands).

## RESULTS

### Characteristics of the schools

Table 6.2 provides school characteristics. Most included schools already organised relevant activities (e.g., encouragement of drinking water, availability of policy, a workgroup or action plan). More intervention ( $n = 5$ ) than control ( $n = 2$ ) schools created a policy to restrict students to take unhealthy or big portions of food to school.

**Table 6.2.** Characteristics of the participating intervention and control schools.

Characteristics of the Schools	Intervention Schools ( $n = 10$ )	Control Schools ( $n = 10$ )
Number of students		
Mean (SD)	928 (509)	1145 (503)
Range	215–1926	330–1720
Educational level ( $n$ )		
Only vocational	3	3
Only senior general/pre-university	2	3
Vocational and senior-general/pre-university	5	4

*table continues*

Characteristics of the Schools	Intervention Schools ( <i>n</i> = 10)	Control Schools ( <i>n</i> = 10)
School canteen catering ( <i>n</i> )		
Arranged by:		
Caterer	7	8
The school	3	2
Offered via:		
Only counter	0	1
Counter and vending machine	10	9
Basic Conditions Healthier Canteens ( <i>n</i> )		
Encouragement to drink water (Yes)	5	6
Policy available for a healthier school canteen (Yes)	1	1
Organised regarding school canteen ( <i>n</i> )		
Workgroup		
No	1	4
No but intention	3	2
Yes	6	4
Action plan		
No	1	3
No but intention	5	2
Yes	4	5
Available school policy ( <i>n</i> )		
Policy to stay at the schoolyard, Yes	9	8
Policy which forbids to take certain foods to school (like big portions, energy drinks)		
Yes	5	2
No	4	7
I do not know	1	1

## Characteristics of the stakeholders

A total of 51 stakeholders (27 of intervention and 24 of control schools) started the stakeholders' questionnaire at baseline. Eleven cases were excluded as they did not fill out the questionnaire at follow-up. Seven cases were excluded due to incomplete questionnaires. In conclusion, thirty-three stakeholders (17 from intervention and 16 from control schools, 1–3 per school) could be enrolled (response rate 64.7%) to analyse the changes in factors affecting implementation. In both the intervention and control group, their roles were: employee at school, as health care coordinator, teacher or facility manager (64.7% vs. 56.3%); employee at a caterer (17.6%, vs. 25.0%); director of a caterer (11.8% vs. 18.8%); or a community health promoter (5.9% vs. 0%). No community health promoters were involved in the control schools, as they wanted to be involved after the research. Some catering companies cater canteens in multiple schools. Stakeholders involved in multiple intervention or control schools (*n* = 4), filled out the questionnaire only once. However, as one catering employee was involved in intervention and control schools, this response was taken into account in both groups, as the experiences were derived from intervention and control schools.

The quality of the implementation tools was assessed by 27 stakeholders in the intervention schools and 7 additional stakeholders: new staff included in the implementation process just after the baseline measurement and after informed consent was obtained. Hence, 24 stakeholders of the 34 that received the implementation tools (response rate 70.6%) evaluated the quality of the implementation tools by completing the quantitative (Table 6.4) and qualitative questions after the intervention. One to four stakeholders per intervention schools were involved. Their roles were employee at school (62.5%); employee at, or director of a caterer (12.5% respectively 16.7%); or a community health promoter (8.3%).

### Factors affecting implementation

Table 6.3 shows, at follow-up (T1), compared to the control schools, the intervention schools scored higher on the factor knowledge (only “I have all the information I need, to make the school canteen healthier”) and motivation and lower on need for support. The determinants descriptive norm and perceived organisational support showed marginal differences between intervention and control schools after intervention.

### Quantitative evaluation of the quality of implementation

Each implementation tool was delivered in every intervention school. As planned, three tools were delivered only to the school coordinators, the others to all involved stakeholders. The advisory meeting was adapted based on their results of the schools’ and stakeholders’ questionnaire and the Canteen Scan. The students’ fact sheet was also school specific, based on their own students’ answers. Table 6.4 shows that a majority of stakeholders indicated attending/receiving and reading the advisory meeting and report (67.9% and 64.3%, respectively), the communication materials (60.7% and 50.0%) and the fact sheet (80% and 60%). According to the objective collected data, more stakeholders subscribed to or read the online community and the newsletter (61.8% and 45.0%, respectively). For the online community, this number is higher than measured with the questionnaires (21.4%). The implementation tools, (i) advisory meeting and report, (ii) communication materials, and (iii) fact sheet, had the highest mean (SD) scores on satisfaction, 4.17 (0.44), 3.98 (0.23), and 4.31 (0.40), respectively.

**Table 6.3.** The factors affecting implementation perceived by stakeholders and differences between intervention and control at follow-up (T1).

Factor Mean (SD)	Intervention (n = 17)		Control (n = 16)		Linear Regression Analyses	
	T0	T1	T0	T1	Beta	CI
<b>INDIVIDUAL FACTORS</b>						
Knowledge						
Role clarity: Clear what activities to do to make the school canteen healthier	3.94 (0.83)	4.29 (0.77)	3.69 (1.14)	4.06 (0.85)	0.22 (0.29)	-0.37; 0.81
Knowledge: I have all the information I need to make the school canteen healthier	3.29 (1.11)	4.24 (0.75)	3.38 (1.03)	3.63 (0.96)	0.61 (0.30)*	0.00; 1.23

*table continues*

Factor Mean (SD)	Intervention (n = 17)		Control (n = 16)		Linear Regression Analyses	
	T0	T1	T0	T1	Beta	CI
Knowledge: I have enough knowledge to make school canteen healthier	3.94 (0.83)	4.18 (0.53)	4.06 (0.77)	3.94 (0.68)	0.27 (0.21)	-0.16; 0.69
Self-Efficacy	3.59 (0.54)	3.34 (0.76)	3.68 (0.92)	3.71 (0.85)	-0.02 (0.25)	-0.53; 0.48
Attitude	3.78 (0.56)	4.03 (0.50)	3.72 (0.89)	3.81 (0.41)	0.21 (0.15)	-0.10; 0.52
Social influence						
Descriptive norm: Colleagues perform their healthier school canteen activities good	2.82 (1.55)	4.00 (0.79)	3.56 (0.63)	3.62 (0.96)	0.60 (0.30)	-0.08; 1.20
Subjective norm: Other people expect me to perform my healthier school canteen activities good	3.82 (1.13)	3.88 (1.54)	4.00 (0.73)	3.81 (0.83)	0.20 (0.36)	-0.53; 0.94
Social support: I receive enough support in performing my healthier school canteen activities	3.41 (1.18)	3.71 (1.16)	3.75 (0.93)	3.69 (1.08)	0.13 (0.38)	-0.65; 0.91
Routine	3.09 (1.28)	3.47 (1.14)	3.44 (1.11)	3.38 (0.79)	0.15 (0.35)	-0.55; 0.86
Intention	3.76 (1.14)	4.12 (1.32)	4.38 (0.81)	3.88 (1.50)	0.25 (0.52)	-0.82; 1.32
Motivation	4.41 (0.51)	4.65 (0.49)	4.38 (1.26)	4.19 (0.66)	0.45 (0.20)*	0.05; 0.86
Skills	3.82 (1.13)	4.29 (0.47)	4.00 (1.21)	4.12 (0.62)	0.17 (0.19)	-0.22; 0.57
Professional Role	3.76 (1.12)	4.12 (1.27)	4.00 (0.88)	3.94 (0.87)	0.37 (0.26)	-0.15; 0.89
Behavioural regulation	3.08 (0.79)	3.53 (0.64)	2.88 (1.13)	3.38 (1.17)	0.06 (0.29)	-0.54; 0.66
<b>ENVIRONMENTAL FACTORS</b>						
Need for support	3.47 (1.05)	2.61 (0.79)	3.10 (0.99)	3.29 (0.90)	-0.79 (0.29)*	-1.37; -0.21
Innovation						
Consistent with my usual work	3.88 (0.93)	3.71 (1.45)	3.94 (0.93)	4.06 (1.00)	-0.36 (0.44)	-1.26; 0.54
Adaptable to the vision of school	3.82 (1.19)	4.06 (1.44)	3.75 (0.86)	3.75 (0.93)	0.25 (0.29)	-0.34; 0.83
Perceived organisational support	3.33 (0.68)	3.54 (0.46)	3.36 (0.65)	3.21 (0.79)	0.35 (0.19)	-0.04; 0.74

\* Significant differences between intervention and control group after the intervention tested with linear regression model, corrected for baseline measurement,  $p < 0.05$ .

**Table 6.4.** Quality of implementation per implementation tool.

Implementation Tool	Target Group	Dose Delivered and Received Objective n (%)		Dose Received Subjective <sup>a</sup> n (%)	Satisfaction <sup>b</sup> Mean (SD)
Questionnaire school	Each school	Invited	10	-	3.56 (0.88)
		Started	9 (90.0%)		
		Completed	9 (90.0%)		
Questionnaire stakeholder	All stakeholders	Invited	46	-	3.40 (0.87)
		Started	34 (73.9%)		

*table continues*

Implementation Tool	Target Group	Dose Delivered and Received Objective <i>n</i> (%)		Dose Received Subjective <sup>a</sup> <i>n</i> (%)		Satisfaction <sup>b</sup> Mean (SD)
		Completed	24 (52.2%)			
Canteen Scan	Each school	Invited	10	Used	3 (30%)	3.50 (0.66)
Advisory meeting and report	All stakeholders	Sent to	27	Received	19 (67.9%)	4.17 (0.44)
				Read	18 (64.3%)	
Communication materials	All stakeholders	Given to the stakeholders present at the meeting		Received	17 (60.7%)	3.98 (0.23)
				Read	14 (50.0%)	
Online community	All stakeholders	Invited	34	Subscribed	5 (17.86%)	2.61 (1.31)
		Subscribed	21 (61.8%)			
		Read	17 (50.0%)			
Newsletter (was sent 4 times)	All stakeholders	Sent to	34	Received	13 (46.4%)	3.35 (0.58)
		Average read	15.3 (45.0%)	Read	9 (32.1%)	
		Average click on topic	4.8 (14.1%) Range per newsletter 2–6			
Students' fact sheet	Each school	Sent to	10	Received	8 (80%)	4.31 (0.40)
				Read	6 (60%)	

<sup>a</sup> Dose received was measured by 1, 3, 5, or 6 questions, with a 5-point Likert scale (1 = totally disagree, 5 = totally agree). To calculate the percentage, the 24 persons who filled in the questionnaire were taken as 100%, except for the Canteen Scan and Students' fact sheet where 10 persons who received these materials are 100%.

<sup>b</sup> The questions to assess Satisfaction were answered by the stakeholders who used/read/completed the implementation tool. Satisfaction was measured by 1 to 6 questions, depending on the implementation tool (see Supplementary Table S6.1 and S6.2), with a 5-point Likert scale (1 = totally disagree, 5 = totally agree).

## Qualitative evaluation of the quality of implementation

The questionnaires for schools and stakeholders were evaluated as being too long and some questions as being difficult to answer if the participant had limited involvement in canteen activities (e.g., school directors or community health promoters). While, due to technical limitations, some participants did not fill out the Canteen Scan themselves, all received the result of the Scan filled out by the school canteen advisor. The Scan was rated as added value increasing knowledge, providing insight into and monitoring the health level of the canteen over time. Stakeholders were satisfied with the personal contact with the school canteen advisors, insight received into their canteens and the tailored, clear, and feasible advices. Stakeholders of schools and caterers both mentioned the importance of collaboration with each other, knowing each other's expectations, and defining aims and actions together. The advisory meeting helped strengthen this.

Stakeholders evaluated the communication materials as clear, feasible and inspiring. The newsletter was also evaluated as feasible and useful, especially as a reminder, for inspiration, and for tips. The newsletter as information overload, in combination with

other health related newsletters stakeholders received, was mentioned. Sharing online information, advice, and news by the online community was evaluated positively while time constraints and Facebook as chosen medium were mentioned as limitations.

Due to potential privacy sensitivity, the students' wishes and needs fact sheet was sent only to the school coordinator who could choose to share it with other stakeholders. Some stakeholders were dissatisfied not receiving it, indicating that the fact sheet was not shared. Stakeholders evaluated the fact sheet as a positive method to get student' opinion and the support of colleagues. One limitation was that the fact sheet was based only on second grade students.

Overall, stakeholders mentioned the combination of different implementation tools as positive. They used the tools they considered appropriate to their situation and preferences. They mentioned several preconditions to realizing a healthier school canteen: sufficient time, money, and facilities; freedom at the work place to perform activities related to a healthier school canteen; adequate knowledge and examples about healthier products and accessibility; existence of a multidisciplinary workgroup; clear and timely information about the guidelines, including possible future changes; the possibility of involving students; and sufficient customers.

Challenges mentioned include, first, lack of support from the school's neighbourhood due to the existence of numerous selling points and offers of less healthy products. Second, competing demands related to other school tasks, such as educational tests, rebuilding or staffing problems, make keeping the healthier school canteen on the agenda difficult. Third, involving students and colleagues and alignment of all health-related activities in the school was found to be important but challenging. Fourth, while many stakeholders learned that the accessibility criteria lead to behavioural changes in students, some did not understand how, or which criteria could be used. Fifth, although stakeholders experienced inconsistency in the financial effects of a healthier school canteen (some schools noticed lower and others higher sales) and long-term effects are unclear, they were wary of potential negative financial consequences.

## DISCUSSION

This study evaluated the process of implementation of the Guidelines for Healthier Canteens in secondary schools in the Netherlands. First, it showed that implementation support resulted in changes in individual and environmental factors related to the implementation of healthier school canteen. More specific, knowledge and motivation increased, and need for support of stakeholders decreased. Second, stakeholders evaluated the implementation tools positively, especially the advisory meeting and report, the students' fact sheet, the communication materials, and the "Canteen Scan".

The implementation plan improved both some individual and environmental factors, although changes are small. However, these changes are supported by the qualitative results. Stakeholders indicated that the plan supported them in creating a healthier canteen. Their positive feeling of support and increased knowledge and motivation may

lead to better implementation [96]. Only a few other studies evaluated the process of supportive implementation of school health policy, and they showed mixed effects on individual factors, such as the relation between being interested and (not) implementing a health related school based intervention [51].

The results with regard to the second research question showed that the personalization and combination of tools particularly supported stakeholders in the implementation of healthier canteen guidelines. Stakeholders considered it helpful to receive personal advice and to use the tool suitable to their specific situation. For example, during the advisory meeting, the given personal advice was helpful to draft aims, supported by stakeholders of school and caterer. Hence, the newsletter reminded them to remain active and to keep the canteen on the agenda. In addition, the students' opinions, summarised in the fact sheet, supported stakeholders to discuss the healthy canteen topic with colleagues. These results are in line with Australian studies showing that implementation of healthy canteen policies can be achieved in most schools with multi-strategic support, including personalized support, monitoring, and feedback [89, 153].

Although the satisfaction with the advisory meeting and communication materials could be influenced by their high use [202], the qualitative results also indicated that the personal contact, tailored advice, examples of healthier products/accessibility, and information about the guidelines given by these tools inspired them. In contrast, the online community scored low on satisfaction. The choice to use Facebook as medium could have influenced these results. Stakeholders indicated they only wanted to use Facebook in personal life. In addition, a supportive community will only be reached if enough people actively contribute. Due to the research setting in which only a limited number of schools and stakeholders participated, we were only able to set up a limited community. The number of subscribed stakeholders ( $n = 21$ ) may be too few to realize an active community. Outside the research setting, more people could subscribe and interact, which may result in higher use and support.

