

## Summary

### **Food and offending From punishment to rehabilitation?**

#### **Why this report?**

Research into the origin of delinquent and criminal behavior has long been strongly psychosocially oriented. In the last decades, however, interest in other explanations has increased significantly. In criminology neurobiological explanations of delinquent and criminal behavior, are accepted as alternative and additional explanations. This recent development also applies to novel knowledge acquired from nutritional sciences. What we eat determines to a certain extent how we behave. Knowledge from nutritional sciences may also provide starting points for new treatments focusing on behavioral change. So far however, this knowledge has not yet been reviewed systematically. This knowledge synthesis aims to fill this gap. Insights from nutritional sciences might shed new light on delinquent and criminal behavior. These insights might contribute to new treatment options for offenders.

#### **For whom is this report intended?**

This knowledge synthesis is written for those who are involved in the care, counseling and treatment of offenders. First and foremost, prison staff and professional involved in the health care of offenders such as nurses, doctors, and psychologists. Managers – heads of department, board members - might also find useful information in this knowledge synthesis. In addition, the report is also important for policy advisors who have food-related subjects in their portfolios, both within the correctional system and the policy departments of the ministry of Justice and security. Finally, the report might also provide valuable information for officials who are involved in the aftercare of detainees, such as probation officers and others within probation organizations. A number of topics is discussed in this knowledge synthesis. Some of these topics have a general, informative character. Information about adequate nutrition and deficiencies, and nutritional references will be discussed. The potential impact of deficiencies on behavior is also discussed. More specifically, in this synthesis a description is provided about what is known about nutritional treatment options for several behavioral problems. A separate chapter is devoted to nutrition interventions for (incarcerated) offenders. Finally, the judicial context in which nutrition plays an important role is discussed.

#### **Research questions and methods**

The knowledge synthesis was built a main research question and a number of sub-questions derived from this main question.

#### **Main question**

What is known from the (nutritional) sciences about the relationship between nutritional status and behavior in people in general and in individuals in particular, and how can this knowledge contribute to the development of policies and interventions

aimed at improving the mental condition of offenders, the reduction of antisocial behavior in particular, in general, but within the context of incarceration in particular?

### **Questions derived from this main question**

- 1 What is meant by nutritional deficiencies, which forms can be distinguished?
- 2 What is known about associations between nutritional deficiencies and behavior?
- 3 What is known about nutritional interventions that focus on specific behavioral problems, cognitive skills and mental health?
- 4 What is known about the nutritional status of offenders prior to incarceration?
- 5 How does this nutritional status develop during the incarceration and what is the role of the the provided nutrition in this respect?
- 6 What is known about the food supply of offenders?
- 7 What is known about dietary interventions in offenders focused on reducing antisocial behavior, aggression in particular?
- 8 What is known about the effects of dietary interventions on recidivism?
- 9 What can be said about the context of incarceration and the food culture of incarcerated offenders?
- 10 How does the food provided during incarceration, and the prison food culture relate to the concepts of *duty of care* (of the prison authorities), *personal responsibility*, *self-reliance* (of prisoners) and *normalization* (within the prison system)?
- 11 Which relevant information for the treatment, care and treatment of offenders emerges when answering the questions above?

### **Method**

The method was overall narrative, but more systematically when possible. For some topics, such as dietary intake standards and definitions of deficiencies, food science literature (journals and handbooks) and websites of health authorities were consulted. For the description of nutritional interventions, aimed at behavioral problems in general, and behavior problems of offenders, searches for systematic reviews of intervention studies were made, with a focus on systematic reviews with meta-analyses. The questions about the food culture were addressed differently. The authors place this culture within the context of deprivation during incarceration. They used interviews with detainees as an important tool.

### **Yield of the knowledge synthesis**

#### **Deficiencies and behavior**

Studies on possible consequences of deficiencies were found in a wide variety. Particularly serious deficiencies, such as resulting from hunger and severe malnutrition, especially when this occurs early in development, turned out to be associated with unfavorable outcomes, such as behavioral problems in children and later antisocial behavior. Serious malnutrition is characterized by low intakes of macronutrients (proteins, carbohydrates and fats). The intake of micronutrients (vitamins and minerals) is often low as well. Less serious malnutrition is characterized by insufficient intake of micronutrients. deficiencies resulting from low intakes can arise from unhealthy dietary patterns. This might be the case when acquiring

enough healthy food is a problem – as in the case of food insecurity – but also by less healthy dietary habits.

The relationship between early deficiencies and subsequent behavioral problems seems reasonably robust: even if alternative explanations are statistically taken into account, such as poverty and socio-economic status, associations remain.

