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# Changing behavior to promote health for all: A life-course approach

Prof. Dr. Jantine Schuit

**Inaugural address,**

Delivered in adapted form by Jantine Schuit, Professor of Health, Behavior and Society at Tilburg University on 30 November 2018.

# Changing behavior to promote health for all: A life-course approach

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# Introduction

Dear Mr. Rector, fellow Deans,  
colleagues of the School of Social and Behavioral Sciences,  
other colleagues from Tilburg University, colleagues from other universities,  
ladies and gentlemen,  
dear friends and family,

I grew up in a loving working-class family in Nijkerk, a strictly reformed community on the Veluwe. An environment in which, at primary school, the teachers had a different view of children of notaries and general practitioners than of me and my brothers and sister. The school advice for secondary education was partly determined by our father's profession; mothers generally did not work. So it was not self-evident for us, children of a working-class family, to go to university, even if our scores were quite good. We were advised, also by our parents and relatives, to find a job and earn some money, especially the girls. Studying meant borrowing money, and that was a big step for me. What if I could not find a job and was not able to pay it back?

As a teenager, I initially accepted the societal expectations regarding my future. After my secondary education, I went to work in a dry cleaning store. But during that time, my feelings of dissatisfaction and unfairness increased. Why do these big differences in opportunities exist? Why didn't I get the opportunity to widen my horizon, to get more out of life? I felt like I wanted to meet people from other countries and cultures and contribute to society. I wanted to do something about the differences in wealth among people and help those in disadvantaged positions. My friends, who were already studying at the university, encouraged me to go and study and take the plunge. Other people around me started to support me as well. My sister, my general practitioner, and even the owner of the dry cleaner's gave me the confidence that I could do it. So I did, and I went to study in Wageningen. There were bumps of course, but I have never regretted it. Now I am standing here and for the second time in my life I am giving an inaugural lecture, about 10 years after my first lecture at the VU University in Amsterdam.

I am telling you this personal story for two reasons.

First of all, with this story, I want to indicate that my work and my goals in life are driven by this background. I am who I am, and I do what I do because of the

experiences and reflections I have had in my life.

Secondly, I am telling you this because my story is not an old story. Socio-economic differences and their consequences remain. Still, girls and boys from less educated parents or with a non-Western background have fewer opportunities to study or to find suitable jobs than their Western peers from academic family backgrounds (Terwel, 2018). This is not only the case in the Netherlands, but in most countries around the globe. Socio-economic differences are persistent during the course of life; they already exist in infancy and they are often passed on from generation to generation. Consequently, the Council of Social Development<sup>1</sup> in the Netherlands warned that, because of the increased division between low-educated and highly educated people, the Netherlands is in danger of becoming a new kind of class society (RMO, 2011). According to the OECD, children with low-educated parents have just a 15% chance of attaining tertiary education. Whereas, children of which at least one parent has tertiary education have a four-fold chance (63%) to finish university (OECD, 2017). So, your socio-economic background and all the aspects that go with it, have an influence on your social position and your opportunities.

But the socio-economic position also affects your state of health and well-being. In the Netherlands, there is a difference of about 6–7 years in general life expectancy between people with a low and people with a high education. But the picture becomes even worse when we look at the healthy life expectancy. The healthy life expectancy of people with a low educational level is, on average, 14 years lower than of people with a high educational level (RIVM, www.volksgezondheidenzorg.nl) (Figure 1).

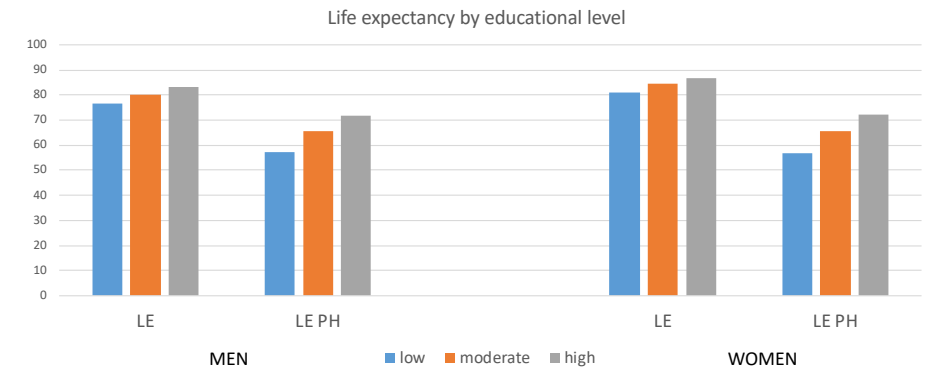


Figure 1. Life expectancy (LE) and life expectancy perceived in good health (LE PH) for men and women by educational level.

Recently, the Netherlands Scientific Council for Government Policy emphasized that although the Dutch are living longer and are feeling healthier than before, the socio-economic health differences are not diminishing, and, in some cases, even increasing (WRR, 2018). So, if we want to tackle these differences and close the gap, we should do something about the underlying determinants of these differences. We call these the wider determinants of health, also known as social determinants. These determinants are a diverse range of lifestyle, social, economic, and environmental factors that have an impact on people's health. The Marmot review, published in 2010, raised the wider determinants of health by emphasizing the strong and persistent link between social inequalities and disparities in health outcomes. The model assumes that health inequalities are likely to persist so long as social inequalities persist.

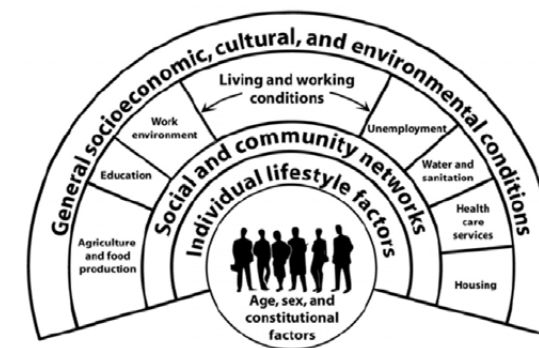


Figure 2. Social model of Health

<sup>1</sup> Now called the Council for Public Health and Society.