In contrast to the high use of the advisory meeting and communication materials, only four stakeholders used the Canteen Scan themselves. This could be explained by the delayed development of the tool, which made it difficult for stakeholders to fill out the scan by themselves. However, in all schools, school canteen advisors filled out the Canteen Scan and discussed the results in the advisory meeting. Stakeholders indicated that insight into the level of their canteen and tailored advices to improve the canteen as generated by Canteen scan helped them to define aims and actions. Our results agree with earlier research, in which tailoring programmes to schools' needs and context, ownership, and providing support and examples were found to be effective to implement school based interventions [70]. These findings could be explained by the different characteristics and diverse and dynamic social, physical, and organisational context of schools and their canteens, which make general advice less applicable.

### **Strengths and limitations**

A strength of this study is the involvement of stakeholders from schools, community health services, caterers, and the Netherlands Nutrition Centre during the process of development and evaluation. This enabled identification of a wide range of factors



affecting implementation from different perspectives. We were therefore able to develop tools that were broadly supported, engaged different stakeholders, and could be easily integrated into existing school routines. We evaluated the tools using a combination of qualitative and quantitative data collected through questionnaires, an evaluation meeting, and online registered data. This combination resulted in reliable and broad insight into both the effects of the tools on perceived factors affecting implementation and the quality of implementation and also provided indications for improvement.

The limitations of this work include first, that we only had data from twenty schools and a relatively small number of stakeholders per school. Included stakeholders, like representatives of caterers and school canteen advisors, represent or visit a large number of schools, thus extending the range of schools affected. Within our study, four caterer employees were involved in multiple schools, of which one was involved in intervention and control schools. This could have biased the results as the received intervention could have influenced the control schools. It is possible that this made the differences between intervention and control schools smaller. Hence, as it was only one person, the bias will be negligible. Second, as mentioned, the Canteen Scan was still in development during data collection. Consequently, school canteen advisors of the Dutch Nutrition Centre could fill in the scan, but for many stakeholders, this was still too difficult. This resulted in low uptake. Stakeholders responded positively to the score and advice generated by the Canteen Scan after being filled out by school canteen advisors. This resulted in the Canteen Scan being improved after this research study. Reasonably, this would improve the use for stakeholders. Third, as all included schools were already motivated to implement the guidelines, stakeholders may have been more positive about their perceived individual and environmental factors regarding implementation of school canteen guidelines than non-included schools. This may have resulted in an underestimation of the tools' effect. Finally, as fidelity is an important concept to measure the quality of implementation [101, 122, 201], we measured it using a combination of dose delivered, dose received, and satisfaction. However, previous studies show that measuring fidelity in multi-component, tailored interventions is difficult and yet, there is no consensus about how to measure it [201]. To be able to compare the quality of implementation across studies, it is recommended to clearly define and use one consistent method to assess fidelity and other process evaluation concepts [201].

## Implications

As also recognized in a previous study [71], creating support and involvement of students, colleagues, and stakeholders within and outside the school and keeping the healthier school canteen on the agenda are both essential and a challenge. Regular reminders such as newsletters, regular contacts with the school canteen advisors, and prompts to fill in the Canteen Scan helped schools to continue paying attention to a healthier food environment. To support sustainable implementation, a healthier school canteen should be aligned with other school health policy, combined with environmental policy to influence the surroundings of the school. To keep stakeholders involved, regular monitoring and feedback of the food environment by measuring the availability and accessibility of healthier food and drink products in canteens and also of students' wishes and needs are recommended. However, in the Netherlands, schools are not obliged to offer and promote healthier foods or drinks at schools. For this reason, our implementation plan will only

support schools that voluntarily want to take action.

To further improve the implementation plan and continue national implementation of the 'Guidelines for Healthier Canteens' in Dutch secondary schools, our results and learnings were shared with the Netherlands Nutrition Centre. Based on these results, implementation tools were improved. For example, the Canteen Scan was improved by adding more explanations and an explanation video 'how to use the scan' was created. Moreover, regarding the fact sheet of students' needs and wishes, we recommended schools to use input of students of different educational levels and grades.

The guidelines for healthier canteens are applicable to sports canteens as well. For this reason, the insights were also shared with stakeholders involved in creating healthier sports canteens. Further research is needed to show whether the findings in the present study are applicable to other settings (such as sports canteens and worksite cafeteria's), other countries, and other health related school based interventions. Moreover, further research is needed to gain more insight into processes of implementation and to be able to compare the quality of implementation across studies. In our opinion, comparability could be improved by clear definitions of concepts like fidelity, dose received, and dose delivered, as well as clear operationalizations to measure these concepts [201, 203]. However, this is challenging because it is also recommended that these measures be adaptable to implementation tools in a specific context.

## **Conclusions**

In conclusion, the tools to implement the Guidelines for Healthier Canteens seem to result in positive changes with regard to individual and environmental factors affecting implementation. The combination of implementation tools supports stakeholders in creating a healthier canteen. In particular, the tools that included students' wishes, tailored information and feedback, reminders, and examples of healthier products/accessibility were evaluated positively.

## **Acknowledgements**

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## SUPPLEMENTARY MATERIALS

**Table S6.1.** The stated questions to assess the perceived factors affecting implementation, including the Cronbach's Alpha.

Factors	Items	Questions	Answer Options	Baseline	After Intervention	Conclusion
<b>INDIVIDUAL FACTORS</b>						
Knowledge	3 items	1. Role Clarity: For me it is clear what activities I have to do to make the school canteen healthier. 2. Knowledge: I have all the information I need to make the school canteen healthier. 3. Knowledge: I have enough knowledge to make the school canteen healthier.	5-point Scale	<0.60	<0.70	Analyse separate
Self-efficacy	6 items	1. I find it easy to do my tasks regarding the implementation of a healthier school canteen. 2. Other tasks conflict to perform my tasks for the healthier school canteen. 3. I am confident that I can change the offer in the canteen. 4. I am confident that I can increase the number of healthier products in the canteen. 5. I am confident that I can change the accessibility of healthier products of the canteen. 6. I am confident that I can perform my tasks, even if there are barriers (e.g., lack of time/motivation of colleagues)	5-point Scale	>0.70	>0.70	Analyse together
Attitude-Belief and Outcome expectations	9 items	<i>See below</i>	5-point Scale	>0.70	>0.70	Analyse together
Attitude-Beliefs	3 items	1. I find it pleasant to do my tasks regarding the implementation of a healthier school canteen. 2. I feel good, when I perform tasks regarding the healthier canteen. 3. I feel myself stressed/sad/nervous, when I perform tasks regarding the healthier canteen.	5-point Scale	>0.70	<0.60	Analyse together with outcome expectations
Attitude-Outcome expectations	6 items	1. The effects of a healthier school canteen are visible for me. 2. Performing my tasks regarding a healthier school canteen gives me many advantages.	5-point Scale	>0.70	>0.60	Analyse together with beliefs

*table continues*

Factors	Items	Questions	Answer Options	Baseline	After Intervention	Conclusion
		<p>3. If I perform my tasks for the healthier school canteen the canteen will get a healthier offer.</p> <p>4. If I perform my tasks for the healthier school canteen the accessibility of a healthier offer in the canteen will increase.</p> <p>5. If I perform my tasks for the healthier school canteen students will eat more healthily.</p> <p>6. Performing my tasks for the healthier school canteen, gives me satisfaction.</p>				
Social Influence	3 items	<p>1. Descriptive Norm: Colleagues perform their healthier school canteen activities good.</p> <p>2. Subjective Norm: Other people expect me to perform my healthier school canteen activities good.</p> <p>3. Social Support: I am receiving enough support in performing my healthier school canteen activities</p>	5-point Scale	<0.60	<0.70	Analyse separately
Routine	2 items	<p>1. Regularly, I control whether I perform all my tasks for the healthier school canteen.</p> <p>2. For me it is easy to remember what I have to do to create a healthier school canteen.</p>	5-point Scale	>0.70	>0.70	Analyse together
Intention	1 item	I want to create a healthier school canteen in the coming 6 months.	5-point Scale	X	X	X
Motivation	1 item	I am motivated to create a healthier school canteen.	5-point Scale	X	X	X
Skills	1 item	My skills are sufficient to create a healthier school canteen.	5-point Scale	X	X	X
Professional Role	2 items	<p>1. In my opinion, it is my task to change the offer of food and drinks in the canteen, to a healthier offer.</p> <p>2. In my opinion, it is my task to change the accessibility of the canteen, to a healthier accessibility.</p>	5-point Scale	>0.70	>0.70	Analyse together
Behavioural regulation	3 items	<p>1. Self-monitoring: Performing my tasks for the healthier school canteen has become a habit.</p> <p>2. Action Planning: I am having a clear plan of how I will perform my tasks for the healthier school canteen properly.</p> <p>3. Action Planning: I am having a clear plan of how I will perform my tasks for the healthier school canteen properly, even when there will arise barriers (lack of time, unmotivated stakeholders).</p>	5-point scale	>0.70	>0.70	Analyse together

*table continues*

Factors	Items	Questions	Answer Options	Baseline	After Intervention	Conclusion
<b>ENVIRONMENTAL FACTORS</b>						
Need for support	3 items	1. I need more information to perform my tasks regarding a healthier school canteen. 2. I need more training to perform my tasks regarding a healthier school canteen. 3. I need more support to perform my tasks regarding a healthier school canteen.	5-point scale	>0.60	>0.70	Analyse together
Innovation	2 items	1. The guidelines are in consistence with my usual work. 2. The guidelines can be adapted to the vision of my school.	5-point scale	<0.60	<0.60	Analyse separately
Perceived organisational support	7 items	1. There are sufficient financial resources to perform my tasks regarding the healthier school canteen. 2. I perceive having enough time to perform my tasks regarding the healthier school canteen. 3. In my organisation, the coordination of the healthier school canteen is well arranged. 4. In my organisation, we made formal agreements about the tasks regarding the healthier school canteen. 5. In my organisation, we have enough human resources to perform the tasks regarding the healthier school canteen. 6. In my organisation, we have enough facilities to perform the tasks regarding the healthier school canteen. 7. In my organisation, I am being informed about the process of the healthier school canteen regularly.	5-point scale	>0.70	>0.60	Analyse together

**Table S6.2.** The stated questions to assess the quality of implementation, including the Cronbach's Alpha.

Factors	Items	Questions	Answer Options	After Intervention	Conclusion
Dose received	1 item	Have you received the [implementation tool]	Yes/No	X	X
Dose received	1 item	Have you read/used the [implementation tool]	Yes/No	X	X
<i>Satisfaction with:</i>					
Schools' questionnaire	1 item	This questionnaire was understandable.	5-point Likert Scale	X	X
Stakeholders questionnaire	1 item	This questionnaire was understandable.	5-point Likert Scale	X	X
Canteen Scan	3 items	1. It is clear how the Canteen Scan needs to be filled out. 2. The given advices are applicable to our situation. 3. It is feasible to fill out the Canteen Scan.	5-point Likert Scale	>0.70	Analyse together
Advisory meeting and report	3 items	1. The advisory report was clear. 2. The advisory report gives practical advices. 3. The advisory report gives feasible advices.	5-point Likert Scale	>0.70	Analyse together
Communication materials (information brochures, poster, website-banner)	6 items	1. The given information and advices in the information brochure were clear. 2. The given information was practical applicable. 3. The given information was feasible. 4. The brochure 'Guidelines for Healthier Canteens' was clear. 5. The brochure 'Guidelines for Healthier Canteens' gives practical information. 6. The information and advices in the brochure 'Guidelines for Healthier Canteens' are feasible.	5-point Likert Scale	>0.70	Analyse together
Online community	5 items	1. It was easy to post messages on the Facebook community. 2. It was clear how to use the Facebook community. 3. The Facebook community gives practical applicable information. 4. The Facebook community gives feasible information. 5. I will advise colleagues to make use of the Facebook community.	5-point Likert Scale	>0.70	Analyse together
Newsletter	6 items	1. The information in the newsletter was clear. 2. The newsletter contained practical information. 3. The newsletter contained feasible information.	5-point Likert Scale	>0.70	Analyse together

*table continues*

Factors	Items	Questions	Answer Options	After Intervention	Conclusion
		<p>4. I was satisfied with the length of the newsletter.</p> <p>5. I was satisfied with the attractiveness of the format.</p> <p>6. I was satisfied with the frequency (once per 6 weeks) of the newsletter.</p>			
Students' fact sheet	5 items	<p>1. The fact sheet was clear.</p> <p>2. The fact sheet was practical and applicable to our situation.</p> <p>3. The fact sheet gives feasible information.</p> <p>4. I was satisfied with the length of the fact sheet.</p> <p>5. I was satisfied with the attractiveness of the format.</p>	5-point Likert Scale	>0.70	Analyse together







# CHAPTER 7

General discussion



The studies included in this thesis concern the implementation of healthier canteen guidelines in secondary schools in the Netherlands. They address the central research question: *Is support for the implementation of the Guidelines for Healthier Canteens helpful in creating healthier school canteens?* In order to be able to answer this question, first implementation tools were developed, based on the needs for support of practice, insight from theory and scientific evidence (Part I). Second, the effectiveness of these developed implementation tools was evaluated and a process evaluation was performed (Part II). This general discussion presents the main findings of both parts of this thesis and reflects on them, followed by methodological considerations and implications for research, practice and policy, leading to an overall conclusion.

## **Main findings**

### **Part I: Development of the support to implement healthier school canteen guidelines**

#### *Summary of part one*

Chapter 2 of this thesis describes the design of the study: how the implementation plan, including different tools, was developed to support implementation of healthier school canteen guidelines in secondary schools. It further describes the design of a quasi-experimental controlled study involving 20 secondary schools. The first aim of this study was to evaluate the effect of the implementation plan by determining changes 1) in the health level of canteens, and 2) in self-reported purchase behaviour of students. Second, a process evaluation was designed to gain insight into the process of implementation via 1) the factors affecting implementation, and 2) the quality of each tool, both according to stakeholders.

Chapter 3 provides a more extensive description of the development and content of the implementation plan. The plan was developed through three steps: 1) interviews with stakeholders to identify impeding and facilitating factors to create a healthier school canteen; 2) an expert meeting to discuss and prioritise these factors; 3) translating these factors into implementation tools using behaviour change methods and implementation strategies. Stakeholders indicated individual determinants as being most important: being motivated and enthusiastic, having a positive attitude and being able to apply knowledge, all regarding creating a healthier canteen. Collaboration with multiple stakeholders such as students, parents and teachers and the feeling of ownership among involved stakeholders were also mentioned as important. Furthermore, stakeholders emphasised the need to have commitment and receive support throughout the whole process from the management of the school and other stakeholders inside and outside the school. Other factors identified as important were insight into the current canteen and organisational situation, being able to create a financial plan and the challenge of maintaining canteen-related activities over time.

Based on these factors and using behavioural change methods and implementation strategies, several implementation tools were specified (Table 7.1). A tool that provides insight into the health level of a canteen is essential to support the implementation of guidelines. Therefore, a digital tool, the “Canteen Scan”, was developed. This tool not only assesses the health level of the canteen, it also provides tailored directions for improvements. Chapter 4 describes how this tool was developed and assessed on content validity and



usability in an iterative theory-based process, again involving multiple stakeholders from research, policy and practice. The Canteen Scan consists of five elements. The first four elements correspond to the subtopics of the Guidelines for Healthier Canteens: A) four questions to assess the basic conditions; the possibility of entering and automatically receiving a classification of the healthiness of all available foods and drinks in B) the cafeteria (e.g. on display, racks) and C) in vending machines; D) nine questions to assess the accessibility of healthier food and drinks. The fifth element combines the entry of the first four elements into E) an overview of the results and offers directions for improvements. The performed content validity and pilot-tests showed a positive evaluation of all elements of the scan, although the time required to fill out needed attention. Based on these results, the scan was improved with minor technical improvements like the position and addition of buttons, more examples and simplified formulations.

