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A comprehensive multicomponent school-based educational intervention did not affect fruit and vegetable intake at the 14-year follow-up

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ABSTRACT

The intake of fruit and vegetables is associated with beneficial health outcomes, and studies aimed at increasing fruit and vegetable intake lack long-term follow-up. The primary objective of this study was to evaluate the long-term (14-year) effects of a multicomponent school-based educational intervention targeted to increase fruit and vegetable intake in children. The secondary objective was to evaluate the potential synergistic effect between free school fruit and the educational program. A cluster randomized school-based intervention was initiated in 2001 in Norway, known as the Fruit and Vegetable Make the Marks study. In total, 38 schools were randomized; for the intervention ($n = 18$) and as control schools ($n = 20$). A subsample of the intervention schools ($n = 9$) were additionally given free school fruit, resulting in two intervention groups - one with and one without free fruit. Participants completed questionnaires in September 2001 (baseline, mean age 11.8), May 2002 (at the end of the intervention), May 2003, May 2005, September 2009 and throughout 2016 (mean age 26.5). Of 1950 participants, 982 (50.4%) completed the 14-year follow-up and were considered as the current study sample. Analysis yielded no 14-year effects of the educational program on fruit and vegetable intake. A synergistic effect between the educational program and free fruit was not observed either. Future studies might benefit from increased focus on more extensive parental involvement, increased home availability, and a longer intervention period. However, more long-term studies are needed to evaluate the effects of school-based interventions into adulthood.

Trial registration number: Ethical approval and research clearance was obtained from The National Committees for Research Ethics in Norway (file number S-01076) and The Norwegian Centre for Research Data (file number 12395).

1. Introduction

European children, including Norwegian children, do not meet the recommended intake of fruit and vegetables (FV) (Lynch et al., 2014). To improve overall public health and prevent non-communicable diseases (NCDs), The World Health Organization recommends an intake of 400 g of FV per day (WHO, 2018). In Norway, health authorities recommend a daily intake of at least five portions (500 g) of FV, of which about half should be vegetables and the other half fruit and berries (Helsedirektoratet, 2011). A study among children across Europe reported a mean intake of FV between 2 and 3.5 portions per day and Norwegian children reported a daily intake of approximately 2.5 portions of fruit and 1 portion of vegetables (Lynch et al., 2014). Therefore, an important step in the prevention of NCDs is to increase FV in accordance with the recommendations (WHO, 2018).

Because schools are attended by children with a wide range of socioeconomic backgrounds, they are optimal for implementing public health interventions, which may result in healthy eating patterns (Glasuer and Sherman, 2005). Various school-based intervention studies have increased FV intake in children, and the pooled estimate from a meta-analysis by Evans et al. (2012) indicates that different school-based interventions have increased the daily mean FV intake (without

Abbreviations: CI, confidence interval; FV, fruit and vegetables; FVMM, Fruit and Vegetables Make the Marks; NA, not applicable; NCDs, non-communicable diseases; SCT, social cognitive theory; SD, standard deviation