The Social model of Health, developed by Göran Dahlgren and Margaret Whitehead in 1991 (Dahlgren, 1991), maps the relationship between individuals, their environment, and their health. Individuals are placed at the center surrounded by the various layers of influences on health: individual lifestyle factors, community influences, living and working conditions, and more general social conditions. The outer layers can directly influence people's health: e.g., people in low socio-economic positions are at increased risk of living in poor housing conditions and, consequently, are at increased risk of exposure to moisture and mold. However, the influence of the environment on health is, for a significant part, based on lifestyle. For example, having a single parent with no permanent income reduces the chances for children to become members of a sports club or eat fresh vegetables every day.

The topic of my research is finding effective ways to promote physical activity and a healthy diet, particularly for those in disadvantaged positions. Both lifestyle factors are related to many chronic diseases with a large public health impact, such as cardiovascular diseases and cancer. Today, I will tell you about my research.

I will start by giving you some background information on the public health problems related to inequity, and how these are largely shaped by unhealthy behavior. I will address the mechanisms as to why we behave as we do, and how the social and physical environment impacts our behavior. I will show you that interventions to change unhealthy behavior should, therefore, not only be directed at the individuals themselves but also at the environment and context in which people live, work, and play. At the heart of my presentation today, I will present you the insights I have obtained in my research over the past years and will show you what the focus will be for the next years. I will emphasize the importance of early action, an integrated approach, and a life course approach in the prevention of diseases and socio-economic differences in health. At the end of my presentation, I will explain how this relates to my plans and vision on education.

## Socioeconomic health differences

Socio-economic<sup>2</sup> health differences already arise early in life (Bengtsson, 2009). A simple example to illustrate this is breastfeeding. Breastfed children have a lower risk of infection in their early childhood and a higher cognitive capacity in later childhood and adolescence (Buijssen, 2017, Victora, 2016). Breastfeeding has also shown to protect against obesity (Buijssen, 2017). In the Netherlands, highly educated women breastfeed their newborn children more often and for longer periods than women with a low level of education (Figure 3).

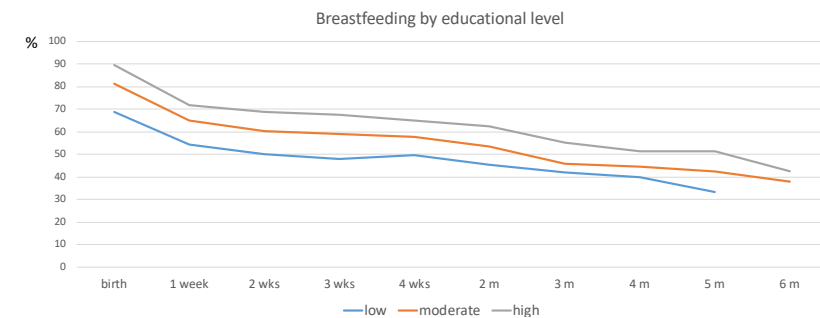


Figure 3. Breastfeeding by educational level of the mother

Socio-economic health differences are also based on differences in the psychological and social development of individuals. Research shows us that children of parents with a low educational level are exposed to more unfavorable psychological and social stimuli than children of parents with a high educational level (Marmot, 2008, Braveman, 2009). This kind of exposure can cause stress, anxiety, insecurity, low self-esteem, lack of control over work and home life, and social isolation. If these psychological circumstances accumulate during life, it increases the risk of mental problems and premature death (Wilkinson, 2003).

In one of my first papers, I investigated the relation between unhealthy lifestyles such as smoking and drinking alcohol in a large monitoring study of the National Institute for Public Health and the Environment. In this study, we found that unhealthy lifestyle factors tend to cluster, meaning that people who smoke more also drink more (Schuit, 2002) and, as a consequence, have an

<sup>2</sup> Socio-economic groups can be defined in many ways. In my research, I usually use educational level as an indicator for socio-economic status.

even higher risk of chronic diseases. We also see these clustering among adolescents (Dumith, 2012). Furthermore, these unhealthy lifestyles are also associated with other health issues such as mental problems and obesity. We see that particularly in groups with a low socio-economic status, e.g., in deprived neighborhoods (Figure 4 a-d). These pictures show that, also in Tilburg, we see an accumulation of unhealthy lifestyles and mental and physical problems in some of the neighborhoods.

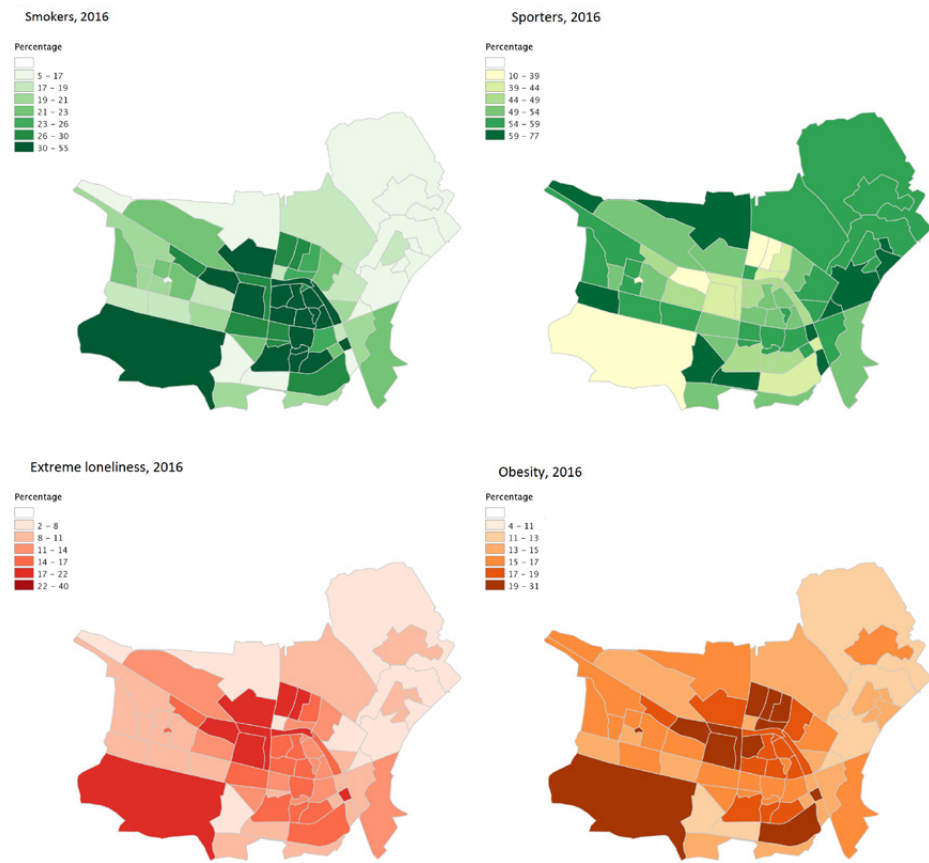


Figure 4. Percentage of smokers (a), people active in sport (b) people with extreme loneliness (c) and people with obesity (d) in the neighborhoods of Tilburg

The next picture (Figure 5) shows the percentage of people who are active according to the physical activity guideline by educational level. Again we see clear differences in physical activity between people with a low and high educational level, but this picture also shows that the differences are not decreasing over time. In fact, the gap even seems to become bigger.