**Table 7.1.** Description of the tools used to support implementation of the Guidelines for Healthier Canteens.

Implementation tool	Explanation
1. Insight into the current situation via:	
<i>Questionnaire school and stakeholders</i>	Online questionnaires to get insight into the characteristics of the school and stakeholders, and stakeholders' individual and environmental determinants [95, 99].
<i>"Canteen Scan"</i>	An online tool providing (I) insight into and (II) directions for improvement of availability and accessibility of food and drink products in cafeterias and vending machines [100].
<i>Advisory meeting and report</i>	The results of the two questionnaires and the Canteen Scan are used by the school canteen advisor of the Netherlands Nutrition Centre to give a tailored advice. During an advisory meeting with all involved stakeholders, together a concrete action plan to create a healthier canteen is developed. After the meeting, a written report including the advices and action plan is shared.
2. Communication materials	Several offered materials with information and examples such as: a brochure about the Guidelines for Healthier Canteens, an overview of the steps to be taken, a personalised poster, and a banner for the school's website.
3. Online community	A closed Facebook community for stakeholders to share their experiences, ask questions and to support each other.
4. Digital newsletters	A regular newsletter sent by email, consisting of information and examples regarding the healthy school canteen.
5. Students' fact sheet	A summary of the students' wishes and needs with regard to a healthier school canteen.

### *Reflecting on the studies of part one*

The study results underline the importance of performing systematic practice-based research during the development and evaluation of an implementation plan [60]. In the last decade, implementation science has recognised the need for theories, models and frameworks as the basis for the development of implementation interventions and to gain insight into successful mechanism of implementation. The studies presented in this thesis used several frameworks and models to guide the development, evaluation and reporting of implementation tools [59]. To illustrate, the "Grol and Wensing Implementation of Change Model" was combined with the "Intervention Mapping approach" to guide

the development process [58, 60]. The “Measurement Instrument for Determinants of Innovation” (MIDI) was used, amongst others, to assess and order relevant determinants related to implementation [95], and the Saunders framework was used to define process evaluation concepts [101]. Besides using these theoretical approaches, practice was also involved during the whole research process. This involvement was a convenient process, facilitated by continuous collaboration with the Netherlands Nutrition Centre and involved stakeholders of school canteens.

The needs identified in our study were comparable to needs identified in other school health promotion studies, where the importance of creating ownership, good collaboration and communication, support of management and sufficient time and staff was also recognised [50, 69, 71]. As in other studies, the involvement of parents was mentioned as important, but also as challenging [204]. In our study, examples of successful parental involvements were shared and intervention schools were advised to collaborate with parents who were already involved, or were interested in being involved.

The developed tools are a mix of (improved) existing and newly developed tools. As there were multiple tools offered, this allowed users to choose a tool suited to their needs, their stage in the process, and their available time with regard to changing their canteen. While such a recommended combination of tools can strengthen the implementation plan, implementation remains a complex interplay related to multiple contextual conditions [56, 68]. So, gaining insight into the contextual conditions in and around each school is important for the formulation of tailored advice. Consequently, the first actions of our implementation plan were to gain insight into the current situation in the specific school and of the stakeholders and canteen via questionnaires and the Canteen Scan. In the subsequent advisory meeting, these insights were combined into tailored and stakeholder-supported advices.

To our knowledge, the Canteen Scan is still the only available online tool that automatically scores entered products as healthier or less healthy options and combines that with the number of products offered and their accessibility. This automatically results in one score, indicating the health level of the canteen with reference to the guidelines. In comparison, in Canada and the United States of America similar validated tools like FoodMats, NEMS-V/S/R and (VEND)ing Audit were developed. These tools also combine the assessment of food availability and accessibility in recreational facilities, restaurants, stores or vending machines, although in these tools users have to check manually whether products are in accordance with the nutritional guidelines [28, 158-160, 205, 206].

An important step in the development of a measurement instrument is to evaluate the quality of a tool through the assessment of its validity and reliability [162]. The Canteen Scan is used in practice to support and monitor the implementation of a healthy school canteen. Therefore, it was necessary to study the inter-rater reliability and criterium validity of the Canteen Scan. The results of this study were published in a report and in a fact sheet (both in Dutch). Appendix I includes the Dutch fact sheet with the study’s summary of objectives, methods, results, conclusions and recommendations. Textbox 7.1 summarises this study in English. As this textbox shows, judged by the criteria of Landis and Koch, the scan had a substantial to good reliability and validity for the measurement of the food availability

in the cafeteria. The scan also showed a substantial to good reliability and validity for the measurement of the food availability in vending machines and food accessibility when assessed by an expert (school canteen advisor). When the food availability in vending machines and accessibility was assessed by a canteen employee, reliability and validity were fair. This suggests that the Canteen Scan is a valid and reliable tool for all assessors to assess the offered food in the cafeteria, but to evaluate the offer in the vending machines and the accessibility validly and reliably an expert has to fill in the scan. Canteen employees needed more explanation of the accessibility criteria in particular. These results were used to further improve the scan.

**Textbox 7.1.** English summary of the study to the reliability and validity of the Canteen Scan.

*Objective:*

The aim of the study was to investigate the inter-rater reliability and criterion validity of the Canteen Scan in Dutch schools by assessing the availability and accessibility of food and drink products. Inter-rater reliability was investigated to examine whether the score remains the same even when assessed by different people. Criterion validity was measured to determine whether the Canteen Scan is able to measure a canteen in accordance with the Guidelines for Healthier Canteens. For additional information about the use of the tool in sports canteens and worksite cafeterias, it was also pilot tested in those two settings.

*Methods:*

A canteen employee, a school canteen advisor (SCA) of the Netherlands Nutrition Centre and a researcher filled out the Canteen Scan (CS) and took pictures independently in 50 school canteens, including vending machines. In the first 25 schools, a second SCA also filled out the CS. Due to the lack of a comparable tool suitable for measuring compliance with the guidelines, a reference score was created through consensus between the first SCA and the researcher. In addition, "remote scans" were performed independently by two SCA's, i.e. they adjusted scans according to pictures of the canteens. This method with "remote scans" is frequently used in practice by SCA's, as they are not able to visit all locations. Scores of different users were compared and analysed separately for food availability in cafeterias and in vending machines (VM), and for food accessibility. Inter-rater reliability and criterion validity were calculated with Weighted Cohen's Kappa coefficients (using Landis and Koch's interpretation with <0.2 slight; ≥0.20 fair; ≥0.40 moderate; ≥0.60 substantial; ≥0.80 almost perfect agreement) [207].

*Results:*

Food availability in cafeterias showed substantial to almost perfect reliability and validity for all users ( $K > 0.70$ ). The reliability analyses of food availability in VM and food accessibility showed substantial reliability between SCA's ( $K > 0.63$ ), but fair reliability between SCA's and canteen employees ( $K \geq 0.2$ ). Food availability in VM and food accessibility revealed good validity when filled in by SCA's ( $K > 0.72$ ), but fair agreement when filled in by canteen employees ( $K \geq 0.20$ ). Canteen employees scored accessibility structurally more positively. Comparison of the scores in the canteen with the scores of remote scans showed substantial to almost perfect reliability and validity ( $K > 0.63$ ) when a different SCA took the pictures and filled out the scan independently.

*textbox continues*



Pilot tests revealed some issues with using the Canteen Scan in sports canteens and worksite cafeterias, including where policy should be recorded and how organisations should include vending machines if they are scattered around the building and not controlled by the same company as the cafeteria.

*Conclusions:*

The Canteen Scan is a valid and reliable online tool to assess availability of products in school cafeterias. It can also evaluate product availability in vending machines and product accessibility validly and reliably when filled out by SCA's, but not yet when filled out by canteen employees. This study contributed to knowledge about how to validly and reliably assess the health level of canteens, and how to combine the assessment of food availability and accessibility in one online tool. At present, the tool is being improved based on the results and recommendations derived from this study, and in collaboration with stakeholders from the setting schools, sports and worksites.

## **Part II: Evaluation of the support to implement healthier school canteen guidelines**

### *Summary of part two*

As reported in Chapter 5, the effects of the implementation plan on the health level of the school canteen (cafeteria and vending machines) and student purchase behaviour were evaluated. In this study, 10 intervention schools received support with implementing the Guidelines for Healthier Canteens, while the control schools only received general information about the guidelines. The schools that received support made more changes towards a healthier canteen compared to the control schools. In particular, the availability of healthier foods and drinks in the cafeteria and the fulfilled accessibility of healthier food and drinks increased. The effect on vending machines, however, was limited. With regard to the self-reported purchase behaviour of students, we cannot draw clear conclusions. In our study, students reported bringing most food and drinks from home. In addition, they bought products in shops around school or in the school canteen. The reported purchases in the schools' cafeteria and vending machines were limited, on average less than one purchase per week. Changes in their purchases as result of the intervention, or due to a healthy availability or accessibility in the canteen, were not detected.

In addition to the effect evaluation, Chapter 6 describes the process evaluation of the implementation plan, showing the effect of the tools on factors affecting implementation as perceived by stakeholders, and the quality of each implementation tool. It showed that compared to the stakeholders involved in schools that did not receive the support, stakeholders belonging to schools that received the tools scored higher on their knowledge ("I have all information I need") and motivation, and lower on their need for support. Although these quantitative changes were small, they were supported by the qualitative results. For example, stakeholders mentioned that the different tools complemented each other and that all the tools together supported them in creating a healthier canteen. In particular, the advisory meeting and report, the students' fact sheet, the communication materials and the Canteen Scan were evaluated as most positive tools. However, each tool has a specific function and stakeholders appreciated that they could choose themselves if, when and what support they used. For example, the newsletter worked as a reminder, while the students' fact sheet was used to discuss the canteen topic with school management.

*Reflecting on the studies of part two*

When comparing the results of our studies with others, we have to take into account that the food and drinks provided in Dutch schools differ from many other countries in that many countries provide school meals, and have formulated compulsory meal guidelines. Nevertheless, the changes in our cafeterias and vending machines as a result of the support in implementation are comparable to studies that evaluated the implementation of school food policies in other countries, such as Australia and the United States of America [51, 89, 153, 208]. Those studies also showed that several implementation tools could support schools making changes in their canteens. Examples of strategies used elsewhere include the adaptation of the tools to the schools' own conditional factors and giving personalised feedback as well as on-going support and insight and feedback on the offered products or offering information about the guidelines [51, 182, 208]. These combined strategies were also included in our plan and adapted to the Dutch guidelines. Another strategy which is also likely to be effective in influencing students' consumption is prescribing compulsory guidelines for offering food at school. To date, several countries have prescribed such guidelines, relating mostly to meals and vending machines standards [34]. This strategy yielded positive effects on compliance and provision, and has the potential to influence students' consumption although offering complementary implementation support continues to be necessary [27, 152, 208].

With regard to the products offered in the vending machines, fewer changes were made compared to the offer in the cafeterias, possibly due to the fact that the machines are less easy to adapt or to the fact that external parties, like caterers or vending machine companies, determine their content. This makes schools dependent on these external parties.

Drawing on previous studies, our hypothesis was that an increase in the availability and accessibility of healthier products would encourage students to choose healthier options [25, 42, 43, 45, 49]. We observed, however, no differences in purchases. In some other studies, but not all, an increase in healthier products was seen though the quality of these studies was sometimes low [45, 49]. Our study also showed no relation between supportive implementation and student purchase behaviour. In a review about the effect of implementation of school health policy or programmes on dietary behaviour of students, eleven studies found improvements on at least one product group, while in three studies no effect was observed [51]. One difference, compared to our study, is that those studies investigated food groups separately, which, due to the low number of recorded purchases, was not possible in our study. It is possible that this may have led to being unable to detect changes in purchases, or that measurement limitations, like the moment of measuring the self-reported data, played a role. This will be discussed in the section about the methodological considerations.

The support plan consists of different implementation strategies intended to complement each other [56]. Although the contribution of each specific tool to the changes made in the canteen was not evaluated, the process evaluation evaluated the quality of each tool separately, as recommended [128]. Consistent with the literature, the personalised and tailored approach of the advisory meeting, taking schools' specific conditions into account, was particularly evaluated as positive [182, 193]. The stakeholders also

recognised the usefulness of the collaboration between school, caterer and municipality health services and to create aims and actions together, by means of the advisory meeting with the participation of different stakeholders. Such community support has previously been identified as one of the conditions influencing implementation of school health programmes [68].

In the process evaluation stakeholders raised some concerns about the financial effects caused by a healthier canteen. Some canteens experienced lower, while in others higher sales were observed. Other research also notes the financial concerns [209], but also shows that vending machines with a healthier offer maintained their revenues [43]. Nevertheless, these concerns among stakeholders should be recognised and taken into consideration.

### **Methodological considerations**

Each chapter in this thesis has already addressed its specific strengths and limitations. This section therefore describes the more general methodological considerations.

#### **Whom to include in your study?**

A strength of our studies is the continuous collaboration between research, practice and policy. However, there is a risk of selection bias with regard to the inclusion of stakeholders, schools and students. Multiple related strengths and limitations can be identified in our studies, which need to be addressed.

A strength of such continuous collaborations is that it improves alignment between scientific evidence and applicability in daily practice, and it increases collaboration and sense of ownership among stakeholders and subsequent uptake of study results [60]. Another strength is that a wide range of stakeholders with different levels of experience of previous canteen guidelines and with different degrees of willingness to use the new guidelines was included in the needs assessment. We took into account Roger's diffusion of innovation theory that explains how innovations spread [94]. According to this theory adopters of an innovation can be classified in five categories on the basis of the pace of adoption: innovators, early adopters, early majority, late majority and laggards. It is reasonable that stakeholders in different categories experience different barriers and facilitators with regard to implementing the guidelines.

In contrast, in order to evaluate the implementation plan, we only could include schools and caterers who were willing to start implementing the Guidelines for Healthier Canteens at an early stage. Therefore, our results pertain only to such early adapters. This may have made the results less generalisable to schools less interested in (making changes in) a healthy food environment at school. This is a limitation, as it may have resulted in smaller differences between the intervention and control group as both groups were motivated to start working with the guidelines, even though the control group received the guidelines without support.

With regard to the inclusion of students, another limitation might be that we included mainly second year students (13-15 years old). This group was selected because they were more adapted to the school environment compared to the first-year students, and in the third class and higher students were less present at school, due to external internships (in

the lower educational levels). This makes the results less generalisable to younger and older age groups, as younger students have different (determinants of) dietary behaviour than older students. To illustrate, younger students might take food and drinks from home more often, might have less money to spend, and are likely to be less independent compared to older students [210]. Besides, as the influence of parents decreases and the influence of peers becomes more prominent, the number of purchases at and around school may differ between ages [19, 20]. Measuring the effect in only one age group might have made the effect of the healthier school environment less visible.

To evaluate the effect and process of the implementation plan, we performed a quasi-experimental controlled trial. This is a potential limitation because Randomised Control Trials (RCT's) are generally recognised as the best design to investigate the effect of an intervention because random assignment assures no systematic difference between the intervention and control group. However, in Dissemination and Implementation (D&I) Research, due to the external validity, practical concerns, and the involved contextual factors, randomisation is not always feasible, making other designs more suitable [211]. In our study, due to the small number of included schools and the fact that different contextual school factors are related to implementation, randomisation was not appropriate. Meanwhile, it is a strength that we matched our intervention schools to control schools in order to reduce the pre-existing differences between intervention and control schools [212]. We matched schools on the characteristics educational level, school size, and catering by the school itself or external catering company. These were broadly similarly distributed across the matched characteristics. Although we were not able to match additionally on the availability of shops near school, and the presence of policy to oblige students to stay in the schoolyard during breaks, these were also about equally distributed across both groups. Moreover, gaining insight into other contextual factors and dynamic processes (in for example the school organisation) which also may influence implementation of school health policy, was part of our intervention [52, 68]. For example, by using the schools' and stakeholders' questionnaires and providing tailored support based on these insights.