Relatively unhealthy dietary patterns seem to be associated with adverse physical as well as mental health outcomes. Studies on healthy dietary patterns on the other hand, such as a Mediterranean dietary pattern, suggest show a more favorable picture. Several large randomized studies were found demonstrating a protective effect of the Mediterranean diet on cardiovascular health, but behavioral studies are rare. One randomized study was found. This study suggests a favorable effect of this diet as adjunctive treatment in the treatment of major depression. Whether healthy dietary patterns also have favorable effects on externalizing behaviors has not yet been studied in randomized studies.

An important limitation of many studies on the relationship between deficiencies and behavior is the observational character of these studies. Associations often emerge, but no firm conclusions can be drawn about the causality within these relationships.

### **Reference intakes**

A few critical notes were made about intake reference levels of vitamins and minerals as recommended by health authorities. These values are aimed at the prevention of deficiency symptoms. In determining these values, optimal brain functioning has not been taken into account. General guidelines also do not take possibly special needs of special populations, such as offenders into account. Special populations might include individuals with psychiatric disorders, addictions and aggression-regulation problems.

### **Glucose metabolism**

A special topic that emerged was glucose metabolism. A number of studies suggests that disorders in this metabolism might play a role in aggression in selected populations. This knowledge might be used in the development of interventions aimed at the reducing of aggression and in risk assessment (prediction of violence recidivism).

### **Nutritional intervention studies**

A search was conducted into experimental studies in which nutrients were used to treat specific behavioral problems. A considerable number of meta-analyses suggests that  $\omega$ -3 fatty acids might have beneficial effects in the treatment of – especially severe – depression. These fatty acids also seem to have a favorable effect on aggression. ADHD symptoms in children might also decrease when using  $\omega$ -3 fatty acids, although the effects seem small. A small number of studies have been conducted in psychotic patients. Although some positive results are reported, the number and size of the studies is too small to draw firm conclusions. In these studies it remains unclear which particular fatty acids, and in which dosage work best. In the treatment of depression, EPA (the  $\omega$ -3 fatty acid eicosapentaenoic acid) appears to be the most effective, in the case of aggression, especially DHA (the  $\omega$ -3 fatty acid docosahexaenoic acid) might be more effective. In ADHD studies, the best results seem to be achieved when, in addition to  $\omega$ -3 fatty acids, GLA (the  $\omega$ -6 fatty acid gamma linolenic acid) is applied. For all four treatment indications mentioned above – depression, aggression, ADHD and psychosis – positive, and sometimes promising results are reported (especially in the case of depression), but evidence is still inconclusive.

Other nutrients that emerge are vitamin D (in depression), zinc (depression and ADHD in children) and magnesium (ADHD in children). However, the number of studies suggesting effectiveness is too small to draw conclusions.

A distinct line of research is provided by restricted elimination diet studies, especially in the treatment ADHD. These studies suggest that these diets do have a beneficial effect on ADHD symptoms in children. There also seems to be an effect on other behavioral problems often accompanying ADHD, such as oppositional and defiant behavior. Whether these diets also have an effect on older children (adolescents) and adults has not been studied.

Nutritional interventions with vitamin / mineral supplements may have a (small) effect on intelligence, especially in vulnerable children. High doses of vitamins and minerals appear in some studies as effective in the treatment of ADHD, both in children and adults.

### **School studies**

Some studies in school children suggest that nutritional interventions with vitamins, minerals and / or  $\omega$ -3 fatty acids can have a beneficial effect on behavior, rule violating behaviour in particular. More complex interventions, such as dietary interventions in a highly structured environment, combined with the simultaneous provision of cognitive behavioral interventions, also seem to be effective. However, due to the complexity of these interventions, it is difficult to assess the contribution of the different intervention components.

### **Offender studies**

Whether offenders often suffer from nutritional deficiencies has not been studied systematically, although a limited number of studies suggest poor dietary habits in offenders. There are also studies suggesting that prisoners are at risk of vitamin D deficiency. Noteworthy are the results of a Dutch study that shows that detainees (especially detainees in special care wards) are often in poor physical condition (underweight) on arrival. Some other studies suggest that food insecurity is relatively common in the history of offenders.

#### *Nutritional interventions in offenders*

A fairly large number of American studies from the last century in (predominantly young) offenders suggests that replacing unhealthy food items (soft drinks, sweet desserts, cookies) with healthier alternatives (spring water, fruit, fruit juice, nuts, raw vegetables) might have favorable effects on offender behavior. This might reduce the number of incidents and rule violating behaviors by about one third. The quality of these studies must be judged as moderate to poor however (absence of control groups, no blinding).

Some more recent double-blind, placebo-controlled studies, mostly with vitamins and minerals, sometimes supplemented with  $\omega$ -3 fatty acids, report similar beneficial effects on offender behavior. When using dietary supplements, the level of incidents in these studies dropped significantly by a quarter to a half. These well-controlled studies can be the starting point for the development of nutritional interventions in offenders with aggression-regulation problems.