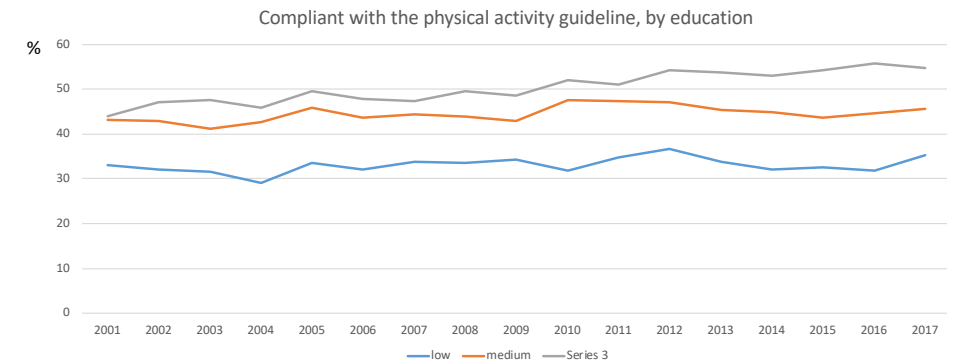



Figure 5. Percentage of people compliant to the physical activity guideline, by educational level (low: lo, vmbo, mbo1, medium: havo, vwo, mbo-2,3,4, high: hbo,wo)

Unfortunately we already see these differences at a young age. Earlier reports (Schrijvers, 2008) show that, on average, children with a lower education start with unhealthy behavior about 2 years earlier than their higher educated peers.

As I mentioned before, socio-economic differences in health and health behavior are persistent and are often passed on from generation to generation. It is, therefore, important to both address the underlying factors and focus on those factors that perpetuate this transfer. In the next part of my presentation, I would like to tell you more about mechanisms that determine our lifestyles and behavior, and why we often make unhealthy choices.



## How do we make our behavioral choices?

Psychology is the discipline that researches people's behavior and mind. It teaches us how the brain works and develops during life. Based on psychological research, we now know that all the experiences and emotions we have throughout our lives determine how we think, feel, and behave right now (Kolb 2014). We learn from the things we do or pay attention to. We improve through training because, by training ourselves, we develop certain parts of our brains. Our brains store and process everything. Therefore, early life development of the brain has lifelong health implications. Regular physical activity is important in that respect. Research shows us that active children develop their brains better compared to inactive children (van der Niet, 2016).  a healthy and active lifestyle has a positive effect on our brain. But also can regular physical activity reduce the risk of cognitive decline later in life (Schuit, 2001; Sofi, 2011)

If we want to change behavior, for example persuade people to become more physically active, we should know how people make choices in life. Numerous theoretical models try to predict behavior or behavioral *change*. The ASE model is a well-used model to predict behavior and is based on the Theory of Planned Behavior. It states that the people's actual behavior is best predicted by looking at the intention whether or not they plan to exhibit the desired behavior. The attitude, social influence, and own effectiveness (ASE) influence the intention. The ASE model also mentions factors such as barriers that can influence the relationship between intention and behavior (Figure 6).

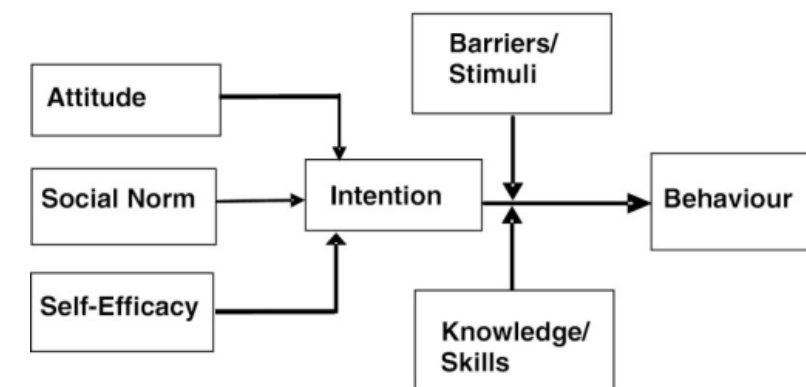


Figure 6. The ASE model

Later a well-known model for behavioral *change* was developed called the Trans-theoretical model, also known as the Stages of Change Model (Prochaska 2005). This model assesses an individual's willingness to change their behavior and provides strategies or change processes to guide the individual towards behavioral change. It distinguishes five stages: (1) Precontemplation: the person is not (yet) considering behavioral change (2) Contemplation: the person is considering behavioral change (within six months), (3) Preparation: person plans and prepares behavioral change. (4) Action: person carries out behavioral change, and (5) Maintenance: person has been sustaining behavioral change for at least six months. Depending on the stage, a different intervention is needed.

Both models are strongly based on rational thoughts and do not take into account emotional factors that may influence behavior. In addition, they also take little account of unconscious habitual behavior, whilst that is exactly what is often decisive and difficult to change. The ASE model was, therefore, succeeded by the Integrated-change model, also called I-Change (De Vries, 2005). In this Integrated-change model, de Vries combines five scientific theories on the development of behavior.

Personally, I appreciate the *elaboration-likelihood* model by Petty and Cacioppo (1986). According to this model, there are two routes by which people can be persuaded to make choices: the so-called **central route** and the **peripheral route**. The name of the model refers to the likelihood or probability that a person thinks about the arguments of the message, processes these arguments, and *elaborates* on them.