### **What is the perfect timing in research?**

In our studies, multiple strengths and limitations occurred with regard to the timing and duration, including the timing of the measurements. One strength is that the interests of both practice and research were balanced in the timing and study duration. We wanted to gain insight into how and when to properly implement the guidelines, while also wanting to start using the developed guidelines as soon as possible. The involvement of multiple stakeholders, like the school canteen advisors and caterers, meant that they had the opportunity to become familiar with the guidelines prior to broader dissemination during the research. Besides, their experiences with and research insights on the implementation tools enabled adaptations before widespread dissemination. This made waiting with broader dissemination of the guidelines until the research results were available worthwhile.

Unfortunately, we had a limited amount of time for the evaluation of the implementation plan, due to the development of the implementation tools on the one hand (like the moment the Canteen Scan was available), and the end of the school year on the

other. Consequently, we were only able to follow schools between four to six months, a relatively short period of time for applying the implementation tools and for making actual adaptations in the canteen. Schools usually plan per school year, which allows them adequate time to work on a healthy canteen through setting up a working group and an anchor policy, and adapting the cafeteria and vending machines.

The limited period of time also influenced when we could measure students' purchase behaviour. The most important limitation was that we measured the purchase behaviour of students around the same time as measuring the health level of the canteen. During the post-intervention investigations, we noticed that the adaptations in the canteens had been recently performed. It appeared that it is difficult for schools to allocate the time required to make a canteen healthier, despite our reminders during the intervention period. A planned moment, like the post-intervention measurement, and the potential reward with a "healthy school canteen award" encouraged them to make changes prior to the measurement. As a consequence, students may not have been able to get used to the adapted offering and presentation of healthier products, and to adapt their purchase behaviour accordingly. This may be why we were unable to detect changes in purchase behaviour, as it is known that it takes a while for students to get used to a new offering and to adapt their behaviour.

The developed online Canteen Scan, which was an implementation and measurement tool in our studies, was launched just before the baseline measurements. On the one hand, this is a limitation, as the scan was still in a development phase and users such as school canteen advisors and canteen employees had to get used to it. On the other hand, it is a strength that we had access to an easy, online tool to score the level of the canteen according to the Guidelines for Healthier Canteens. At a later stage, the scan showed a good validity and reliability particularly when filled out by a school canteen advisor, as shown in previously presented textbox 7.1 and the accompanying fact sheet I.

### **How to describe and assess an implementation plan properly?**

A strength of our study is the clear description of the development and content of the implementation plan, including the aims, strategies and tools [58]. Although such descriptions have been acknowledged by others, implementation plans have generally been described poorly, making it difficult to compare study results and to integrate insights in practice [54, 213]. Since each country has its own system and regulations, this extensive explanation is even more important in the field of school food environment [214].

Another strength is the fact that we performed an effect and process evaluation that included multiple outcomes. As the effect evaluation included measures on canteen and student level, and the process evaluation included stakeholders' determinants affecting implementation, and the quality of each tool, these outcomes complemented each other. The results on effect and process level contributed to broad insights into the relevance and feasibility of our plan.

With regard to the process evaluation, there were several strengths and limitations. One strength was that we aligned the process outcomes to the identified determinants in the needs assessment, which formed the basis of the selected implementation strategies

and tools that our plan consists of. By doing so, our process evaluation measured if these determinants changed due to the support in implementation. Although this alignment seems obvious, the impact of implementation strategies on stakeholders' determinants like knowledge and attitude have rarely been assessed in school health promotion supportive programmes [51].

Another strength was that we measured the quality of each implementation tool separately with multiple measures like satisfaction, dose delivered and dose received. We selected only the most important process evaluation concepts used in implementation research as it was not feasible to measure all recommended concepts [122]. While using only a selection of concepts is a limitation, it is a strength that we assessed both self-reported and objective data (for example dose received concerning the newsletter). These objective data were generated automatically during the intervention, for example, whether participants opened the received digital newsletter, and which part they clicked to read more, was recorded.

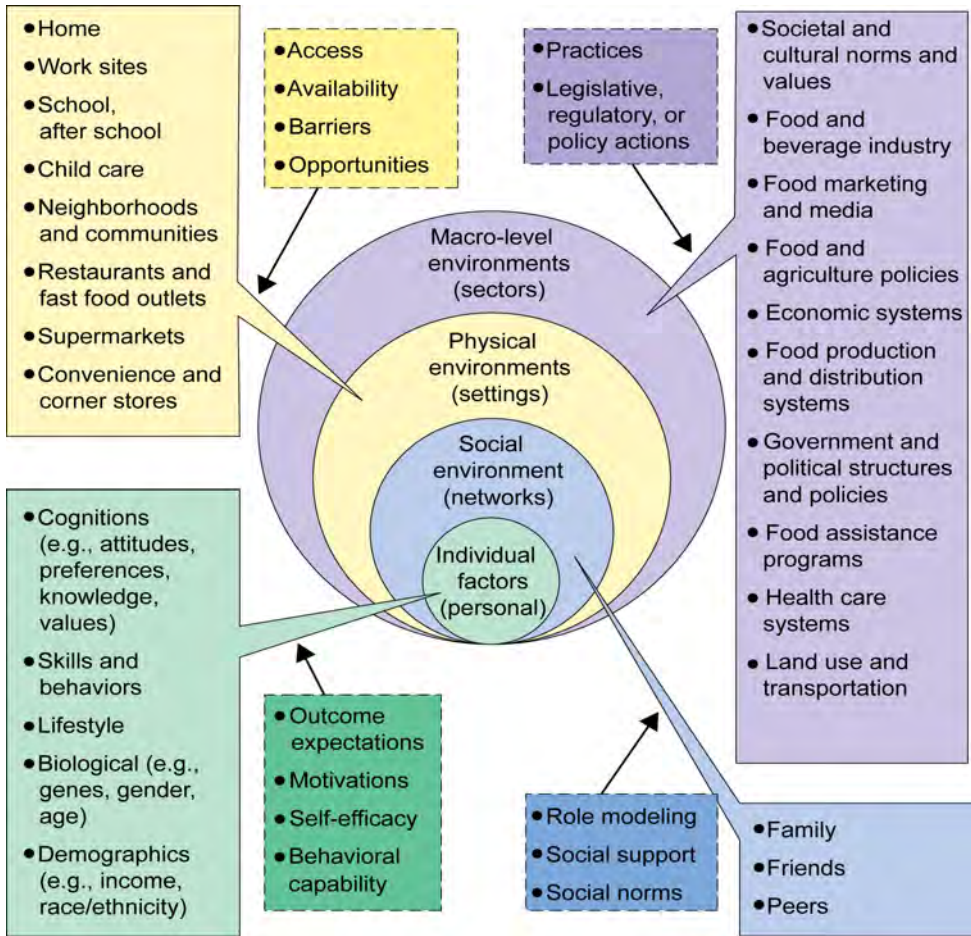
## **Implications**

This thesis focuses on support to facilitate schools and involved stakeholders to create a healthier availability and accessibility of food and drinks inside schools. The knowledge gained has implications for future actions. In this discussion, it is important to emphasise that (changing) healthy eating of students is complex, and is subject to multiple influences related to the school food environment. In advance, it is therefore of interest to use the social ecological model of Story, et al. (2008), Figure 7.1, to review the different influences involved in this complex interplay [15].

This model includes four levels: 1) individual factors, like demographics, and personal behavioural determinants; 2) social environment, including the support and experienced norms of family and friends; 3) physical environment, not only the environment inside schools, including the canteen, but also the environment around school; and 4) macro-level environment, including regulations and policy support with regard to the canteen as well as the societal and cultural norms.

Offering support aiming to facilitate creating a healthier school canteen includes both individual factors of students and stakeholders (like behavioural determinants of students and canteen employees), the social environment (the support of friends, and the reaction of students on the healthier offer in the canteen), and the physical environment inside school (making changes in the school canteen). However, this support is also related to other physical environments inside school (like attention for nutritional education and the healthiness of food and drinks offered at schools' activities) and outside school (like shops around school, but also the home, sports and worksite environment) and the macro-level environment (the norms about healthy eating in the society and the efforts of the national and local government). Consequently, when considering the implications for future research, practice and policy, attention will be paid to how these different levels of the ecological model can contribute to successful implementation of healthier school canteen guidelines, thus stimulating adolescents' healthy dietary habits in school.





**Figure 7.1.** An ecological framework depicting the multiple influences on what people eat, described by Story, et al., 2008 [15].

### Implications for future research

The knowledge gained from the studies performed has implications for future research. These concern the individual factors, of stakeholders and students, and the social and physical environments (Figure 7.1). In my opinion, creating successful healthier school environments requires more insight into: 1) the sustainability of healthier school canteen policy; 2) students' food choices throughout the day, not limited to the school setting; and 3) school-based implementation.

### Improve knowledge about sustainable implementation of healthier school canteen policy

The studies showed that support in implementation of healthier canteen guidelines resulted into healthier canteens. However, whether these effects will remain is unknown. To be able to scale-up the support and to reach all schools willing to work towards a healthier canteen, investigation is needed into the supportive implementation: a) over a



longer period; b) in a diversity of schools; c) to its cost-effectiveness, and d) to its financial sustainability for practice.

First, whether the current tools are sufficient to maintain healthier school cafeterias and vending machines over longer periods of time needs to be investigated. Since the implementation tools were developed on the basis of the needs of stakeholders starting to work with the Guidelines for Healthier Canteens, the next step is to gain insight into the needs of stakeholders who have been working with the guidelines for a while. It is possible that their needs change due to their experience, or that they need recurrent stimuli to remain active. With regard to these needs, whether the current tools are sufficient to maintain healthier school canteens should be investigated. Schools are rewarded with an annual healthier school canteen award, which they receive when they meet the Guidelines for Healthier Canteens. The Netherlands Nutrition Centre found that up to 2019, a total of 731 schools have had such an award, of which 407 (56%) received one for two or more years [215]. This indicates that maintaining a healthier canteen for multiple years is possible. However, more insight into why a school was (not) able to maintain their healthy canteen is recommended [216]. Besides, the effect of this annual reward might not be sustainable, and its value in addition to the other supportive tools should be investigated.

Second, it is of interest to explore if the support is appropriate for a diversity of schools: schools that differ in context with regard to for example, differences in the stage of implementation of the guidelines, educational levels offered, management of the canteen (with and without a caterer), location (inside a city, and more rural). Additionally, as we recognized that the included schools in our study were already motivated to start working towards a healthier canteen, investigations are recommended into the impact of the support on schools who are less motivated is recommended. This will reveal whether additional tools are needed for certain schools.

Third, future investigations should look at sustainable possibilities for finance and delivery the (personal) approach to all schools. It is known that the costs of scaling up such approaches can be challenging [89]. Nevertheless, in Australia a high and medium intensity programme has been evaluated as more positive on cost-effectiveness compared to a low intensity programme, so the relative costs (effects per euro) may be affordable [217]. It is therefore of interest to investigate the cost-effectiveness and the ideal intensity of the developed support.

Finally, the financial sustainability for schools and caterers should be investigated. For example: included stakeholders had already reported their concerns about the profitability of the canteen. Research showed that a healthier offer in vending machines did not result to negative financial consequences [43]. Experiences from practice appear to indicate a minor financial drop in income that is only temporary, although this has yet to be investigated. Available systems like telemetric data from vending machines or electronic cash desk systems can be used to measure these financial consequences.

### **Achieving insight into food choices of students due to a healthier school canteen**

In our study, the food purchases of students inside the school were investigated. Future research should evaluate the effects of a healthier canteen on students' dietary behaviour

more comprehensively: in the longer term, and on different groups of students. To be able to measure the sustainability of the effects throughout adolescence, the duration of such a study should be at least three years.

Research into potential differences of the effect of a healthier canteen in different student groups is recommended. Firstly, this should consider students of different age groups because on the one hand, students from higher classes have experienced the old as well as the new offering in the canteen, while those in the lower classes have experienced only the healthier canteen. This will also enable investigation of differences in effect between younger (12-14) and older (15-18) adolescents [210]. Second, although our study did not reveal gender differences in purchase behaviour in the school canteen, it did find subtle gender differences, with boys indicating buying food and drinks outside the school more often. This makes further investigating these differences worthwhile, because other studies did find differences [187]. Thirdly, the effect of a healthier canteen on students with different educational levels is of interest.

The school is known to be just one of the settings where students buy and take food and drinks. Since our study confirms that youth also bring food from home and buy food outside the school, it is therefore of interest to investigate the relation between the exposure of healthier foods in schools and food choices outside school throughout the day. Such research should assess students' daily food intake in the long-term, as well as the locations where they buy and eat foods and drinks during the day [49].

One reason for also assessing students' dietary behaviour outside school is the risk of compensatory behaviour outside school in response to the offer of healthy products at school [37, 49]. A second reason is that the healthy school canteen is likely to communicate a descriptive norm, which could influence students' food choices outside school: if students see healthy products in school, they may assume that other students also buy these foods and that it is normal to eat those kinds of foods. This may result into a positive change in students' food choices outside school throughout the day and later in life [192, 218]. Besides to the assessment of student dietary behaviour in the physical environment in- and outside school, insight into other factors related to what adolescents eat is also necessary. As Figure 7.1 shows, these may include individual factors, such as age, ethnicity or behavioural determinants, or social environments, such as social norms and support from parents and friends [19, 20, 41].

Although investigating students' dietary behaviour over a longer period and throughout the day may be complex, new technologies like Ecological Momentary Assessment (EMA) may increase the feasibility of such measurements [195, 219]. EMA uses repeated data collections, of people's current behaviour and experiences in their daily life. For example, a mobile phone application enables students to receive questions about what they eat, with whom and where, every 2-hour. EMA may be particularly feasible for students because they are used to integrating their mobile phones into their daily activities. In addition, existing tools to report daily intake can also be used, for example "Mijn Eetmeter" (My Eat-meter), a Dutch tool of the Netherlands Nutrition Centre that enables individuals to report their daily dietary intake [220]. Complementing the self-reported measurements with objective sales data is also recommended. This information can be combined with

the investigation into the previously mentioned financial sustainability for schools and caterers.

### **Increase insights about school-based implementation**

Over the last decade, there has been a growing interest in implementation science, although not all results are applicable to the implementation of school-based health programmes [221]. More insight into school specific implementation is therefore needed. First, as the contextual factors related to school-based implementation differ from, for example, care-based implementation settings, more insight into them is needed. Such factors include both inside school factors, like the support of management, nutritional education and student involvement, and factors outside school, like shops close to schools, regional factors and the support of Community Health Services. In particular, the influence of factors related to the school organisation like educational level, involvement of teachers, and nutritional working groups is limited [41].

Second, a new school specific implementation strategy compilation (SISTER) that has been recently published should be used in future research on school-based implementation [67]. During the development of our implementation plan, we used the general ERIC strategy compilation [65]. These strategies have meanwhile been adapted to more specific strategies for school-based health programmes, i.e. the SISTER strategy compilation [67, 222]. Specifically, of the 74 ERIC strategies, 11 remain; 57 were changed, with mostly terminology adaptations; 5 have been deleted, for example “other payment schemes”; and 7 strategies have been added. These new strategies included “develop local policy that supports implementation”. Such school specific strategies are likely to facilitate implementation of health programmes in schools.