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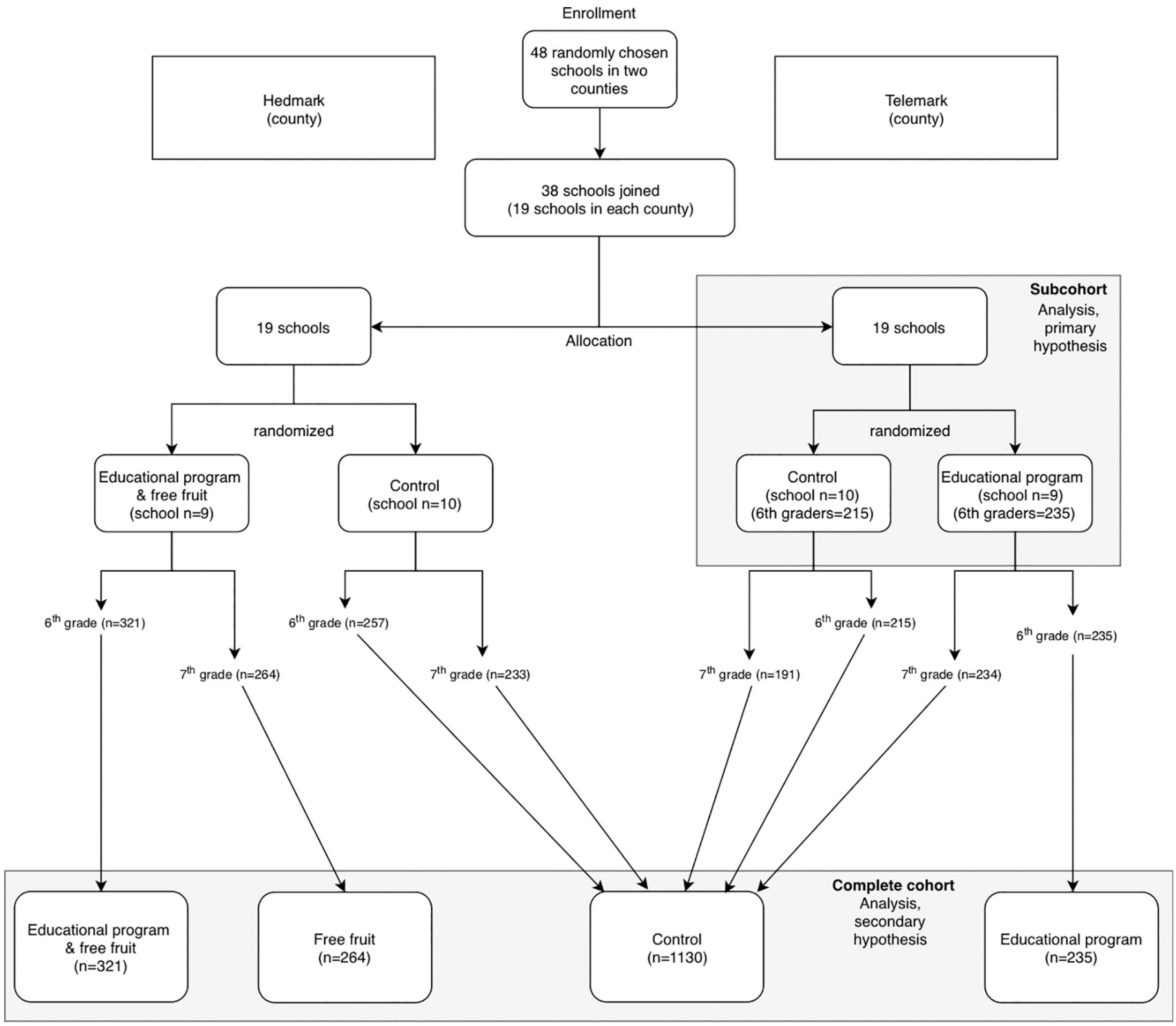

Fig. 1. Study design of the Fruit and Vegetable Make the Marks project, showing the intervention conditions and the comparable groups in the current study in the grey boxes, initiated in Norway in 2001.

fruit juice) with 0.25 portions (Evans et al., 2012).

Evans et al. (2012) have argued that multicomponent interventions are more effective in increasing FV intake than single component interventions as their meta-analysis suggested that multicomponent interventions tended to yield larger improvements in FV intake (Evans et al., 2012). Additionally, preferences, taste, parental intake, home availability and methods of preparation have been reported by other authors as modifiable determinants of FV intake in children (Krolner et al., 2011; Rasmussen et al., 2006), and therefore these determinants should be targeted in interventions to increase FV intake.

Poor long-term adherence to healthy behavior has been reported as a common challenge in intervention studies (Middleton et al., 2013). FV intake should be at the recommended levels and sustained throughout life to have an impact on health (WHO, 2018; Helsedirektoratet, 2011; Slavin and Lloyd, 2012). The few studies that have evaluated interventions aimed at increasing FV intake in children have included follow-up surveys after the interventions had ended (Evans et al., 2012). When including the time of the intervention, the longest follow-up in the meta-analysis by Evans et al. (2012) was approximately 2.5 years. To our knowledge, no study with a school-based educational program aimed at increasing FV intake in childhood has evaluated the potential effects in adulthood. From a public health perspective, evaluating interventions from childhood and possible effects in adulthood is important.

The Fruit and Vegetable Make the Marks (FVMM) project included an educational program based on a framework from social cognitive theory (SCT) (Bere et al., 2006a). Social cognitive theory proposes that behavior, environmental and personal factors interact and all contribute to action (Bandura, 2001), and these factors have been used to develop the FVMM educational program (Bere et al., 2006a). This program consisted of a classroom component and parental involvement (see further details under Methods) and both had significant focus on changing different determinants of FV intake in accordance with SCT (e.g. frequency of FV intake, accessibility, awareness, preferences) (Krolner et al., 2011; Rasmussen et al., 2006; Bere and Klepp, 2004). The program targeted both school and home environments by providing a range of activities aimed at increasing FV intake. Although no effect on FV intake was reported after eight and 32 months, respectively, the educational program yielded an effect on awareness of the five-a-day recommendation (Bere et al., 2006a) which may affect FV intake in adulthood when the participants themselves are responsible for their own nutritional intake. Further, a substantial part of the intervention was to influence determinants of FV intake (Krolner et al., 2011; Rasmussen et al., 2006), which might have led to behavior changes later in life (Larson et al., 2012).