The *central route* consists of thoughtful consideration of the arguments of the message. It can, however, only occur if the receiver has both the motivation and the ability to think about the message and its topic. If the listener doesn't care about the topic of the persuasive message, he or she will almost certainly lack the motivation to do central processing. Also, if the listener is distracted or has trouble understanding the message, he or she will lack the ability to perform central processing.

The *peripheral route* occurs when the individual decides whether or not to agree with the message based on other cues besides the arguments or ideas in the message. For example, if the messenger is an expert, a general practitioner, a

cartoon character, or a handsome movie star, people are more likely to act upon the message. We also tend to base our decisions and our behavior on the experiences and behavior of a friend, a neighbor, a sister-in-law, or someone else we trust without thoroughly thinking the arguments through.

According to Petty and Cacioppo, attitude changes and behavioral changes that result from the central route, are more persistent than attitude and behavioral changes that result from peripheral cues (Petty & Cacioppo, 1986). So if we want to maintain behavioral change, the central route would be most relevant. However, even though central processing has advantages, receivers do not always have the motivation and ability to think and elaborate on the message.

There are two important explanations for that:

First, we humans prefer to continue doing the things we are used to (cognitive dissonance) and, therefore, we are looking for information that confirms our already made choices about our behavior (Nisbett and Ross, 1980). This particularly applies to everyday choices. It becomes habitual behavior. An example is the way we normally travel to school or work. We do not consciously think about it every day.

Second, our behavior is often an automatic response to our environment. Let me explain that with respect to the dietary choices we make.

Fifty years ago, there was a limited choice and availability of food. Nowadays, food is available everywhere and at all times and ready to eat. We smell the scents and see pictures of delicious savory and sweet delicacies when we walk or cycle through shopping streets. It has become increasingly difficult to resist these temptations. If not on the street, then we are confronted with food advertisement on television or other media. When we give in to these temptations, we eat more than we should; our bodies store the calories, and we gain weight.

This also applies to physical inactivity. So many technological developments in the past 20 years have resulted in a reduced need for physical activity. Examples for adults include e-mail, social media, and digitalization. For young people, there is a large increase in the provision of digital games, films, Netflix, WhatsApp, Instagram, and channels like YouTube. Our children now spend

more time behind a screen than playing outdoors, making them less fit and causing them to develop fewer motor skills. As a result, children are not sufficiently physically challenged or stimulated. They have fewer opportunities to experience how much fun it can be to be active, or how good it feels when you play sports in a team.

We call such an environment an obesogenic environment; an environment that stimulates unhealthy behavior (Mackenbach, 2014).

So if we want to change people's behavior, and particularly of people in disadvantaged positions, we should make use of the above-mentioned insights. And this is what my research in the past decades has been focused on. In the next part of my presentation, I will show you, in a nutshell, what kind of research I have done so far, what the most important lessons are, and how I want to continue my work at Tilburg University in the future.

# Lessons learned

As said before, the topic of my research is finding effective ways to promote physical activity and a healthy diet, particularly for those in disadvantaged positions. In the next part of my presentation, I will tell you about my research in the past 15 years, and how I will continue my work in the coming years.

In short, I have studied the following: How can we stimulate physical activity and a healthy diet by creating supportive social and physical environments? In other words: How can we make a healthy choice the easy choice? Or: How can we nudge people to make healthy lifestyle choices?

Together with many PhD candidates, post docs, and colleagues, I have investigated amongst others:

- How can we spatially organize a neighborhood in such a way that children play outdoors more (Aarts, 2011)?
- How can we stimulate active transportation to school by making it more attractive (Aarts 2011)?
- Can we increase the consumption of fruit and vegetables if we lower the price in the supermarket (Waterlander, 2012)?
- How can we get people out of their cars and onto their bikes (Scheepers 2016)? or
- How can we best evaluate community-wide prevention programs (van Koperen, 2016)?
- How can we involve citizen in designing healthier neighborhoods (den Broeder, 2017)?

So there were many different topics considering various interventions and programs, and, without going into detail, I would like to share some important lessons learned with you, the ones that are more general in nature.

## Lessons learned

I want to distinguish two aspects in my lessons learned. Firstly, I want to show you what we have learned with respect to what is important to make health promotion effective. Secondly, I want to tell you the consequences for the methodology of research.

First, with respect to what is important in order to make interventions effective:

- If we want to stimulate an active lifestyle and a healthy diet we should (a) motivate people to do this (consciously and/or unconscious), (b) make people psychologically and physically capable of doing this, and (c) create circumstances and opportunities that make this possible.
- Therefore, changing health behavior requires complex interventions, tackling not only the individual but also the social, economic, environmental, and political contexts in which people live. My research shows e.g. that particularly the social environment is important when it comes to physical activity of children (Aarts, 2011). Changing the environment is only possible if we use an integrated approach, involving various government sectors (e.g., transportation, urban design), all government levels (local, regional, and national), and levels within governments (strategical, tactical, and operational) (Hendriks, 2016). Apart from the government we should also involve societal organizations, civil society, private organization, the media, and of course citizens themselves. We usually use the term “Whole of Government Approach” or “Whole of Society Approach” to describe these subsequent approaches (Storm, 2016, Dyakova, 2018).
- There are a lot of opportunities for policy and practice that create win-win situations. We should make more use of that. There is low-hanging fruit. For example in stimulating active transportation, which, apart from the increase of exercise, also reduces air pollution and the risk of accidents. Another example for a healthy diet: If we are able to increase the consumption of plant products instead of animal products, we will not only have public health effects, but it will also contribute to environmental benefits (van Vliet, 2018).
- Socio-economic health differences start early in life and are persistent throughout people’s life course. Therefore, early action and promoting a healthy cognitive, psychosocial, and physical development for children is extremely important. But more attention should also be paid to critical and vulnerable transition periods during the life course, such as moving from primary to secondary education, leaving home, and becoming a parent, i.e., when behavioral changes occur.