Third, feasible, reliable and valid process evaluation measures that are also adaptable to the specific implementation situation in schools need to be developed [51]. During our process evaluation, we found that translating general process evaluation concepts, such as fidelity, into research specific questions while taking into account the comparability and feasibility was challenging. While existing online databases with measurement instruments may already support researchers choosing appropriate instruments [223], increased knowledge about school specific instruments is likely to support researchers even more.

### **Implications for practice**

The studies performed also revealed multiple practical implications related to individual factors and the social and physical environment (Figure 7.1). These involve: 1) facilitating the collaboration between research, policy and practice; 2) strengthening the collaboration inside schools; and 3) aligning food related interventions inside and outside school.

### **The collaboration between research, policy and practice should be facilitated**

I recommend that scientists, practitioners and policymakers collaborate in research projects from the outset, in order to enable joint creation of relevant, feasible research questions. This is likely to result in a sense of ownership among all involved stakeholders, commitment and support to perform the study, and broad dissemination of the study results. Honesty, appreciation, knowledge of each other’s strengths and the intention to put effort in the collaboration are some factors needed for a successful collaboration [113].

In order to be able to build upon, and maintain, sustainable networks in the long term, study funding should incorporate financial opportunities for such collaborations. Only then will it be feasible for involved stakeholders to build upon and invest in those meaningful collaborations.

The contribution of nutritional experts in the implementation of school canteen guidelines, in our programme with school canteen advisors, is unique and worthwhile and should be maintained. Such experts are particularly important in connecting and increasing collaborations between schools, caterers and the local Community Health Services. Drawing on their experiences in different schools, they can provide schools, but also organisations in others settings like sports canteens or work-site cafeterias, with tailored advice and examples. Although the Canteen Scan was constructed in such a way that stakeholders are able to check their canteen and receive advice without external support, relying on self-reported data may be more prone to desirable answers, leading to a more positive score. Consequently, an additional check and support by an independent reviewer like a school canteen advisor is necessary [155].

### **The collaboration inside schools should be strengthened**

The physical and social environment inside the school, consists of more than the schools' cafeteria and vending machines. Consequently, to strengthen the impact of a healthy school environment on students' behaviour, additional efforts inside school are needed. These are 1) active involvement of students and parents; 2) communicate one coherent message about healthy dietary behaviour; and 3) creating a school environment where youth can learn how to adopt a healthy lifestyle.

Active involvement of students and parents is recommended because it can increase the success of a healthier school canteen and may influence healthy eating at home [174, 224]. Although we advised schools to involve students and parents, they experienced difficulties in this. The offered fact sheet containing students' needs and wishes was experienced as a first step in the involvement of students. More efforts are therefore needed to really involve students. Other successful examples are: school gardening (and sale of produce in the canteen), students-chefs (and production of items which can be sold in canteens), allowing students (co)decide about the assortment, combining activities for the canteen with the nutritional education, and allowing students to make promotional materials to display in the canteen [174, 225, 226]. With regard to parental involvement, increased attention and practical tools on how parents can be involved are likely to support schools. In one of our implementation tools, the advisory meeting, we aimed to engage all relevant stakeholders, such as schools' management, teachers, students, parents, and the (external) caterer. However, only one school included parents in this meeting, so more support is needed. It may be beneficial to focus on multiple health related themes instead of just one, and to involve students in bridging the gap between the school and home environment [224]. This will enable both the physical and the social environment to support students in making healthier dietary choices. This could include, for instance, organising a meeting for parents where their children can show what they have learned, like cooking a meal, or allowing students to make food related exercises at home in which parental involvement is needed [227]. However, since it differs per school how students and parents can be involved best, collecting good examples from schools in a hand book, which can be distributed by the

Netherlands Nutrition Centre, may support schools.

A supportive school environment that communicates one coherent message about healthy dietary behaviour, is another important recommendation for practice. Schools are the owners of their school food environment: if they want to create a positive, healthy climate for their students, they should offer an overall healthy food environment at school. Here, it is important that schools not only promote healthy food in the canteen, but also create a positive climate to eating healthily, like an agreeable area where students can consume their lunch, promoting social interactions during lunch time and ensuring that students have enough time for their lunch [34]. In addition, the presence of and consistency across the nutritional school policy emphasises the importance of a healthy dietary behaviour throughout the day. All different policies, like the aspiration of the school canteen, kinds of foods students receive at school activities and are allowed to bring to school, should be in line with the overall healthy message of the school [228].

Another important recommendation for schools is to combine the changes in the school food environment with nutritional education and other health promotion interventions in order to create a supportive school climate where youth can learn how to behave healthy [191]. Teaching nutritional education can support the healthy school canteen, as children also have to increase their knowledge about a healthy dietary pattern and to learn practical food skills, for instance what foods are nutritious and how to prepare a healthy meal. To increase the benefits of health promotion, attention for other health related themes like physical activity or well-being is also important [191]. With regard to our study, consideration how our results may be transferable to other health themes within the Dutch Healthy School Approach is of interest. Previous research has already shown that the school-based implementation strategies for physical activity and nutritional policy were similar [51]. The implementation strategies we used, including ownership, collaboration and personalised approach, could support implementation of other health themes. The involvement of the Netherlands Nutrition Centre in our studies and its coordination of the nutritional theme within the Healthy School Approach may facilitate this knowledge exchange.

### **Aligning food related interventions inside and outside school**

Our studies show that supportive implementation can facilitate implementation of healthier canteen guidelines inside schools. However, students' food choices, and thereby the success of school canteens, are also influenced by other physical environments (Figure 7.1) like the food environment around school and the foods/drinks brought from home [19, 139]. Creating a system-based approach involving schools and the broader physical food environment, like shops around schools, is likely to contribute to a successful healthy school canteen and healthier food choices of students [228]. This may include collaborations with places where students work, for example the supermarkets in the schools' neighbourhood, and also other environments that students visit, such as sport facilities or cultural settings. If multiple organisations provide healthy food and drinks, this may become the social norm [192]. School canteen advisors or the local government can facilitate collaborations between multiple organisations to exchange knowledge and learn from each other, and food related assignments of school can be linked to food environments outside schools using for instance, the Canteen Scan to assess the food availability and accessibility in a location close to school.

## **Implications for policy**

Finally, the studies reported in this thesis provide insights for policy implications. These implications are related to the macro-level environment (Figure 7.1) and can be divided into efforts with regard to 1) healthier canteen policy, and 2) the local and national governments.

### **The future of the Guidelines for Healthier Canteens**

The studies performed in this thesis all contributed to the implementation of Guidelines for Healthier Canteens in schools. In terms of the future, updating of these guidelines if new relevant scientific evidence or practical based information is available is necessary. Updates should include relevant evidence regarding strategies to create a healthier food environment and adaptations in the Dutch nutritional guidelines, without losing practical feasibility. Consequently, this process should be performed in an iterative process, involving stakeholders from research, practice and policy. These adaptations could be made on a regular basis and should be communicated at an early stage.

Part of the guidelines are the dietary criteria that determine whether a product is considered to be a healthier or less healthy product. Currently, healthier products are defined as foods and drinks recommended in the Dutch nutritional guidelines “Wheel of Five” [79]. In addition, so-called “day choices” are tolerated: products not included in this “Wheel of Five” but containing a limited amount of calories, saturated fat and sodium [79]. At present, this results in the situation where a healthier canteen can offer products that do not really contribute to a healthy dietary pattern. In practice, offering in a healthier canteen small portions of less healthy products, for example small bags of popcorn or candy, led to confusion among students and parents. I therefore advise setting a minimum for the products included in the “Wheel of Five”, like water, whole grain products, fruit and vegetables, and restricting the number of day choices.

### **Efforts to be made on local and national government**

Schools are a place where youth can learn and grow, in terms of educational aims but also in broader terms, in their development into healthy, responsible and independent adults. Consequently, ensuring healthy eating at schools should be a priority of national and local government. This encompasses, besides healthy school canteens, efforts with regard to nutritional education and a healthy food environment around schools.

At present, nutritional education in schools is not compulsory in the Netherlands. This contrasts with the pedagogical task of schools educating students towards independent individuals. There already exist multiple voluntary interventions to educate children, from toddler until adolescence, to learn healthy dietary behaviour: for childcare, primary schools, and secondary schools. In this pathway, youth can be educated stepwise about nutrition, so they receive the knowledge and skills to make healthy dietary choices throughout their life. However, to ensure that all children receive this education, regardless of their social economic position or background, nutrition needs to become compulsory for all schools.

At the same time, as long as unhealthy food and drinks are easily accessible in the environment around schools, policies for schools will have limited impact on youth's dietary behaviour. At present, the national government has increased its attention towards

healthier food environments, including healthier school canteens, in their National Prevention Agreement (2018) [77]. This has induced local governments to create a local prevention plan. These local plans create opportunities to include a healthy environment in all policies they develop and to improve the interaction between local organisations and citizens. Within this process, incorporating the lessons learned from complex community initiatives like the JOGG-Approach (Young People at a Healthy Weight) [82] or the Amsterdam Healthy Weight Programme [229] and engaging communities via for example citizen science is recommended [230]. Also, school canteen advisors, or Community Health Services are able to facilitate and support between different local food initiatives and organisations within governments.

In the current time of fake news and non-evidence-based advices, I recommend that an independent organisation continues to be the coordinator of the Guidelines for Healthier Canteens and the executor of the Healthy School Canteen Programme. Research finds that a credible source of the implementation tools regarding healthy school food policy is important [182]. Currently, as a result of the support by the national government, the Healthy School Canteen Programme of the Netherlands Nutrition Centre is able to assist schools, caterers and Community Health Services towards healthier canteens for free. This nationwide support for an independent, non-profit organisations, should be retained to be able to increase and sustain a healthy environment for youth.

### **General conclusion**

The performed studies show that the support in implementation of the Guidelines for Healthier Canteens supported stakeholders adequately and resulted into healthier school canteens. Still, the effects of a healthier school canteen on student purchases and consumption remain unclear. The advisory meeting and report, the communication materials, the students' fact sheet and the Canteen Scan have been particularly evaluated as positive.

The combination of and collaboration with research, policy and practice from the start and throughout this study resulted in feasible, evidence-based tools, and a broad feeling of ownership among stakeholders. This mixture of tools can be tailored to each school, and stakeholders can choose if and when they use a tool. This was evaluated positive. The gained results are applicable for research as well as policy and practice.

Meanwhile, the insights acquired to refine the tools have been implemented by the Netherlands Nutrition Centre. It is likely that the needs of stakeholders are going to change in the future, for example, when schools use the guidelines for a longer period, or if the guidelines are adapted. Reviewing the tools regularly to evaluate whether they still align with the (changing) needs of practice is advised.

A healthy school canteen is an essential part of a healthy food environment for youth. However, stimulating healthy dietary behaviour among youth requires to be combined with nutritional education and healthy food environments inside and around schools.





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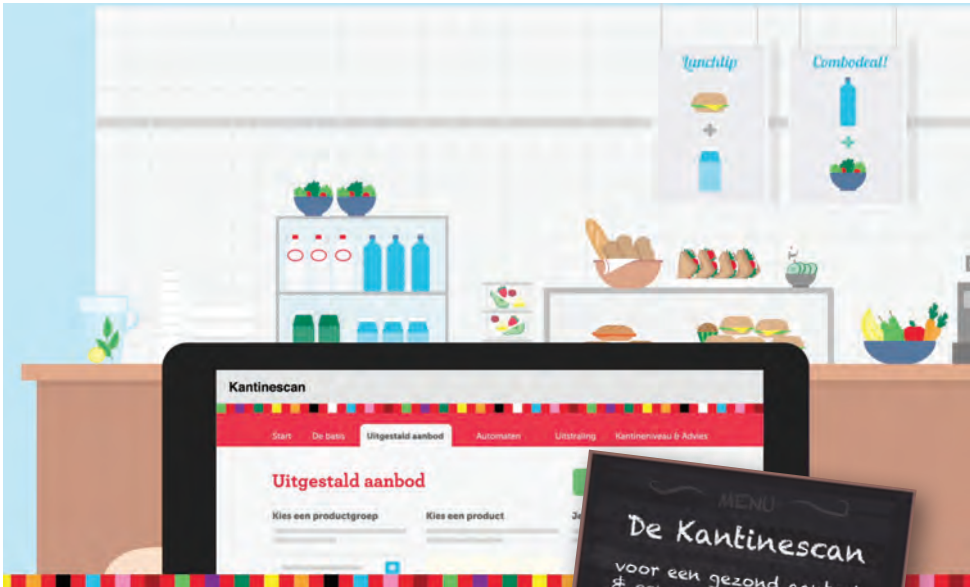




# APPENDIX I

Factsheet “Brengt de  
Kantinescan aanbod en  
uitstraling goed in kaart?”





## Brengt de Kantinescan aanbod en uitstraling goed in kaart?

Met de Kantinescan kan het uitgestalde aanbod in schoolkantines goed in kaart worden gebracht. Het meten van het aanbod in de automaten en de uitstraling kan beter. Dat is de conclusie van het onderzoek dat de Vrije Universiteit Amsterdam in 2017 en 2018 heeft uitgevoerd in opdracht van het Voedingscentrum op 50 middelbare scholen. Ook is bij 7 sportkantines en 11 bedrijfsrestaurants gekeken naar de ervaringen met de Kantinescan.

Het Voedingscentrum gaat op basis van de resultaten van het onderzoek onder andere de vragen over voedingsbeleid in de organisatie, en de onderdelen automaten en uitstraling van de kantine verder verduidelijken.



## Samenvatting onderzoek

**Schoolkantines, sportkantines en bedrijfsrestaurants kun je zo inrichten dat mensen gemakkelijker gezond kunnen kiezen. Hiervoor zijn de Richtlijnen Gezondere Kantines door het Voedingscentrum ontwikkeld. In deze richtlijnen wordt gekeken naar het aanbod en de uitstraling. Welke producten worden aangeboden? En op welke manier worden deze gepresenteerd? Wat staat er bijvoorbeeld op de opvallende plaatsen in de kantine? Welke producten worden aangeprezen? Wat staat op afbeeldingen in de kantine? Om te kunnen meten in hoeverre de richtlijnen worden toegepast, is in een samenwerking tussen de Vrije Universiteit en het Voedingscentrum in 2015 de Kantinescan ontwikkeld.**

### Betrouwbaarheid en validiteit onderzocht

In 2017 en 2018 heeft de Vrije Universiteit in opdracht van het Voedingscentrum de validiteit en betrouwbaarheid van de Kantinescan onderzocht. Met validiteit wordt bedoeld: meet de Kantinescan wat gemeten moet worden? En met betrouwbaarheid wordt bedoeld: als verschillende mensen de Kantinescan invullen, is de uitkomst dan hetzelfde? Dit onderzoek is uitgevoerd op 50 middelbare scholen. Ook is bij 7 sportkantines en 11 bedrijfsrestaurants gekeken naar de ervaringen met de Kantinescan.