A subgroup of the participants in the FVMM was given free school fruit. This resulted in an increased FV intake while it was given (Bere et al., 2005). Furthermore, in the seven-year follow-up analysis of free school fruit, sensitivity analysis revealed the highest effect size in the group receiving both free fruit and the educational program (Bere et al., 2015). This might indicate a possible synergistic effect of the educational program when combined with free fruit.

Based on this, our primary objective was to evaluate the effect of the FVMM multicomponent school-based educational program 14 years after the intervention ended, when the participants were adults. The secondary objective was to evaluate a possible synergistic long-term effect between the educational program and free fruit.

2. Methods

2.1. Design and setting

The design of the FVMM project has previously been reported by Bere et al. (2006a), Bere et al. (2005), and Bere et al., 2006b); nevertheless, a short overview follows. A cluster of randomized school-based interventions was initiated in 2001 with the aim of increasing FV intake in school children. A total of 48 elementary schools in two Norwegian counties, Hedmark and Telemark, were randomly selected and invited to participate. Of these, 38 schools agreed to participate (19 schools in each county). Nine schools in each county were randomized to the intervention and the remaining were included as control schools. The participants consisted of pupils in the 6th and 7th grades during the school year of 2001–2002, where 6th graders in the intervention schools were given a multicomponent educational program to increase FV intake. Due to practical reasons, all pupils (i.e. both 6th and 7th graders) in the intervention schools in Hedmark County were also given free school fruit during the intervention period. This resulted in breaking the randomized design between counties. However, within counties, the randomization was still valid. Regarding the multicomponent educational program, it resulted in two intervention groups and two control groups, both with and without free school fruit. The study design of the current study is shown in Fig. 1.

2.2. Sample

From the 38 schools, a total of 2287 pupils were invited to participate. 337 pupils did not want to participate or did not complete the baseline survey for other reasons (e.g. did not attend school the day of the survey). The baseline sample consisted of 1950 (85%) pupils in 6th and 7th grades. For 1028 6th graders (10–11-year-olds) and 922 7th graders (11–12-year-olds), we also obtained data from parents. Of the 1950 pupils, 984 were boys and 966 were girls. All parents gave informed consent prior to the first survey.

2.3. Interventions

2.3.1. Multicomponent educational program

The multicomponent educational program consisted of an educational program with a classroom and a parental component as described in Bere et al. (2006a). A brief overview of these components follows.

2.3.2. Classroom component

The classroom curriculum was based on SCT and given once a month in Home Economics classes by Home Economic teachers over a 7-month period (October 2001 to April 2002). Three sessions were completed before Christmas and four were completed after. Each session lasted 3 h and included preparation of dishes and snacks with a focus on FV, group activity and information. The pupils monitored their own FV intake for 3 days followed by self-assessment and goal setting for future intake (awareness/perceived personal need to increase consumption). The goals were to focus on FV throughout the year, preparation of FV (to increase practical skills, sense of self-efficacy, and preferences), increase knowledge about FV, create positive attitudes toward FV and increase short and long-term intake of FV.

2.3.3. Parental involvement

Parents were introduced to the intervention at school meetings, including information on FV and health. During the intervention, parents received six newsletters (each with a theme) aiming to increase communication between parent and child regarding FV and how to increase their access to FV at home. In addition, an FV event was held where the children served self-made FV dishes.

2.3.4. Free school fruit

During the intervention period, pupils in the intervention schools in Hedmark ($n = 9$) received one piece of free fruit or carrot at lunch, as previously described (Bere et al., 2005). The most frequent fruits given were: apples, pears, bananas, oranges, clementines, kiwis, carrots, and nectarines.

2.4. Measurements

Baseline questionnaires were completed in September 2001 and follow-up questionnaires were administered in May 2002 (after the intervention period), May 2003 (1-year follow-up), May 2005 (3-year follow-up), September 2009 (7-year follow-up) and throughout 2016 (14-year follow-up). At baseline and the first three follow-ups questionnaires were completed by the pupils at school with a trained project worker present. The project worker helped with the dietary assessment. The 7-year follow-up was completed by a questionnaire sent by mail, while the 14-year follow-up was a web-survey.