Then with respect to how to study this:

- Since we are dealing with wicked problems and complex interventions, evaluating these issues is a challenge. It is very difficult to find a causal relationship between actions and outcomes, and it is even more difficult to assess the impact of the context in which the intervention is implemented (Datta 2013, Bauman 2014). It is, therefore, crucial that the evaluation of all the processes and outcomes is planned from the start of the intervention program (van Koperen, 2016). So-called logic models or evaluation frameworks can be very helpful in describing and evaluating the activities, processes, and outcomes properly. Mixed methods, i.e., both quantitative and qualitative research, are necessary in evaluation studies.
- It is important to conduct research into what works, for whom, under what circumstances, and why, instead of just investigating whether or not something works under controlled conditions. (Pawson and Tilley, 1997). In this way, we learn how changes evolve in programs and why it works in some circumstances and not in others. It is, therefore, not the program itself that works, but the way people respond to it (Kremers, 2018). The context is partly decisive and, consequently, the results are not the same for everyone. This indicates that we have to move away from linear thinking. It is not the program or intervention itself that is effective or not, but the means and opportunities that it offers to enable the system to make it effective. Evaluation protocols that do not take into account these principles are not appropriate and are sometimes even dangerous because they can lead to the wrong conclusions.

## Future focus and plans

### More attention to life course in the future

Following the UN's 2030 agenda (WHO) and the Scientific Council for Government Policy in the Netherlands (WRR), I want to give more priority to doing research using the life course approach in the coming years. Particularly I want to focus on children and people in vulnerable positions. According to the WHO, adopting a life course approach in health promotion means: "appropriately intervene during life's transition periods" and "taking action together, as a whole society, to create healthy environments, improve conditions of daily life" (Source: Minsk Declaration on the Life-Course Approach in the Context of Health 2020). The latter, I have already discussed previously in my presentation. But what do we mean with appropriately intervene during life's transition periods and why is this so important?

There are a number of critical transition periods in early life, such as the intra-uterine period, starting primary and secondary school, adolescence, young adulthood, and becoming a parent. At these critical and vulnerable moments, when there is a biological or social transition, people often change their behavior, sometimes in an unhealthy way. It is exactly during these critical transition periods that we should take action and prevent unhealthy behavioral changes (WHO, 2018, Kuh 2014). Some of these changes are induced by social or cultural pressure. The period of adolescence may be the best example. In this period, young people push their boundaries and start experimenting with all kinds of unhealthy behaviors, some of which are addictive. Some of these behaviors, like excessive alcohol consumption, are more health damaging during growth and the development of the body and brain and can, in some cases, affect the DNA permanently. These genetic changes can also be passed on to the next generation. The synthesized life course approach assumes that health, at any moment during the life course, is the result of interactive experiences, exposures, and influences from previous phases in life. Aspects include genetic, intra-uterine, biological, lifestyle, psychological, family environmental, social, and economic factors (WHO, 2018).

To me, appropriate intervening means taking a more personalized or tailored approach: giving each and every person the right prevention, adapted to his/her needs, with maximum effect and minimum side effects and costs. The reason for more tailoring or a personalized prevention is that our preventive interventions are often not effective in large groups (Gans, 2006). A life course

approach can be used to provide solutions for preventions in individuals and groups, for example, prevention of smoking among pregnant women, reducing salt and sugar content in baby food, informing adolescents about the health effects of UV light or use of tablets and smart phones, and stimulating young parents to vaccinate their children.

### Future projects

In my first year as Dean of the School of Social and Behavioral Sciences, I only had limited time available to start new research. Nonetheless, I have already embarked on a number of exciting collaborations. I am keen to expand these collaborations and to put more time and effort into setting up and running new research projects in the coming years.

My research will be closely aligned with the aims of the recently initiated Herbert Simon Research Institute. A School-wide research program for Health, Well-being and Adaptiveness. Within this program, we have recently chosen three cross-cutting themes, namely, “Healthy Lifespan,” “Personalized Prevention and Care,” and “Adaptive Society, Organizations, and Workers.” My research fits particularly well within the Healthy Lifespan theme. I hope that, with this speech, I have inspired colleagues to work with me on this theme. In addition, my research is completely in line with one of the strategic Impact themes of Tilburg University, namely, Enhancing Health and Well-being. Furthermore, our university’s objective is to generate more impact in practice.

Working at Tilburg University provides great new opportunities. In that context, I am very pleased to announce that we are planning a renewed partnership with the Tilburg municipality. I worked with them in the past on the project Move your Neighbourhood: a project in which we conducted research into environmental determinants of physical activity in children. In the coming years, we will strengthen and extend our collaboration. We will continue to work on creating environments that stimulate physical activity and a healthy diet for children. We are now in the process of making our plans more concrete. I will do that together with my colleagues of the academic workplace Public Health of the Department Tranzo within our School of Social and Behavioral Sciences.

Another new initiative that has recently started is the development of the Tilburg University “Healthy Campus” program. Together with a group of col-

leagues in the field of HRM, housing, public health, sports facilities, and the Executive Board, we are developing a social and physical environment that stimulates healthy behavior and contributes to the physical and mental health of both students and staff. The focus of our activities and programs will be on a healthy diet, physical activity, smoking, and mental health. With this program, we will try to practice what we preach, and we will also monitor and evaluate our program activities on their effectiveness.

I have already discussed some of the models that are used within health promotion. In the next part of my presentation, I will show you which conceptual model served as a basis for my work in the last few years, and how I will also use this in my future projects.

# Behavioral Change model

Susan Michie, Professor of Health Psychology and Director of the Centre for Behaviour Change at UCL has introduced a model, the so-called Behavioural Change Wheel model (Michie, 2011), in which she systematically uses 19 previously published behavioral change models/frameworks and reduced these to a number of simple principles. This model is appealing to me because of (1) the robustness and simplicity, (2) the inclusion of conscious and unconscious (automatic and emotional) thinking, (3) the inclusion of intervention possibilities, and finally (4) the acknowledgement of the interplay of contextual factors and the need for integrated action.

The Behavioural Change Wheel (Figure 7) is a theory- and evidence-based tool allowing users to design and select interventions and policies according to a systematic analysis of the nature of the behavior, the mechanisms that need to be changed in order to bring about behavior change, and the interventions and policies required to change those mechanisms. We have, for example, used this model in a Horizon2020 project, in which we wanted to identify effective policies, practices, and innovations that address key environmental stressors of health and the underlying causes of health inequity (van Vliet 2018). This model recognizes that behavior is part of an interacting system involving all these components. Interventions need to change one or more of them in such a way as to put the system into a new configuration.