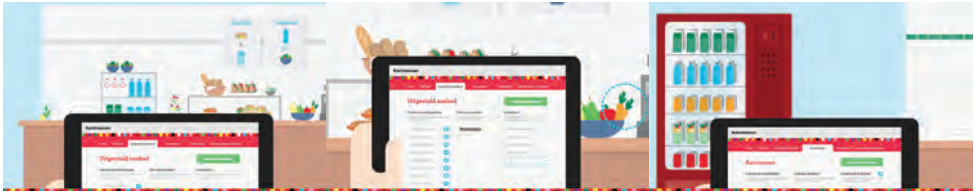
### Uitgestalde aanbod goed gemeten, automaten en uitstraling kunnen beter

Het blijkt dat met de Kantinescan in scholen het uitgestalde aanbod valide en betrouwbaar gemeten kan worden. Het blijkt echter nog wat lastig het aanbod in de automaten en de uitstraling van de kantine goed te meten. Alleen als mensen veel ervaring hebben met het toepassen van de Richtlijnen Gezondere Kantines en de Kantinescan, zoals de Schoolkantine Brigade van het Voedingscentrum,

kan het aanbod in de automaten valide en betrouwbaar gemeten worden. De uitstraling van de kantine kan dan ook deels betrouwbaar en valide gemeten worden, maar er is ook een deel dat beter kan. In sportkantines en bedrijfsrestaurants bleek bij onder andere de vragen over voedingsbeleid in de organisatie en het bepalen van opvallende plaatsen in de kantine nog onduidelijkheid te zijn.

### Verduidelijking nodig

Op basis van de resultaten van het onderzoek worden verschillende adviezen gegeven voor verbetering, zoals het verduidelijken van de vragen over het voedingsbeleid, en het verduidelijken van het onderdeel automaten en sommige uitstralingspunten. Deze adviezen zullen in samenwerking met de praktijk worden omgezet naar verbeteringen in de Kantinescan.



## Beschrijving onderzoek

### Inleiding

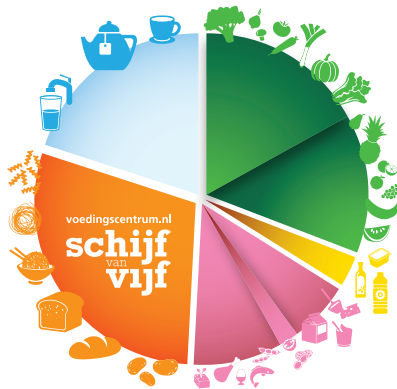
Het Voedingscentrum heeft richtlijnen opgesteld waarmee je schoolkantines, sportkantines en bedrijfsrestaurants gezonder kunt maken: de Richtlijnen Gezondere Kantines. Met deze richtlijnen kun je het makkelijker maken voor consumenten om gezond te kiezen. In de richtlijnen wordt gekeken naar het aanbod en de uitstraling van kantines en restaurants.

Binnen de Richtlijnen Gezondere Kantines zijn drie niveaus gedefinieerd: brons, zilver en goud. Hoe 'edeler' het metaal, hoe gezonder het aanbod en de uitstraling. Niveau brons is alleen van toepassing op sportkantines en bedrijfsrestaurants. Van schoolkantines wordt verwacht dat zij ten minste instappen op niveau zilver.

Voor de indeling van de aangeboden producten wordt als basis de Schijf van Vijf gebruikt. In de

Schijf van Vijf staan alleen gezondere keuzes, zoals water, volkorenbrood, karnemelk en vers fruit. Producten die te veel zout, suiker of verzadigd vet bevatten, of maar weinig vezels hebben, staan buiten de Schijf van Vijf. Als je eet volgens de Schijf van Vijf kunnen deze producten er wel bij, maar in beperkte mate: niet vaker dan drie tot vijf keer per dag iets kleins buiten de Schijf (een dagkeuze), en hooguit drie keer per week wat groters (een weekkeuze).

In de Richtlijnen Gezondere Kantines wordt onderscheid gemaakt tussen betere keuzes en uitzonderingen. Alle producten uit de Schijf van Vijf en de dagkeuzes samen vormen de betere keuzes. De weekkeuzes zijn de uitzonderingen. Een zilveren kantine bestaat voor minstens 60% uit betere keuzes en een gouden kantine voor 80% uit betere keuzes.



niet in de  
schijf van vijf



## Appendix I. Brengt de Kantinescan aanbod en uitstraling goed in kaart?



Hoe producten worden aangeboden, heeft invloed op de keuzes die mensen maken. Daarom zijn binnen de Richtlijnen Gezondere Kantines verschillende uitstralingspunten beschreven. Bijvoorbeeld: staan op de opvallende plaatsen in de kantine betere keuzes? Hoe worden groente en fruit gepresenteerd? Wat zie je het eerste als je binnenkomt? Hoe gezonder het aanbod en hoe meer uitstralingspunten die voldoen, hoe gezonder de kantine of het restaurant.

Om te kunnen bepalen op welk niveau een kantine of restaurant zit, is in een samenwerking tussen de Vrije Universiteit en het Voedingscentrum in 2015 de Kantinescan ontwikkeld. De Kantinescan geeft op basis van het ingevulde aanbod en uitstraling, ook adviezen om het aanbod en de uitstraling gezonder te maken. Het is belangrijk om te weten of je met de Kantinescan goed en betrouwbaar het aanbod en de uitstraling in kaart kunt brengen. Dit heeft de Vrije Universiteit in opdracht van het Voedingscentrum onderzocht. Het doel was onderzoeken in hoeverre de Kantinescan betrouwbaar en valide is. Meet de Kantinescan wat gemeten moet worden? En als verschillende mensen de scan invullen, is de uitkomst dan hetzelfde?

### Beschrijving onderzoek

In 2017 en 2018 is in 50 schoolkantines onderzoek gedaan. De Kantinescan is ingevuld door de kantinebeheerder van de school, de onderzoeker van de VU en door verschillende adviseurs van het Voedingscentrum, oftewel de Schoolkantine Brigadiers. Ingevulde scans zijn ook door brigadiers op afstand op basis van foto's gecontroleerd. De uitkomsten van de metingen zijn vervolgens zowel onderling als met de zogenaamde referentiescan vergeleken.

De referentiescan is bepaald door overleg tussen de onderzoeker en steeds één en dezelfde brigadier. Voor de vergelijkingen is gekeken naar de 'weighted kappa'; een maat die iets zegt over de overeenkomst tussen metingen. Een kappa van  $\geq 0,6$  is een goede overeenkomst en een kappa van  $\geq 0,8$  een zeer goede overeenkomst.

Naast schoolkantines is ook bij 11 bedrijfsrestaurants en 7 sportkantines gekeken naar het gebruik van de Kantinescan.

## Resultaten

De metingen op scholen wat betreft het uitgestalde aanbod komen, ongeacht wie de Kantinescan invult, goed met elkaar overeen; alle kappa-waardes zijn  $\geq 0,6$  (zie tabel 1 en tabel 2).

Wat betreft de kappa-waardes van het aanbod in de automaten en de totaalscore van de uitstraling van de kantine; alleen de metingen door de brigadiers van het Voedingscentrum zijn voldoende valide en betrouwbaar (zie tabel 1 en tabel 2). Wanneer overigens naar de afzonderlijke uitstralingspunten wordt gekeken, wordt een deel voldoende betrouwbaar en valide gemeten door brigadiers en een ander deel kan beter. De uitstralingspunten over opvallende plaatsing in automaten, de kassa, het aantrekkelijk presenteren van groente en fruit en over de menulijst of prijslijst hebben allemaal kappa-waardes van  $\geq 0,6$ . De uitstralingspunten over opvallende plaatsing bij het uitgestalde aanbod, de looproute, (aan) prijsacties, beeldmateriaal en merknamen en productafbeeldingen op automaten hebben echter (ook) kappa-waardes van  $< 0,6$ .

De metingen door de kantinebeheerders zijn niet betrouwbaar en valide; de kappa-waardes zijn allemaal  $< 0,6$ .

Tabel 1. Validiteit van Kantinescan gemeten op scholen

	Brigadier 1 versus referentiescan	Brigadier 2 versus referentiescan	Beheerder versus referentiescan	Op afstand brigadier versus referentiescan	Op afstand beheerder versus referentiescan
Uitgestald aanbod	0,86	0,81	0,73	0,81	0,71
Aanbod in automaat	0,87	0,77	0,38	0,77	0,58
Uitstraling	0,80	0,72	0,21	0,80	0,27

Tabel 2. Betrouwbaarheid van Kantinescan gemeten op scholen

	Brigadiers onderling	Beheerder versus brigadier 1	Beheerder versus brigadier 2	Brigadier versus op afstand brigadier	Beheerder versus op afstand beheerder	Op afstand brigadier versus op afstand beheerder
Uitgestald aanbod	0,81	0,78	0,74	0,90	0,78	0,80
Aanbod in automaat	0,77	0,32	0,43	0,90	0,54	0,66
Uitstraling	0,63	0,20	0,31	0,85	0,52	0,28

Voor bedrijven en sportkantines was het aantal metingen te gering om op dezelfde manier te analyseren, maar ook daar lijkt het lastiger voor beheerders de Kantinescan goed te kunnen invullen. Dit komt door onduidelijkheden over bijvoorbeeld de vragen over het voedingsbeleid in de organisatie en het bepalen van opvallende plaatsing van producten.





### Conclusie en adviezen

Het blijkt dat met de Kantinescan in scholen het uitgestalde aanbod valide en betrouwbaar gemeten kan worden. Het blijkt echter nog wat lastig het aanbod in de automaten en de uitstraling van de kantine goed te meten. Alleen als mensen veel ervaring hebben met het toepassen van de Richtlijnen Gezondere Kantines en het gebruik van de Kantinescan, zoals de Schoolkantine Brigade van het Voedingscentrum, kan het aanbod in de automaten valide en betrouwbaar gemeten worden. De uitstraling van de kantine wordt op sommige punten betrouwbaar en valide gemeten, andere punten kunnen beter.

Naast informatie over de validiteit en betrouwbaarheid, is ook informatie verzameld over de ervaringen met het gebruik van de Kantinescan in de praktijk. Over het geheel gezien was men tevreden met de Kantinescan. Verder gaf men aan dat het invullen van de Kantinescan veel tijd kost, maar ook dat deze tijdinvestering de moeite waard is.

Op basis van de resultaten van het onderzoek worden verschillende adviezen gegeven om de Kantinescan verder te verbeteren, zoals het verduidelijken van vragen over het voedingsbeleid in de organisatie en het verduidelijken van sommige uitstralingspunten. Deze adviezen zullen in samenwerking met de praktijk worden omgezet naar verbeteringen in de Kantinescan.

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[www.voedingscentrum.nl/gezondekantine](http://www.voedingscentrum.nl/gezondekantine)



# APPENDIX II

Factsheet “Alles is Gezondheid  
in de schoolkantine”



# Alles is Gezondheid in de Schoolkantine

Onderzoek Vrije Universiteit Amsterdam i.s.m. het Voedingscentrum  
Augustus 2017

## Samenvatting van het onderzoek

Met de Richtlijnen Gezondere Kantines van het Voedingscentrum kan het aanbod en de uitstraling van schoolkantines gezonder gemaakt worden, zodat jongeren makkelijker gezond kunnen kiezen. De Vrije Universiteit Amsterdam heeft zowel de aanpak van het Programma De Gezonde Schoolkantine als de Richtlijnen in samenwerking met het Voedingscentrum geëvalueerd om een strategie te ontwikkelen voor de verdere implementatie.

Aan het onderzoek namen 20 scholen deel, waarvan 10 interventiescholen die begeleiding en hulpmiddelen ontvingen van het Voedingscentrum, waaronder de Kantinescan (een online tool om inzicht te krijgen hoe gezond een kantine is). De andere 10 controlescholen kregen eveneens de Richtlijnen aangeboden, maar zij dienden deze zonder hulp te implementeren.



Bij de interventiescholen werd het aanbod van producten op de balie van de kantine gezonder dan bij de scholen die geen begeleiding kregen, ook verbeterde de uitstraling. De interventiescholen zijn met name positief over het adviesgesprek en -rapport door de Schoolkantine Brigade, de Kantinescan en de samenvatting wat de leerlingen vinden van het aanbod en uitstraling en graag willen zien in hun kantine.

Om de Richtlijnen breder te implementeren is het belangrijk om de begeleiding inclusief de hulpmiddelen bij scholen aan te bieden. Verder is het van belang meerdere mensen binnen de school te betrekken en te zorgen dat de gezonde schoolkantine op de agenda blijft.

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### Achtergrond

Als het gaat om het stimuleren van gezond eetgedrag bij jongeren is hun school een belangrijke plek. Zij brengen hier immers een groot deel van hun tijd door, inclusief lunch- en snackmomenten. Het programma De Gezonde Schoolkantine van het Voedingscentrum is een goed onderbouwde interventie (zoals beschreven in de I-database van het Centrum Gezond Leven) om de voedselomgeving op school gunstig te veranderen en daarmee een bijdrage te leveren aan het bevorderen van gezonde voedingskeuzes van jongeren.

In 2014 zijn de Richtlijnen Gezondere Kantines ontwikkeld met criteria voor schoolkantines, sportkantines en bedrijfsrestaurants. Deze Richtlijnen beschrijven onder meer dat er vooral gezondere producten zoals groente, fruit en water worden aangeboden in de kantine. Ook factoren die van invloed zijn op het keuzegedrag van scholieren, zoals de uitstraling en de plaatsing van producten komen aan de orde. Op welke manier de Richtlijnen het beste geïmplementeerd kunnen worden op scholen en wat het effect van de Richtlijnen is op de schoolkantine en het aankoopgedrag van leerlingen in de schoolkantine is met dit onderzoek bekeken.

### De doelen van het onderzoek

1. Het ontwikkelen van hulpmiddelen om scholen te helpen de Richtlijnen Gezondere Kantines te gebruiken.
2. Nagaan hoe deze ondersteuning bij het gebruik van de Richtlijnen in de dagelijkse praktijk wordt ervaren door verschillende betrokkenen (caterars, schoolmanagement, kantinemedewerkers).
3. Evalueren van het effect van het gebruik van de Richtlijnen op de schoolkantine en het aankoopgedrag van leerlingen en onderzoeken welke factoren samenhangen met het aankoopgedrag.



### Ontwikkeling van de hulpmiddelen

De eerste stap van dit onderzoek was het in kaart brengen van ervaringen en verwachte bevorderende en belemmerende factoren bij het gebruik van de Richtlijnen Gezondere Kantines. Hiervoor zijn de belangrijkste personen die de Richtlijnen zullen gaan toepassen geïnterviewd (kantinebeheerders, Schoolkantine Brigade, caterars en schoolmanagement).

Uit de interviews kwamen de volgende thema's naar voren, die zowel belemmeringen als succesfactoren kunnen zijn:

- de visie van de schooldirectie over een gezonde school, de kennis over gezonde voeding onder gebruikers van de Richtlijnen (schoolpersoneel en kantinemedewerkers) en hun motivatie om de kantine gezonder te maken
- de voedselomgeving van de school
- financiële middelen en mogelijke omzetsdaling
- balans in het assortiment van gezondere en minder gezonde producten
- betrokkenheid van o.a. ouders, leerlingen en docenten
- de omgeving en bewustwording van leerlingen

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Deze factoren zijn voorgelegd aan een groep experts uit wetenschap, beleid en praktijk (waaronder cateraars, scholen, GGD, JOGG) om te kiezen welke factoren vooral aangepakt moeten worden en oplossingen aan te dragen. Met behulp van deze informatie en theorieën op het gebied van gedragsverandering en implementatie zijn hulpmiddelen ontwikkeld, of bestaande middelen aangepast:

- Middelen die inzicht geven in huidige situatie:
  - Vragenlijst naar kenmerken en omgeving van de school en opvattingen en behoeftes t.a.v. de gezonde schoolkantine.
  - Vragenlijst voor betrokkenen naar persoonlijke en organisatorische factoren, hun mening en behoeftes gericht op het gebruik van de Richtlijnen.
  - Kantinescan om inzicht te krijgen in het aanbod en de mate van gezonde uitstraling van de schoolkantine.
  - Persoonlijk adviesgesprek en -rapport van de Schoolkantine Brigade over de huidige stand van zaken, wensen, doelen en actiepunten van de school t.a.v. de gezonde schoolkantine.
- Uitleg Richtlijnen en stappenplan
  - Brochure Richtlijnen Gezondere Kantines voor scholen
  - Stappenplan, hoe tot een gezondere kantine te komen
- Online community
  - Laagdrempelige mogelijkheid voor alle betrokkenen om vragen te stellen, onderling informatie uit te wisselen en voorbeelden en tips te ontvangen.
- 6-wekelijkse nieuwsbrief
  - Met voorbeelden, adviezen en nieuws t.a.v. de gezonde kantine.
- Samenvatting van resultaten
  - Samenvatting resultaten van de vragenlijst over aankoopgedrag van de leerlingen van de school.