#### *Prevention of recidivism*

There is limited evidence for the effectiveness of nutritional interventions as an instrument for recidivism prevention. Most studies were conducted within the context of probation supervision. These interventions, often referred to as 'customized' individual treatment (of deficiencies) seem to have a significant effect on recidivism, but there is a lack of systematic research. It must be noted that it is very challeng-

ing to determine the effects of customization, since it actually involves a large number of mutually different interventions.

*Nutrition in the context of incarceration*

Until now, the food culture the Dutch prisons has been determined by a commitment to cost reduction and efficiency. The nutritional value of provided meals is sufficient, but there are doubts – although these doubts can not be substantiated – whether these meals are actually utilized completely.

Reference is made to alternatives for the current catering system. The self-catering system used in other countries (e.g. Scandinavia), in which detainees are responsible for the composition of menus and the preparation of meals, might better suit a number of important principles of detention, such as promoting self-reliance and appealing to prisoners own responsibility. Wasting of food also might decrease. Experiments with self-catering have are already being conducted on a limited scale in the Netherlands.

**Tabel S1 Yield in a nutshell**

Subject	Main findings
Deficiencies	<ul style="list-style-type: none"> <li>• (Serious) deficiencies in early development may play a role in the development of later antisocial behavior.</li> <li>• Unhealthy dietary patterns may have an unfavorable effect on behavior.</li> <li>• Deficiencies may play a role in offending.</li> <li>• (incarcerated) offenders are at risk of vitamin D deficiency.</li> <li>• Glucose metabolism disorders may play a role in aggression in a selected group of offenders.</li> </ul>
Nutritional interventions (general)	<ul style="list-style-type: none"> <li>• A fairly large number of studies suggest that <math>\omega</math>-3 fatty acids might be effective in the treatment of depression.</li> <li>• A limited number of studies suggests that aggression might decrease when <math>\omega</math>-3 fatty acids are used.</li> <li>• Beneficial results of <math>\omega</math>-3 fatty acids have also been reported in the treatment of ADHD (in children) and psychosis, but results are inconclusive.</li> <li>• Studies on the effects of the restricted elimination diet in ADHD seem promising. Although apparently effective in children, this method has not been studied in adolescents and adults.</li> </ul>
Nutritional interventions (offenders)	<ul style="list-style-type: none"> <li>• Interventions with nutritional supplements (vitamins, minerals and <math>\omega</math>-3 fatty acids), aimed at reducing antisocial and rule-violating behaviour are apparently effective. These studies might be the bases of the development of nutrient based treatments of aggression in prisons.</li> </ul>
Preventing recidivism	<ul style="list-style-type: none"> <li>• Tailor-made interventions aimed at the individual treatment of deficiencies in offenders have been investigated in a limited number of studies. Although results are inconclusive, these treatment option offers an interesting perspective.</li> </ul>
Nutrition during incarceration	<ul style="list-style-type: none"> <li>• The current catering food system (in the Netherlands) is focused on efficiency and cost reduction. Self-catering as a food system (which is being tested on a small scale) is more in line with the principles of incarceration, such as the importance of self-reliance, personal responsibility in offenders and normalization.</li> </ul>
Overarching remarks	<ul style="list-style-type: none"> <li>• Food science based knowledge might provide new, additional insights into the origin of delinquent and criminal behavior.</li> <li>• Food science also might contribute to the development of nutrition based treatments of common psychiatric disorders and aggression among offenders</li> </ul>

## Research

Many of the findings in this synthesis study are characterized by uncertainty, and additional research and pilot studies will be required. A number of topics that qualify for this can be found in table S2.

**Table S2 Additional research / practice pilots**

Topic	Research/practice pilots
Deficiencies in offenders	<ul style="list-style-type: none"><li>• Research into possible deficiencies in the history of offenders.</li><li>• Research into current nutritional status and possible deficiencies in offenders when entering prison.</li><li>• Research into the prevalence of vitamin D deficiency in offenders.</li></ul>
Glucose metabolism	<ul style="list-style-type: none"><li>• Research into the possible role of glucose metabolism in offenders with aggression regulation problems (intervention and risk assessment)</li></ul>
Nutritional interventions (general)	<ul style="list-style-type: none"><li>• Research into the feasibility of restricted elimination diets in (young) offenders.</li></ul>
Nutritional interventions (offenders)	<ul style="list-style-type: none"><li>• Pilots in practice with food supplements in the treatment of violent and rule-violating behaviour in incarcerated offenders.</li></ul>
Prevention of reoffending	<ul style="list-style-type: none"><li>• Pilots in practice with customized nutrition based interventions in offenders during probation.</li></ul>
Food in prisons	<ul style="list-style-type: none"><li>• More pilots in practice with self-catering.</li></ul>