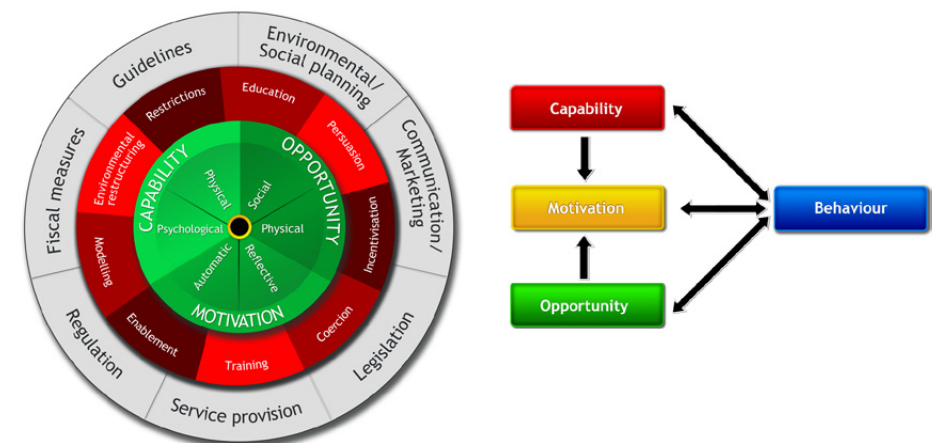


Figure 7. The Behavioural Change Wheel, including the COM-B system



## The layers of the model

This model simply comes down to 3 layers. The core/hub of the model shows the three sources of behavior that interventions can focus on. These are “Capability,” “Opportunity,” and “Motivation.” The relationship among these sources is also shown in the figure on the right. It recognizes that behavior is part of an interacting system involving all these sources or components (COM-B). Capability is defined as the individual’s psychological and physical capacity to engage in the behavior concerned. It includes having the necessary knowledge and skills. Motivation is defined as all those brain processes that energize and direct behavior, not just goals and conscious decision-making. It also includes habitual processes and emotional responses. Opportunity is defined as all the factors that lie outside the individual that make the behavior possible or prompt it. The opportunity component is the context. As mentioned before, context is key to the effective design and implementation of interventions.


The single and double-headed arrows in Figure 7 represent possible influences between components in the system. Opportunities, for example, can influence motivation as well as behavior; behavior can change the capability, motivation, and opportunity. This model clearly indicates that we should not regard behavior as a simple, gradual, and linear result of specific influences that can be solved in a simple way, but rather as an expression of the interplay of influences (Kremers, 2018): an interplay that can also lead to vicious circles and wicked problems.

Let me give you an example of such a vicious circle: If you are overweight or even obese, you no longer enjoy being physically active. You try to lose weight, but you don’t succeed and out of misery you eat more and gain more weight. An example of a wicked problem: we do not just eat because we need the energy to survive. We also eat because we enjoy it, because it gives meaning to our day, because it gives us our identity, and because it is often a central part of our social activities. This also applies to sports: we no longer have to run to survive, but we perform sports activities for several reasons such as the need for privacy or the need for social contacts, status, or challenge. So, if we want to change behavior and make it healthier, we have to take these different motivations into account, create supportive environments, and use interventions modes that contribute to that. And that brings me to the next layer.

Surrounding the hub is a layer of nine intervention functions that can be used to change behavior. Examples of interventions include environmental restructuring, such as extra bicycle paths or making the city center car-free in order to stimulate walking and cycling. This creates more opportunities for people to be active.

The outer layer, the rim of the wheel, identifies seven policy categories that can support the delivery of these intervention functions. One of the policy categories is fiscal measures. A recent example of a fiscal policy measure is the taxation for sugar-sweetened drinks in the UK. I wonder if that will also be possible in the Netherlands.

So this BCW is a good basis for the development of health promotion interventions. But is it also adequate or suitable to be used from a life course perspective? Although it has not been explicitly designated as such, I believe that it can easily be integrated or added to the model. Considering the various life cycle phases, we need different functions of interventions and different policy measures to implement them. For example, modelling is a very interesting method for youngsters because we know from research that, particularly in this period of life, adolescents are susceptible to influencers. The program JOGG (*jongeren op gezond gewicht*), for example, uses a soap actor, a famous ice skater, and a female kickboxer to stimulate physical activity among young children. These ambassadors are from different social and cultural backgrounds and, therefore, appeal to various socio-economic groups in society. But of course, also the distribution of fancy water bottles or convenient water taps (service provision) in the city or at schools can stimulate the consumption of water instead of sugar containing soft drinks.

To summarize, I have told you that socio-economic health differences are largely determined by unhealthy behavior. I have also told you that unhealthy behavior is often not a conscious choice people make, but it is the result of an automatic reaction to the environment or stems from emotional thinking. Finally, I have told you about my own research, in the past and my plans for the future. I hope to have convinced you about the importance of an integrated approach and a life course approach to develop effective interventions, and I have shown you the model that I will use for this. In the next part  I will say some words about education and share with you my vision on education and how I would like to contribute to this. Since I am a Dean, and not yet involved in teaching within our School, I will do this from a Dean’s perspective.

# Education

At Tilburg University, we have implemented the Tilburg Educational Profile. The inspiration for this profile is Martinus Cobbenhage who is also the founding father of Tilburg University. The Tilburg Educational Profile is unique in the Netherlands. It is built on three pillars: Knowledge, Skills, and Character to be realized by Exploring, Connecting, Engaging, and Activating students. The goal is to let Tilburg University students and alumni stand out by being well equipped to further develop their talents, increase their knowledge, and contribute to society. We want to educate our students to become adults who are accountable for their actions, who take their social responsibility, who incorporate ethical aspects into their work, who consider good standards and values, and who care for their fellow human beings. I truly support this educational profile, and, as a Dean, I will work together with my Vice-Deans and management in accommodating this.

Furthermore, I would like to stimulate and contribute to new courses, both Bachelor's and Master's courses, in the field of health and behavioral sciences in order to broaden the scope of educational programs in our School. Specifically, I will try to contribute and support the development of new interdisciplinary courses with other Schools. As said before, most societal problems are wicked problems, and, in order to solve these, we need to address them in an interdisciplinary way. Therefore, we also need to educate our students to become T-shaped professionals: professionals with expertise and skills in a specific discipline but with a broader scope and willingness to address issues in an interdisciplinary way. I am happy to say that we are already in the process of developing new courses together with the Law School and the School of Humanities and Digital Sciences.

