

Correlates of Fruit and Vegetable Consumption Among 11-Year-Old Belgian-Flemish and Dutch Schoolchildren

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ABSTRACT

Objective: To determine factors associated with the consumption of fruit and vegetables among 11-year-old schoolchildren in Belgium-Flanders and the Netherlands.

Design: In total, 2468 school children from 98 randomly selected schools participated in a cross-sectional survey.

Variables measured: Frequency of fruit and vegetable intake and potential personal, social and environmental correlates were measured by means of self-administered, school-based, written questionnaires.

Analysis: Hierarchical multiple regression analyses were conducted to assess potential correlates of schoolchildren's fruit and vegetable consumption. Separate analyses were conducted for boys and girls.

Results: Bringing fruit to school, modeling behavior of parents and friends, parents demanding that their child eat fruit, knowledge about recommended intake levels, liking fruit, and self-efficacy to eat fruit were the strongest correlates of fruit intake. For vegetables, gender, parental demand, parents facilitating the consumption of vegetables by cutting them for their child, modeling behavior of parents and friends, and preferences for vegetables emerged as strongest correlates. No substantial differences in significant correlates were found according to gender. The percentage of explained variance was 33.7% for fruit and 28.4% for vegetable intake.

Conclusions: Interventions need to be focused on personal (taste preferences), social (parental influences), and environmental factors (availability).

KEY WORDS: schoolchildren, fruits and vegetables, correlates, Dutch, Flanders

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INTRODUCTION

In many European countries, fruit and vegetable intake among children and adolescents is lower than recommended. Mean intake of fruit and vegetables among 11-year-old schoolchildren in 9 European countries was 141 grams of fruit and 86 grams of vegetables, which is 57% of the daily intake levels recommended by the World Cancer Research Fund.^{1,2} In some countries, fruit and vegetable

intake levels have decreased in the past few decades, especially in children. Between 1993-94 and 1997-98, the reported frequency of fruit and vegetable intake decreased in about two-thirds of the 29 European countries that participated in the Health Behaviour in School-Aged Children (HBSC) study.³ Evidence from the Dutch National Food Consumption Surveys shows that this decrease was especially apparent in the Netherlands.⁴

Epidemiological evidence for an association of adequate intake of fruits and vegetables with decreased risk for cardiovascular diseases including obesity, hypertension, and type 2 diabetes mellitus is convincing.⁵ Although a recent study suggests a less important role of fruit and vegetable intake in relation to the prevention of cancer,⁶ improving the intake of fruits and vegetables remains an important public health challenge.

Some studies suggest that children's eating habits are maintained into adulthood.⁷⁻⁹ Moreover, it has been suggested that food preferences may be easier to modify during

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childhood than during adulthood.¹⁰ Thus, children are an important target group for interventions aimed at increasing fruit and vegetable intake.

The Pro Children study was designed to promote intake of fruit and vegetables among European schoolchildren. The main objective of the Pro Children study was to develop, implement, and evaluate intervention strategies to promote intake of fruit and vegetables in European schoolchildren.¹¹ In order to design such effective intervention strategies, insight into possible mediators or correlates of fruit and vegetable intake of schoolchildren is needed.^{12,13} A recent review showed that few studies have investigated comprehensive models of possible correlates of fruit and vegetable intake of European schoolchildren and adolescents, including Belgium-Flanders and the Netherlands. Most studies were conducted in the United States,¹⁴⁻²¹ and availability and accessibility, parental behavior, peer influences, television viewing/advertisement and access to school snacks, taste preferences, outcome expectations, self-efficacy and skills, and knowledge were most often examined as possible determinants of intake.²² To ensure inclusion of potential and relevant determinants of fruit and vegetable intake, a problem-driven and theory-driven approach was chosen. The development of the theoretical framework for the questionnaire was mainly inspired by Flay's Theory of Triadic Influences²³ and extended with constructs from the "attitude, social influences, self-efficacy (ASE) model"²⁴ and Bandura's Social Cognitive Theory.²⁵ Flay's Theory of Triadic Influences emphasizes that more distal determinants of fruit and vegetable consumption can be found in the cultural, physical, and social environment, and that these determinants in turn influence more proximal personal influences of attitude, social influences, and self-efficacy. The ASE model distinguishes different social influences, of which social support (ie, active encouragement to engage in healthful behavior) and modeling behavior of significant others were incorporated in the theoretical framework. According to Flay's Theory, perceived behavior of others (modeling) is viewed as a distal social-environmental determinant of behavior. Modeling is also an important concept in Bandura's Social Cognitive Theory, as is the self-efficacy concept, which stresses that behavior is a result of interaction between the environment or situation and the person and the person's behavior.²⁵ The role of the environment is also more recognized in the socioecological perspectives on behavior, as shown by French et al.²⁶ Especially for children, environmental factors such as fruit and vegetable availability may more directly influence their intake. Therefore, environmental determinants of behavior were also included in the theoretical framework used for the Pro Children study. In the final Pro Children model, three levels of determinants were distinguished: first, the most distal physical environmental determinants; second, the social environmental determinants; and third, the most proximal personal determinants of fruit and vegetable consumption.¹¹

Insight into important and changeable correlates is needed in order to tailor interventions. The aim of the present study was to quantitatively test personal, social, and physical environmental correlates of 11-year-old schoolchildren's fruit and vegetable intake. As a first step to gain insight into possible relevant determinants of children's fruit and vegetable intake, qualitative studies were conducted.²⁷ The results of this qualitative exploration were combined with the results of a systematic review (Rasmussen M, unpublished data) to inform the development of questionnaires to quantitatively assess possible determinants of intake.²⁸ In an earlier paper, Sandvik and colleagues²⁹ presented descriptive statistics on the possible determinants that were included in the Pro Children cross-sectional survey study and on the differences in these variables among the 9 Pro Children countries. In the present study, for the first time, the strength of the associations between the presumed correlates and intake levels of children in both countries were tested, to study whether these variables are indeed related to fruit and vegetable intake. To our knowledge, this is the first study among primary school children to test associations of a broad range of potential determinants of children's fruit and vegetable intake, and the first to verify results found in the qualitative study among children in both Dutch-speaking countries within the Pro Children study. Additionally, special attention was paid to differences in potential correlates according to gender.

METHODS

Design and Sample

Data were collected by means of a self-administered, written questionnaire among 11-year-old schoolchildren during October and November 2003. Children completed their questionnaires in the classroom during school hours and were supervised by the teachers, who had received instructions from the research centers.¹¹ To obtain representative samples, schools were randomly selected in both countries. In total, 2468 schoolchildren from 98 schools (49 in both countries) participated in this study. The participation rate among the schools was 45.2%, and the response rate among children in participating schools was 82.6%.

Schools were approached by telephone, and school officials who indicated that they did not want to participate were asked for a reason for nonparticipation. Already participating in other research projects was mentioned most often as the reason not to participate in this project. In the Netherlands, lack of time was mentioned as a second important reason not to participate.

Twenty child questionnaires were excluded from the analyses because of missing gender data ($n = 9$), no consent from parents ($n = 4$), the questionnaire was considered not to be reliable ($n = 2$), or the questionnaire was returned but not completed ($n = 5$). Ethical approval for the Pro Children study was obtained from the medical ethics committees in both countries, and schools provided informed consent and full cooperation. Responses were treated

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