A written 24-hour recall was used to assess FV intake in portions per day. Intake recorded at school (years 2001–2005) represented a weekday, while the two former follow-ups (in 2009 and 2016) did not specify which day the questionnaire was to be completed. In follow-ups between 2002 and 2005 the 24-hour recall separated intake in five periods through the day (before school, at school, after school, at dinner and after dinner). At the last two follow-ups the participants had finished school, so the day was separated into four periods fitting an adult schedule (morning including breakfast, after breakfast including lunch, after lunch including dinner, and after dinner including supper). The sample recorded gender and age at baseline. Socio-economic status was based on parental education level at baseline (lower: no college or university education versus higher: having attended college or university).

The study was conducted according to the Helsinki Declaration. Ethical approval and research clearance were obtained from The National Committee for Research Ethics in Norway (for the first three surveys (file number S-01076)) and all surveys were cleared by The Norwegian Centre for Research Data (file number 12395).

2.5. Statistical analysis

To assess baseline differences and attrition between the groups, we used x^2-test with categorical variables, and t-test or ANOVA with continuous variables. Additional z-test of proportion was completed with Bonferroni adjustment where necessary.

Analysis to evaluate our primary objective was conducted with 6th graders in Telemark county only (referred to as the subcohort, see Fig. 1), to exclude the potential effect of also receiving additional free fruit. The 7th graders were excluded from this analysis to have similar age in the groups, and to stick to the pure randomized design. To adjust for observations nested within subjects, the linear mixed model was used to determine the effect of the educational program on FV intake by using all the relevant, available data from each follow-up. The model included group (educational program versus control), time and group*time interaction as fixed variables, subject as random intercept and time as random slope. We adjusted for gender, parental education level and baseline observations. The residuals were examined, and the model assumptions were considered met.

Analysis to evaluate the secondary objective was completed with

Table 1
Baseline (year 2001) characteristic of the study sample.

	Free fruit	Boys n (%)	Low parental education n (%)	Baseline fruit intake mean (SD)*	Baseline vegetable intake mean (SD)*
Subcohort ($n = 450$)					
Educational program	No ($n = 235$)	114 (49)	121 (60)	1.7 (1.9)	1.0 (1.3)
Control	No ($n = 215$)	90 (42)	112 (66)	1.6 (2.1)	0.9 (1.3)
p-Value		0.145	0.206	0.717	0.596
Complete cohort ($n = 1950$)					
Educational program	Yes ($n = 321$)	174 (54)	155 (54)$^{a,\ b}$	1.3 (1.5)^{a}	0.9 (1.2)
	No (n = 235)	116 (49)	121 (60)	1.7 (1.9)^{a}	1.0 (1.3)
Control	Yes ($n = 264$)	127 (48)	113 (49)$^{a,\ c}$	1.4 (1.5)	0.8 (1.2)
	No ($n = 1130$)	567 (50)	555 (61)$^{b,\ c}$	1.6 (1.9)	0.9 (1.3)
p-Value		0.442	0.003	0.039	0.549

* Intake in portions per day. Similar subscripts within column indicates significant differences between the groups. SD: Standard deviation.

the use of the complete cohort with four groups (intervention and control group, with and without free school fruit) as dummy variables. Our main focus assessing the potential synergistic effect was the differences between the two groups with free fruit, with and without the educational program, and these results are therefore reported. The linear mixed model, with the same settings as above, was completed to evaluate this effect. The follow-up in 2003 was only completed on initial 6th graders who received the educational program, which resulted in no participants in the control group who only received free fruit, reported as Not Applicable (NA).

Analysis were completed in Stata version 15.1 software (StataCorp. 2017. *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LLC), with two-sided *p*-values and significance level set to 5%.

3. Results

3.1. Baseline characteristics

Baseline characteristics are presented in Table 1. Mean age at baseline was 11.8 years, while mean age at follow-up in 2016 was 26.5 years. There were no significant differences in gender, parental education or FV intake between the intervention and control group at baseline in the subcohort. In the complete cohort, there was a significant overall difference between the groups at baseline regarding fruit intake ($p = 0.039$) and parental education ($p = 0.003$), but no differences in gender or vegetable intake were observed.

3.2. Effect of the educational program

Of the 450 6th graders in the subcohort who completed the baseline questionnaire, 237 (53%) completed the 14-year follow-up. There were no significant differences in attrition at the 14-year follow-up regarding baseline fruit intake, baseline vegetable intake, gender or group. Attrition was significantly higher among participants who had parents with low education versus high education (77% versus 23%, $p < 0.001$).