Even though my time in the coming years is limited due to my obligations as a Dean, I hope, with my research, to contribute to the education of our Bachelor's and Master's students. We are in the process of developing a new track in the Sociology Master's program, called Health, Well-being and Society. This course is very much in line with my expertise and I hope to make a relevant contribution to that.

# Thank you

I want to thank a number of people who have made it possible for me to stand before you now. First of all, I would like to thank the Executive Board of Tilburg University for my appointment. I am happy and thankful for the trust they have placed in me. I was appointed Dean and Professor at the School of Social and Behavioral Sciences over a year ago, and, from the beginning, I felt that I was in the right place. I felt welcomed by the people in the School office with whom I work on a daily basis. I would like to mention Hans Georg van Liempd and Monique Vermeë in particular. Hans, as the Director, I consult with you on a daily basis, and you are always there for me. You have a very pleasant way of supporting me, and I can build on your knowledge and expertise. Monique, you are so quick and thorough in the way you manage my agenda, and my to-do list. It is a real pleasure working with you. I also want to thank the Heads of Departments in our School, my fellow professors, and other colleagues for your pleasant collaboration. I also very much appreciate the pleasant way in which I work with my fellow Deans. Thank you very much for that.

There is one person who has played a central role in my career. A person I value very highly as a scientist, and whom I value very much as a person. This is Prof. Jaap Seidell. Jaap, I consider you to be my mentor. You were there for me at important moments with advice, and you always spoke freely to me. You have always supported me and trusted me. As a scientist and professor, this has given me a great deal of confidence and courage to take steps that I sometimes did not imagine I could do. Thank you very much Jaap for your advice and support.

In addition, I have always had a lot of support and pleasure in working with colleagues from the VU and other universities for many years. I especially would like to mention Carry Renders, with whom I have worked and hope to continue working together for many years to come. I would also like to thank my colleagues at the RIVM for shaping me into who I am. The management of the RIVM has always supported me and gave me opportunities to grow in management positions and in my academic career. Many people there have inspired me: everyone in his or her own way. There is one person I would like to mention in particular and that is the former director general, Andre van der Zande. Probably without knowing this, he has taught me and showed me what is important in leadership. I believe he is a man with vision and character.

I am looking forward to new collaborations. I already mentioned the collaboration with the Tilburg municipality, but we will also work more closely together with the Elizabeth Twee Steden Ziekenhuis. We have recently agreed to work together on a research program in which we want to combine the expertise of Tilburg University with the expertise of staff of the ETZ hospital in order to make their health care program more evidence based. This is in line with the university's ambition to create more impact and, for the ETZ, to improve the quality of care using science.

But there is also a life outside academia. I have many friends and too little time to spend with them. But fortunately, for true friends, this is not an obstacle. I want to thank my close friends for supporting me and trusting me. They know me so well and, therefore, always provide me with good advice. You also make me aware that there is more to life than work.

I also would like to thank my family. I will do that in Dutch. Mijn broers en zus, zo dierbaar voor mij. Ik geniet enorm van ons samenzijn, onze wintersport vakanties, altijd vol met humor en heel veel gezelligheid. Voldoende afleiding om daarna weer met volle kracht aan het werk te kunnen gaan. Ik wil mijn moeder bedanken, die zo sterk is en altijd zo haar best heeft gedaan om voor ons te zorgen en nu zo trots op mij is. Ook van mijn schoonfamilie ervaar ik altijd steun en oprechte interesse in mij en mijn werk. Dank jullie wel voor dit. Tot slot mijn eigen gezinnetje. Reggy, nog steeds kan ik om je humor lachen, je bent zo gevat, en zo zorgzaam. Je houdt ons gezinnetje op de rails. Mijn beide meiden op wie ik zo trots ben. Jullie hebben mijn leven zo ontzettend verrijkt, gewoon door te zijn wie jullie zijn. Tegelijkertijd maken jullie het gemakkelijk voor mij om het werk te doen wat ik nu heb en dat ik nu hier kan staan. Dat maakt mij erg gelukkig.

*Ik heb gezegd / I have spoken.*

## References

- Aarts, MJ. *Children, physical activity and the environment: opportunities for multi-sector policy*. Thesis Tilburg University 2011.
- Bauman AE, King L, Nutbeam D. Rethinking the evaluation and measurement of health in all policies. *Health Promotion Int.* 2014;29(Suppl 1):i143–i51.
- Bengtsson T, Mineau G. Early-life effects on socio-economic performance and mortality in later life: a full life-course approach using contemporary and historical sources. *Social Science & Medicine.* 2009; 68(9):1561-4.
- Broeder L. den, *Citizen Science for Health in All Policies. Engaging communities in knowledge development*. Thesis VU university 2017
- Braveman P, Barclay C. Health disparities beginning in childhood: A lifecourse perspective. *Pediatrics.* 2009;124(Supplement 3):S163–S75.
- Buijssen M, Jajou R, van Kessel FGB, Vonk Noordegraaf-Schouten MJM, Zeil-maker MJ, Wijga AH, van Rossum CTM. *Health effects of breastfeeding: an update: Systematic literature review*, RIVM 2017.
- Dahlgren G, Whitehead M. *Policies and Strategies to Promote Social Equity in Health*. Stockholm, Sweden: Institute for Futures Studies. 1991
- Datta J, Petticrew M. Challenges to evaluating complex interventions: a content analysis of published papers. *BMC Public Health.* 2013;13(1):568
- Dumith SC, Muniz LC, Tassitano RM, Hallal PC, Menezes AMB. Clustering of lifestyle factors for chronic diseases among adolescents from Southern Brazil. *Prev Med* 2012, 54(6): 393-396.
- Dyakova M, Hamelmann C, Bellis MA, Besnier E, Grey CNB, Ashton K, et al. *Investment for health and well-being: a review of the social return on investment from public health policies to support implementing the Sustainable Development Goals by building on Health 2020*. Copenhagen: WHO Regional Office for Europe; 2017 (Health Evidence Network (HEN) synthesis report 51).