## Evaluatie van de hulpmiddelen in de praktijk

In totaal namen 20 scholen uit het voortgezet onderwijs deel aan het tweede deel van het onderzoek. Tien scholen kregen begeleiding en hulpmiddelen van de Schoolkantine Brigade van het Voedingscentrum aangeboden, zoals een adviesgesprek en een rapportage met aanbevelingen hoe zij hun kantine gezonder kunnen maken. Ook werd met de Kantinescan inzicht gegeven hoe gezond hun kantine is. Deze ondersteuning kregen zij gedurende 6 maanden. Tien andere scholen kregen eveneens de Richtlijnen aangeboden, maar zij dienden deze zonder hulp te implementeren. We evalueerden bij betrokkenen het gebruik en tevredenheid van de hulpmiddelen. Ook hebben we voor en na de interventie de schoolkantine geëvalueerd met de Kantinescan en het aankoopgedrag en determinanten van aankoopgedrag van leerlingen uit het 2<sup>e</sup> of 3<sup>e</sup> jaar gemeten met een digitale vragenlijst. De leerlingen werden onder andere gevraagd hoe vaak zij iets kopen in de schoolkantine. Ook werden verschillende factoren van aankoopgedrag, zoals houding en sociale invloed ten aanzien van het kopen van gezonde producten in de schoolkantine uitgevraagd.

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### Resultaten

Betrokkenen die ondersteuning kregen evalueerden vooral het adviesgesprek en -rapport, de Kantinescan en de samenvatting wat leerlingen vinden van het aanbod en uitstraling en graag willen zien in hun kantine positief.

Bij de interventiescholen zijn na de interventie significant positieve veranderingen in de schoolkantine te zien: in het aanbod van de balie van de kantine steeg het gemiddelde percentage gezondere producten significant van 46% naar 77%, terwijl dit percentage in de controle scholen van 50% naar 60% ging (niet significant). Ook verbeterde de uitstraling in de kantines die ondersteuning kregen, bijvoorbeeld door het opvallend plaatsen van gezonde producten, zodat deze meer in het zicht staan.



Veranderingen in aankoopgedrag en determinanten van aankoopgedrag zijn gemeten bij 1623 leerlingen. Wat het effect is van het implementeren van de Richtlijnen op het aankoopgedrag van leerlingen wordt nog nader onderzocht.

### De toekomst

Om de Richtlijnen breder te implementeren is het belangrijk om de begeleiding inclusief hulpmiddelen bij de scholen aan te bieden. Daarbij is het belangrijk om meerdere mensen binnen school (zoals schoolmanagement, kantinebeheerder/cateraar, leerlingen, docenten en ouders) en buiten de school (zoals JOGG, GGD, Gezonde School en Voedingscentrum) te betrekken, hen tijdig en duidelijk te informeren over aanpassingen in voedingsadviezen en -beleid en te zorgen dat de gezonde schoolkantine op de agenda blijft.

Via deze weg willen we nogmaals alle deelnemers bedanken voor hun inzet. Fijn dat zoveel mensen wilden meewerken aan het onderzoek, om zo schoolkantines in Nederland gezonder te maken.





Summary  
Samenvatting  
Dankwoord  
List of Publications  
About the Author



## SUMMARY

### Introduction

Many adolescents have an unhealthy dietary pattern, which is associated with an increased risk for many chronic non-communicable diseases, amongst others, overweight and obesity. This can cause physical and psychosocial health problems and reduced quality of life in the short-term, and also during adulthood. Creating a healthier food environment is likely to make it easier for adolescents to make healthier food choices. Due to their reach and pedagogical tasks, schools in particular can contribute to stimulating healthy choices in adolescents. Increased availability and accessibility of healthier products in school canteens, including cafeterias and vending machines, makes it easier for students to choose the healthier option. In addition, by implementing a healthy school canteen, the school is likely to set a norm with regard to healthy food and drinks. Thereby they contribute to the personal development of students, which includes learning to make responsible and healthy lifestyle choices.

In the Netherlands, schools have autonomy in terms of how they arrange their food and drinks. Since 2003, the Netherlands Nutrition Centre supports schools to create a healthier school canteen in secondary (vocational) schools with the “Healthy School Canteen Programme”. This programme is commissioned and financed by the Dutch Ministry of Health, Welfare, and Sports and is available to all Dutch secondary (vocational) schools. It has been implemented and elaborated over the years, including the development of the Guidelines for Healthier Canteens in 2014. The guidelines combine the offer of healthier products, including tap water, (availability) with the promotion and placement of these healthier products (accessibility), and anchoring policy. It aims to support stakeholders creating healthier canteens through three incremental levels: bronze, silver and gold, although only the levels silver and gold are sufficient to be designated a healthier school canteen. After the development of the guidelines, the next step was their implementation. Hence, more insight was needed into how this implementation could be supported appropriately according to different involved stakeholders with different needs and wishes; in what extent are the existing supportive tools of the Healthy School Canteen Programme suitable, and how could the programme be improved?

These considerations were the basis of this thesis. The overall research question studied in this thesis was formulated as: Is support for the implementation of the Guidelines for Healthier Canteens helpful in creating healthier school canteens in the Netherlands? This question is addressed in two parts: the development of the support, and the evaluation of that support.

### **Part I: Development of the support to implement healthier school canteen guidelines**

First, drawing on three studies, this thesis explains how the support to facilitate the implementation of the Guidelines for Healthier Canteens was developed.

Chapter 2 describes the design of the study to develop and evaluate an implementation plan for the Guidelines for Healthier Canteens in secondary schools. This plan, consisting of a number of different tools, was developed in three steps based on the “Grol and Wensing

Implementation of Change Model". These steps combined a theory-based approach with a practice-based approach involving different stakeholders, including caterers, school management, canteen employees and school canteen advisors. The resulting plan was studied in practice on effectiveness and using a process evaluation in a quasi-experimental trial (as explained in part II).

A more detailed explanation of the development and content of the implementation plan is provided in Chapter 3. This plan was developed in three steps: 1) performing interviews with stakeholders to identify impeding and facilitating factors to create a healthier school canteen; 2) facilitating an expert meeting to discuss and prioritise these factors; 3) using behaviour change methods and implementation strategies to translate these factors into implementation tools. The interviews revealed the most important factors affecting implementation, identifying the individual factors motivation and enthusiasm, a positive attitude and applying knowledge, all towards creating a healthier canteen. Next, factors related to the multitude of involved stakeholders (inside and outside schools) were identified, including collaboration, ownership, commitment and receiving support. Finally, insights into the level of the canteen and the organisational situation, including the financial situation, and the challenge to maintain canteen-related activities were identified as related factors. Based on these factors, behavioural change methods, evidence-based implementation strategies and accompanied tools were selected. These tools are partly derived from the existing Healthy School Canteen Programme and partly newly developed. The tools included the questionnaires for schools and stakeholders, the "Canteen Scan" (an online tool to assess product availability/accessibility), a tailored advisory meeting and report, communication materials, an online community, newsletters, and a fact sheet with students' wishes and needs.

Chapter 4 reports on the development, content validity and usability of one of the novel tools, the online "Canteen Scan". This tool was developed through an iterative theory-based process, again involving multiple stakeholders from research, policy and practice, aiming to support the implementation of the guidelines. It assesses the availability and accessibility of healthier food and drinks, including the offer of water, and the presence of a healthy school canteen policy according the Guidelines for Healthier Canteens. Resulting to insight into the health level of a canteen, and a tailored advice about how to improve the canteen. This scan was favourably rated by stakeholders like the school canteen advisors, canteen managers and representatives of caterers.

An additional study, summarised in Chapter 7 and reported in Dutch in Appendix I, investigated the quality of this scan by measuring the inter-rater reliability and criterium validity for two assessors: an expert (school canteen advisor) and a canteen employee. This study showed a substantial to good reliability and validity for measuring the food availability in the cafeteria for school canteen advisors and canteen employees, and for measuring food availability in vending machines and accessibility when measured by a school canteen advisor.

## **Part II: Evaluation of the support to implement healthier school canteen guidelines**

The second part of this thesis covers the effect and process evaluation based on a 6-month quasi-experimental controlled study in 10 intervention and 10 matched control schools which included their involved stakeholders and 100 students per school. The schools were matched on different characteristics, including how the catering was provided (by the school itself, or by a catering company), school size (<1000 or ≥1000 students) and educational level (vocational, senior general, or pre-university). Intervention schools received support in implementation with the developed tools, while control schools only received general information about the guidelines.

Chapter 5 reports on the effect of the implementation plan on both the health level of the canteen and self-reported purchase behaviour of 13 to 15 years old students. The intervention schools made more changes in their canteen compared to control schools. More specifically, the availability of healthier food and drinks in the cafeteria and the number of fulfilled accessibility of healthier food and drinks criteria increased more often in the intervention schools, but the effect on vending machines was limited. The large majority of the students reported that they usually bring food or drinks from home and buy food or drinks in school only once a week or less. With regard to the students' self-reported purchase behaviour, no changes resulting from the support in implementation or a healthier availability or accessibility in the canteen were detected.

Chapter 6 reports on the process of the supportive implementation of healthier canteen guidelines in schools. The results show that, compared to the control condition, stakeholders (like canteen employees, caterers, school management) who received the support perceived an increase in their knowledge ("I have all information I need") and their motivation, and a decrease in their need for support. These small effects agreed with the qualitative results. For example, stakeholders mentioned that the different tools complemented each other, and that the tools together supported them in creating a healthier canteen. In addition, the quality of the implementation tools was evaluated by the stakeholders on dose delivered, dose received and satisfaction. They particularly liked the advisory meeting and report, the students' fact sheet, the communication materials and the Canteen Scan.

### **Conclusion**

The final chapter of this thesis (Chapter 7) summarises the main findings and reflects on them. It also discusses methodological considerations and implications for future studies, practice and policy.

This thesis describes how a plan to support implementation of the Guidelines for Healthier Canteens in schools was developed and thereafter evaluated on effect and process level. It shows how stakeholders with a diverse background in research, policy and practice engaged in all studies, throughout the whole process from the research design, to intervention development, and evaluation. Their practical experience, combined with theoretical frameworks and methods were used to guide the development and evaluation of the implementation tools. The aim of the implementation plan was to facilitate the process to create a healthier school canteen, thus stimulating Dutch adolescents to purchase healthier food and beverages in school.

This study concludes that the tools supported stakeholders adequately in the implementation of the Guidelines for Healthier Canteens, and resulted into healthier school canteens. In particular, the advisory meeting and report, the communication materials, the students' fact sheet and the Canteen Scan were evaluated positively. However, the support in implementation and changes in the canteen did not result to measurable changes in students' purchase behaviour. This might be due to the relatively short time between changes made in the canteen and the assessment of students' purchases. The fact that not all students buy food and drinks, and that they reported a small number of purchases, in the school canteen might also have influenced the results.

The combination of, and collaboration with, research, policy and practice from the start and throughout this study resulted in useful results applicable for all three fields. The insights on refining the tools have since been implemented by the Netherlands Nutrition Centre. For the future, evaluating and reviewing the tools and the guidelines regularly to ensure that they still adhere to recent scientific insights and the (changing) needs of practice, to remain supportive for stakeholders, is recommended.

Since a healthy school canteen is an essential but not the only setting that influences the dietary behaviour of youth, stimulating healthy eating habits among youth requires a combination of actions that intervene on individual factors, and on the social, physical and macro-level environment. Meaningful collaborations between scientists, practitioners and policymakers strengthen such a system-based approach. In addition, more insight is needed into the sustainable effects of the school food environment on students' food choices in- and outside schools throughout the day.

To be able to create an effective supportive climate where youth are encouraged and can learn how to eat healthily, schools should 1) develop consistent nutritional policy, including an aspiration with regard to a healthy school canteen and nutritional education, 2) invest in collaborations to create ownership and support for a healthy school environment among all involved stakeholders (students, parents, teachers, external parties like a caterer), and 3) convey their nutritional policy in their school environment, so throughout the school and during all lessons and activities.

At the same time, the government should facilitate and support independent, non-profit organisations, like the Netherlands Nutrition Centre, so all schools remain to have the opportunity to receive support with personal, tailored advice on how to create a healthier school food environment.

## SAMENVATTING

### **Op weg naar gezondere schoolkantines: Implementatie en evaluatie van richtlijnen voor gezondere kantines**

Veel jongeren in de leeftijd van 12 tot 18 jaar vertonen ongezond eetgedrag. Dit is gerelateerd aan een verhoogd risico op verschillende chronische aandoeningen, zoals overgewicht en obesitas. Dit kan leiden tot fysieke en mentale gezondheidsproblemen en verminderde kwaliteit van leven op korte termijn, maar ook op lange termijn op volwassen leeftijd. Een gezond voedselaanbod kan jongeren stimuleren om gezondere voedingskeuzes te maken. De rol van scholen is hierin belangrijk, omdat alle jongeren naar school gaan, ze hier meerdere eetmomenten doorbrengen en omdat scholen een pedagogische taak hebben en daar valt het aanleren van gezond gedrag ook onder. Door in de schoolkantine en in de automaten gezondere producten aan te bieden en te promoten wordt het leerlingen makkelijker gemaakt om op school gezondere voedselkeuzes te maken. Bovendien toont een gezondere schoolkantine dat het normaal is om gezond te eten en drinken. Scholen kunnen zo bijdragen aan de persoonlijke ontwikkeling van hun leerlingen en het aanleren van gezonde, verantwoordelijke voedselkeuzes.

Nederlandse scholen zijn vrij om te bepalen of en hoe ze eten en drinken aanbieden aan leerlingen. Met het programma De Gezonde Schoolkantine ondersteunt het Voedingscentrum sinds 2003 scholen bij het gezonder maken van kantines. Dit programma wordt uitgevoerd in opdracht van en gefinancierd door het Ministerie van Volksgezondheid, Welzijn en Sport. Het programma is beschikbaar voor alle Nederlandse scholen in het voortgezet (speciaal) en middelbaarberoeps onderwijs. In 2014 heeft het Voedingscentrum de Richtlijnen Gezondere Kantines (RGK) opgesteld. Met deze richtlijnen kunnen scholen kantines zo inrichten dat leerlingen gemakkelijker gezondere keuzes kunnen maken. Deze richtlijnen combineren criteria over: 1) Aanbod, oftewel welke en hoeveel producten aangeboden worden, waaronder (kraan)water; 2) Uitstraling, hoe producten gepromoot en geplaatst worden; 3) Opstellen van kantinebeleid. De richtlijnen bevatten drie oplopende niveaus: brons, zilver, goud. Deze oplopende niveaus zijn bedoeld om betrokkenen te stimuleren om aan de slag te gaan en om de gezondheid van de kantines gaandeweg steeds verder te verbeteren. Schoolkantines die het niveau zilver of goud bereiken mogen zich een 'gezondere kantine' noemen. De ontwikkeling van de Richtlijnen Gezondere Kantines in 2014 gaven aanleiding om te onderzoeken hoe scholen het beste ondersteund kunnen worden bij het implementeren van deze richtlijnen in de praktijk, voortbouwend op het bestaande programma De Gezonde Schoolkantine.