- Gans RO. The metabolic syndrome, depression, and cardiovascular disease: interrelated conditions that share pathophysiologic mechanisms. *Medical Clinics of North America*. 2006; 90(4):573-91.
- Hendriks AM, Habraken JM, Kremers SP, Jansen MW, van Oers H, Schuit AJ. Obstacles and Enablers on the Way towards Integrated Physical Activity Policies for Childhood Obesity Prevention: An Exploration of Local Policy Officials' Views. *Biomed Res Int*. 2016;2016:5739025
- Kolb B, Whishaw IQ. *An introduction to brain and behaviour*. Worth Publishers 2014
- Koperen TM van. *Evaluation of Integrated Community-Wide Intervention Approaches to prevent overweight in children*. Thesis VU university 2016.
- Kremers SPJ, Visscher TLS, Schuit AJ. Effect in zijn context. Evaluatie van Jongeren op Gezond Gewicht. *TSG* 2018;96 3-4: 128-131.
- Kuh D Cooper R Hardy R Richards M Ben-Shlomo Y. *A Life Course Approach to Healthy Ageing*. 1st edn. Oxford, UK: Oxford University Press, 2014.
- Mackenbach JD, Rutter H, Compernelle S, Glonti K, Oppert JM, Charreire H, De Bourdeaudhuij I, Brug J Nijpels G, Lakerveld J. Obesogenic environments: a systematic review of the association between the physical environment and adult weight status, the SPOTLIGHT project. *BMC Public Health*. 2014; 14: 233.
- Marmot M. *Fair Society, healthy lives. The Marmot Review. Strategic review of the health inequalities in England post 2010*. February 2010.
- Marmot M, Friel S, Bell R, Houweling TA, Taylor S; Commission on Social Determinants of Health. Closing the gap in a generation: health equity through action on the social determinants of health. *Lancet*. 2008 Nov 8;372(9650):1661-9.
- Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci*. 2011 Apr 23;6:42.
- Niet AG van der, Smith J, Oosterlaan J, Scherder EJ, Hartman E, Visscher C. Effects of a Cognitively Demanding Aerobic Intervention During Recess on Children's Physical Fitness and Executive Functioning. *Pediatr Exerc Sci*. 2016;28(1):64-70.
- Nisbett, R. & Ross. *Human Inference: Strategies and Shortcomings of Social Judgment*. Englewood Cliffs, NJ: Prentice Hall. 1980
- OECD. The Issue note. *The only way is up? Social mobility and equal opportunities*. Center for opportunities and Equality. COPE. <http://oe.cd/cope/social-mobility-2017>
- Petty, R.E., & Cacioppo J.T. *Communication and persuasion: Central and peripheral routes to attitude change*. New York: Springer. 1986
- Prochaska, James O.; DiClemente, Carlo C. "The transtheoretical approach". In *Norcross, John C.; Goldfried, Marvin R. Handbook of psychotherapy integration*. Oxford series in clinical psychology (2nd ed.). Oxford; New York: Oxford University Press. 2005 pp. 147-171.
- Raad voor Maatschappelijke ontwikkeling. *Nieuwe ronde, nieuwe kansen. Sociale stijging en daling in perspectief*, 2011.
- Scheepers CE. *Opportunities to stimulate healthy transport*. Thesis VU university 2016.
- Schrijvers CTM, Schoemaker CG. *Spelen met gezondheid. Leefstijl en psychische gezondheid van de Nederlandse jeugd*. RIVM rapport 270232001, 2008.
- Schuit AJ, van Loon AJM, Tijhuis M, Ocke MC. Clustering of lifestyle risk factors in a general adult population. *Prev Med* 2002;35(3) 219-224.

- Schuit AJ, Feskens EJ, Launer LJ, Kromhout D. *Physical activity and cognitive decline; the role of the apolipoprotein e4 allele*. *Med Sci Sports Exerc* 2001; 33(5):772-7
- Sofi F, Valecchi D, Bacci D, Abbate R, Gensini GF, Casini A, Hacchi C. *Physical activity and risk of cognitive decline: a meta analysis of prospective studies*. *J Int Med* 2011;269(1):107-10
- Storm I. *Towards a HiAP cycle. Health in All Policies as a practice-based improvement process*. Thesis VU university 2016.
- Terwel, J, Van de Koot-Dees, D. & Rodrigues, G.R. *Die droom heb ik nog steeds. Schoolloopbanen en levensverhalen van jongeren in een diverse samenleving*. Antwerpen en Apeldoorn: Garant. 2018
- Victora CG, Bahl R, Barros AJD, França GVA, Horton S, Krasevec J, et al. *Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect*. *Lancet*. 2016;387(10017):475–90.
- Vliet N van der, Staatsen B, Kruize H, Morris G, Costongs C, Bell R, Marques S, Taylor T, Quiroga S, Martinez Juarez P, Máca V, Asn M, Zvinová I, Tozija F, Gjorgjev D, Espnes GA, Schuit J. *The INHERIT Model: A Tool to Jointly Improve Health, Environmental Sustainability and Health Equity through Behavior and Lifestyle Change*. *Int J Environ Res Public Health*. 2018 Jul 7;15(7).
- Vries, H. de, Dijkstra, M. & Kuhlman, P.. *Self-efficacy: the third factor besides attitude and subjective norm as a predictor of behavioral intentions*. *Health Education Research*, 1988; 3: 273–282.
- Vries, H. de, Mesters, I., Steeg, H. van de, & Honing, C. *The general public's information needs and perceptions regarding hereditary cancer: An application of the Integrated Change Model*. *Patient Education and Counseling*, 2005; 56: 154-165.
- Waterlander WE. *Put the money where the mouth is: The feasibility and effectiveness of food pricing strategies to stimulate healthy eating*. Thesis VU university 2012.
- Wetenschappelijke Raad voor het Regeringsbeleid: WRR-Policy Brief 7 *Van verschil naar potentieel. Een realistisch perspectief op de sociaaleconomische gezondheidsverschillen*, 2018.
- Wilkinson R, Marmot M. *Social determinants of health. The solid facts*. WHO 2003
- World Health Organization. *The life-course approach: from theory to practice. Case stories from two small countries in Europe*. 2018