De overkoepelende onderzoeksvraag van dit proefschrift luidt:

*Draagt ondersteuning bij het implementeren van de Richtlijnen Gezondere Kantines bij aan het gezonder maken van Nederlandse schoolkantines?*

Deze vraag wordt in twee stappen beantwoord: de ontwikkeling en de evaluatie van de ondersteuning.



## **Deel 1: Het ontwikkelen van ondersteuning om richtlijnen voor gezondere schoolkantines te implementeren**

De eerste drie studies van dit proefschrift beschrijven hoe de ondersteuning ontwikkeld is. Het doel van de ondersteuning is om het gebruik van de Richtlijnen Gezondere Kantines (RGK) in de praktijk te vergemakkelijken.

Hoofdstuk 2 beschrijft globaal de opzet van de studies om het implementatieplan, bestaande uit verschillende middelen, te ontwikkelen en te evalueren. Het implementatieplan is ontwikkeld in drie stappen gebaseerd op het “Grol and Wensing Implementation of Change Model” en is een combinatie van een theoretische en praktische aanpak. Het plan is mede gebaseerd op ervaringen van verschillende betrokkenen, zoals cateraars, schooldirecties, kantinemedewerkers en schoolkantine-adviseurs (zogeneten Schoolkantine Brigadiers). Daarnaast is gebruik gemaakt van wetenschappelijk onderbouwde methodieken voor gedragsverandering en implementatiestrategieën. Het ontwikkelde implementatieplan is vervolgens getest in de praktijk op effect- en proceslevel in een quasi-experimentele studie (uitgelegd in deel 2).

In hoofdstuk 3 wordt de ontwikkeling en de inhoud van het implementatieplan in meer detail beschreven. De 14 interviews met betrokkenen, zoals cateraars, kantinebeheerders, schoolmanagement en Schoolkantine Brigadiers gaven inzicht in de bevorderende en belemmerende factoren die een rol spelen bij het gezonder maken van de schoolkantine. De belangrijkste persoonlijke factoren die men noemde waren motivatie en enthousiasme, een positieve houding en het hebben en kunnen toepassen van kennis om de kantine gezonder te maken. Daarnaast werden gevoel van eigenaarschap, betrokkenheid, steun en goede samenwerking tussen de vele betrokkenen, binnen en buiten de school, genoemd. Andere genoemde factoren waren inzicht in het huidige niveau van de kantine en hoe de kantine georganiseerd is, inclusief mogelijke aangrijpingspunten voor verbeteringen, waaronder de financiële situatie van de kantine en de invloed van veranderingen in de kantine op de omzet. Vervolgens zijn deze factoren in een expertbijeenkomst bediscussieerd en geprioriteerd, met 25 deelnemers vanuit de praktijk, wetenschap of beleidssector. Daarna zijn de belangrijkste en veranderbare factoren gekoppeld aan wetenschappelijk onderbouwde gedragsveranderingsmethodieken en implementatiestrategieën.

Uiteindelijk zijn deze factoren omgezet naar praktische ondersteuningsmiddelen. Deze middelen zijn enkele nieuw ontwikkelde middelen en bestaande of verbeterde middelen van het programma De Gezonde Schoolkantine. De ondersteuningsmiddelen zijn:

1. vragenlijst voor betrokkenen waarin informatie wordt verzameld over persoonlijke en organisatorische factoren om aangrijpingspunten voor verbeteringen te vinden,
2. de Kantinescan (een digitale tool om in kaart te brengen welke en hoeveel producten in de kantine uitgesteld worden en hoe ze gepresenteerd en gepromoot zijn),
3. een persoonlijk adviesgesprek en -rapport gebaseerd op de vragenlijsten, de Kantinescan en ervaringen van de Schoolkantine Brigadier,
4. diverse communicatiematerialen, zoals een brochure van de richtlijnen en een kort stappenplan,
5. een besloten Facebook community,
6. nieuwsbrieven,

7. per school een samenvatting van de wensen omtrent de kantine van hun eigen leerlingen.

Hoofdstuk 4 beschrijft de ontwikkeling, inhoudsvaliditeit en gebruiksvriendelijkheid van de digitale Kantinescan. In de Kantinescan voert de Schoolkantine Brigadier of kantinemedewerker de aangeboden producten (soort en hoeveelheid) in en beantwoordt vragen over de presentatie van producten (zoals staan gezondere opties vooraan, als eerste op de looproute en op afbeeldingen) en over het wateraanbod en de aanwezigheid van beleid. Dit leidt tot een score die laat zien in hoeverre de kantine gezond is volgens de Richtlijnen Gezondere Kantines. Daarnaast worden gerichte toepasbare adviezen gegeven waarmee betrokkenen stappen kunnen zetten richting een gezondere kantine. De scan is tijdens deze studie positief geëvalueerd door toekomstige gebruikers, zoals Schoolkantine Brigadiers, kantinemanagers en medewerkers van cateraars.

Er is een extra studie verricht naar de kwaliteit van de Kantinescan op het gebied van inter-beoordelaarsbetrouwbaarheid (de mate van overeenstemming tussen diverse gelijktijdig afgenomen scans, ingevuld door verschillende personen) en criteriumvaliditeit (de mate waarin het instrument het te meten construct werkelijk weergeeft). Hoofdstuk 7 vat deze samen en appendix I beschrijft deze studie uitgebreider. In deze studie zijn van 50 schoolkantines de Kantinescan-uitkomsten van externe experts (Schoolkantine Brigadiers) onderling en Kantinescan-uitkomsten tussen Schoolkantine Brigadiers en kantinemedewerkers met elkaar vergeleken. Deze studie toont een substantiële tot goede betrouwbaarheid en validiteit om het uitgestalde aanbod te meten met de Kantinescan. Voor het meten van het aanbod in automaten en de uitstraling toont de studie ditzelfde resultaat, mits de scan ingevuld werd door een Schoolkantine Brigadier.

## **Deel II: Evaluatie van de ondersteuning om richtlijnen voor gezondere schoolkantines te implementeren**

Het tweede deel van dit proefschrift omvat de effect- en procesevaluatie gebaseerd op een 6 maanden durende quasi-experimentele studie in 10 interventie- en 10 vergelijkbare controlescholen. In het onderzoek zijn meerdere betrokkenen (zoals de kantinemedewerker, directie, facilitair beheerder, cateraar, gezondheidsbevorderaars van de GGD) en 100 tweede- of derdejaarsleerlingen per school betrokken. De interventie- en controlescholen waren vergelijkbaar op verschillende eigenschappen, zoals kantinebeheer (door de school zelf of door een cateraar), het aantal leerlingen (<1000 of ≥1000 leerlingen) en het onderwijsniveau (VMBO, HAVO, VWO). De interventiescholen ontvingen ondersteuning bij het gezonder maken van hun uitgestalde aanbod en automaten middels de genoemde middelen. De controlescholen ontvingen alleen informatie over de Richtlijnen Gezondere Kantines.

Hoofdstuk 5 beschrijft het effect van het implementatieplan op zowel kanteniveau als op het gerapporteerde aankoopgedrag van leerlingen in de leeftijd van 13-15 jaar. In vergelijking tot de controlescholen hadden de interventiescholen meer veranderingen in hun kantine aangebracht. De verhouding van het aanbod gezondere ten opzichte van ongezondere producten in het uitgestalde aanbod was toegenomen. Daarnaast werd er voldaan aan meer 'uitstralingspunten' (manieren om gezondere producten opvallend te presenteren en te promoten). Wat betreft de inhoud van de automaten was het verschil

tussen de interventie- en controlescholen minder aanwezig. Waarschijnlijk omdat scholen voor veranderingen in dit aanbod afhankelijk zijn van een externe partij, de automatenleverancier. De meerderheid van de ondervraagde leerlingen gaf aan dat ze vooral eten en drinken van huis meenemen en aanvullend daarop één keer per week of minder iets op school kopen. Er werden geen significante veranderingen gevonden in het aankoopgedrag van de leerlingen.

In hoofdstuk 6 wordt het proces van implementatieondersteuning bij het gezonder maken van de schoolkantine beschreven. Betrokkenen (n = 33) zoals facilitair managers, kantinemedewerkers en cateraars rapporteerden voor de start en na afloop van de studie hun ervaren individuele en omgevingsfactoren die de implementatie kunnen beïnvloeden. Betrokkenen van de interventiescholen (n = 24) rapporteerden ook de kwaliteit van de implementatiemiddelen, op de mate van verstuurde en ontvangen middelen en hun tevredenheid over de middelen. De resultaten tonen aan dat betrokkenen die ondersteuning hebben ontvangen een toename ervaren in hun kennis en motivatie met betrekking tot de gezondere kantine. Ook nam hun behoefte aan ondersteuning af. De betrokkenen in de controlegroep lieten geen veranderingen zien. Hoewel de verschillen klein waren, werden ze bevestigd door de inzichten uit de kwalitatieve resultaten (de gesprekken en open vragen). Betrokkenen gaven aan dat ze de ondersteuning prettig vonden, dat de ondersteuning hen geholpen heeft om de kantine gezonder te maken en dat de verschillende middelen elkaar aanvulden. Uit de evaluatie van de kwaliteit van de implementatiemiddelen bleek dat de volgende middelen vooral goed geëvalueerd werden: het adviesgesprek en -rapport, de samenvatting van de wensen van leerlingen, de communicatiematerialen en de Kantinescan.

## Conclusie

Het laatste hoofdstuk van dit proefschrift geeft een samenvatting en discussie van de belangrijkste bevindingen. Ook worden methodologische overwegingen en aanbevelingen voor vervolgonderzoek, de praktijk en beleid beschreven.

Dit proefschrift beschrijft hoe de ondersteuning bij het implementeren van de Richtlijnen Gezondere Kantines in scholen is ontwikkeld en geëvalueerd op proces- en effectniveau. Het laat zien hoe diverse betrokkenen met expertise vanuit wetenschappelijk onderzoek, praktijk en beleid zijn betrokken in alle fases van het onderzoek. Dit betreft zowel de opzet, de ontwikkeling als de evaluatie van het implementatieplan. Er is gebruik gemaakt van een planmatige aanpak waarin ervaringen uit de praktijk zijn gecombineerd met wetenschappelijke theorieën, methodes en inzichten. Het doel van het implementatieplan is het ondersteunen van betrokkenen bij het gezonder maken van schoolkantines, om op die manier jongeren in Nederland te stimuleren om gezonder te eten.

Op basis van de uitgevoerde studies kan geconcludeerd worden dat de ondersteuning betrokkenen helpt bij het implementeren van de Richtlijnen Gezondere Kantines op school en dat de ondersteuning resulteert in een gezonder uitgestalde aanbod en uitstraling in de schoolkantine. Vooral het adviesgesprek- en rapport, de communicatiematerialen, de samenvatting van de wensen van leerlingen, en de Kantinescan zijn positief geëvalueerd door betrokkenen. De ondersteuning heeft niet geleid tot veranderingen in het zelf gerapporteerde aankoopgedrag van leerlingen. Een mogelijke verklaring hiervoor is dat

er weinig tijd zat tussen de gemaakte veranderingen in de kantine en het meten van het aankoopgedrag. Hierdoor zijn leerlingen mogelijk nog niet in staat geweest om hun gedrag aan te passen. Het feit dat niet alle leerlingen eten en drinken op school kopen, en dat degenen die iets kopen aangeven dat ze weinig kopen kan er ook voor gezorgd hebben dat er geen verschillen aangetoond zijn.

De gecombineerde theoretische en praktische aanpak, uitgevoerd in samenwerking met betrokkenen vanuit onderzoek, praktijk en beleid gedurende de hele studie, heeft geleid tot nuttige resultaten voor al deze werkvelden. De inzichten hoe de middelen verbeterd konden worden, zijn ondertussen verwerkt in het programma De Gezonde Schoolkantine van het Voedingscentrum. Voor de toekomst is het belangrijk dat de middelen en de Richtlijnen Gezondere Kantines regelmatig worden geëvalueerd zodat ze blijven aansluiten bij de (veranderende) behoeftes en context van de praktijk en nieuwe wetenschappelijke inzichten. Zo blijft gewaarborgd dat de geleverde ondersteuning de praktijk daadwerkelijk faciliteert bij het gezonder maken van schoolkantines.

Een gezonde schoolkantine is een essentiële, maar zeker niet de enige setting die het eetgedrag van jongeren kan beïnvloeden. Het stimuleren van gezonde eetgewoontes bij jongeren vergt daarom een combinatie van acties op individueel, sociaal, fysiek en politiek-sociaal vlak. Structurele samenwerkingen tussen wetenschappers, professionals uit de praktijk en beleidsmakers kunnen een dergelijke systeem-aanpak versterken. Daarnaast is er meer inzicht nodig in de langetermijneffecten van een gezonde voedselomgeving op school, op de voedselkeuzes van leerlingen binnen en buiten de school, gedurende de hele dag.

Het is belangrijk dat door de verschillende betrokkenen gezamenlijk een omgeving gecreëerd wordt waarin jongeren worden gestimuleerd om gezond te eten. Hiervoor is het noodzakelijk dat scholen: 1) een consistent voedselbeleid ontwikkelen met een ambitie voor een gezondere schoolkantine, inclusief automaten, en voedselonderwijs; 2) investeren in samenwerkingen om eigenaarschap en steun te creëren van alle betrokkenen zoals leerlingen, ouders, docenten, ondersteunend personeel en externe partijen zoals de cateraar; 3) hun visie en activiteiten gerelateerd aan voedingsbeleid in de school en de schoolomgeving uitdragen bij alle activiteiten en lessen op de school. Tegelijkertijd moet de overheid waarborgen dat alle scholen de mogelijkheid hebben om een persoonlijk advies en praktische ondersteuning te ontvangen om de voedselomgeving op school gezonder te maken. Dit kan alleen als de overheid ondersteuning geeft aan non-profit organisaties, zoals het Voedingscentrum.



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## ABOUT THE AUTHOR

Irma Jeltiena Evenhuis (1985) was born in Groningen. She grew up in the small village Roodehaan just below Groningen, with her parents and two older sisters. She finished her pre-university education (VWO) at the H.N. Werkman College Groningen in 2003, whereafter she studied Physical Therapy at the Hanze University of Applied Sciences. After obtaining her Bachelor's degree (2007) and having worked as a physical therapist for some years, she decided to combine her work with studying to pursue her interest in prevention and health promotion. In 2009, she enrolled for the pre-Master's program in Health Sciences at the Vrije Universiteit Amsterdam, after which she continued with the Master in Health Sciences, specialization Prevention and Public Health. During her Master's she did an internship about food and self-regulation at the department of Health Psychology at the University of Utrecht.



In 2011, Irma obtained her Master's degree and started working at the Health Sciences department at the Vrije Universiteit Amsterdam. First, she worked as a lecturer for BSc and MSc students in the field of prevention, health promotion behaviour and policy, social marketing and study skills. Second, from 2015, she started as a researcher on the healthy school canteen research project. In 2017, the research project was extended through additional funding, which gave Irma the opportunity to obtain her PhD degree.

While finishing her PhD project, Irma has continued her work in the field of implementation, health promotion and healthy food environments at the Netherlands Nutrition Centre, since 2018.

In her spare time, she enjoys gathering with family and friends, cycling and speed-skating.