Predicted means of FV intake for each group are presented in Table 2. The linear mixed model analysis yielded no overall significant effect of group, time or group ∗ time interaction on fruit intake (all *p*-values > 0.05). The analysis yielded a significant increase in vegetable intake over time ($p < 0.001$, data not shown), but no significant overall effect of group ($p = 0.405$) or differences between the groups over time (group ∗ time interaction, $p = 0.975$) with regards to vegetable intake.

3.3. Synergistic effect of the educational program and free school fruit

Of the 1950 6th and 7th graders who completed the baseline questionnaire, 982 (50%) completed the 14-year follow-up. There were no significant differences in attrition at the 14-year follow-up regarding baseline fruit intake, baseline vegetable intake, or group. Analysis showed a significantly higher 14-year attrition rate among men compared to women (55% versus 45%, $p < 0.001$). Additionally, attrition was significantly higher among participants who had parents with low education versus high education (67% versus 33%, $p < 0.001$).

Analysis revealed no significant difference in fruit intake at neither follow-up between the two groups who received free fruit, with and without the educational program (Table 3). There were no significant differences in vegetable intake between the groups who received free fruit, with and without the educational program, at any time (Table 4).

4. Discussion

Results from the present study showed no effect of a multicomponent school-based educational program on FV intake 14 years after the intervention period. Furthermore, analysis revealed no synergistic effect of the educational program and free school fruit.

Several multicomponent intervention studies have increased FV intake in children (Evans et al., 2012; Van Cauwenberghe et al., 2010). However, the effects of multicomponent interventions reveal inconsistent results (Evans et al., 2012; Van Cauwenberghe et al., 2010; Delgado-Noguera et al., 2011). Although these interventions are argued better than single component interventions, this might rely more on the actual components, as well as the total comprehensiveness, than the number of components. Also, single component interventions might be effective, e.g. it has been shown that giving free fruit in schools increases intake (Evans et al., 2012; Bere et al., 2015; Delgado-Noguera et al., 2011). In the present study, we reported no synergistic effect between the educational program and free fruit, which indicate free fruit as an important single component in FV intake in children.

We hypothesized that children's awareness of the five-a-day recommendation would result in an increased FV intake in adulthood when the participants themselves were responsible for their own nutritional intake. The health authorities have over the last decade increased focus on healthy eating, which might have increased awareness of five-a-day in the whole Norwegian population and their intake. Although awareness has been found to explain variations in FV intake (Van Duyn et al., 2001), our study might indicate that other factors have a higher impact on long-term FV intake.

Our intervention had a parental component, but this component might not have involved parents at a sufficient level (Jorgensen et al., 2016). Parental involvement has previously been identified as an important factor affecting the result of interventions targeting adolescents (Jorgensen et al., 2016; Golan, 2006). A study by Jorgensen et al. (2016) classified high parental involvement as one parent taking part in three out of four parental activities and getting a score of at least four out of six points (Jorgensen et al., 2016). This high involvement was

Table 2
Adjusted means (95% CI) of fruit and vegetable intake at each follow-up by group in the subcohort.

Variable	Group	Baseline[a] (2001)	2002[b]	2003[b]	2005[b]	2009[b]	2016[b]
Fruit, portions per day	Educational program	1.7 (1.5, 1.9)	1.4 (1.2, 1.7)	1.2 (1.0, 1.5)	1.4 (1.2, 1.6)	0.9 (0.4, 1.4)	1.2 (1.0, 1.5)
	Control	1.7 (1.5, 2.0)	1.3 (1.1, 1.5)	1.4 (1.2, 1.6)	1.3 (1.1, 1.6)	0.8 (0.2, 1.3)	1.2 (0.9, 1.5)
	p-Value	0.840	0.409	0.377	0.578	0.689	0.976
Vegetables, portions per day	Educational program	1.0 (0.8, 1.2)	0.7 (0.5, 0.9)	0.7 (0.5, 0.9)	1.0 (0.8, 1.2)	1.1 (0.6, 1.5)	1.5 (1.3, 1.8)
	Control	0.9 (0.7, 1.1)	0.8 (0.6, 1.0)	0.8 (0.6, 1.0)	1.0 (0.8, 1.2)	1.0 (0.5, 1.6)	1.7 (1.4, 2.0)
	p-Value	0.443	0.405	0.428	0.893	0.984	0.492

CI: Confidence interval.
[a] Adjusted for gender and parental education level.
[b] Adjusted for baseline data, gender and parental education level.

significantly associated with a higher daily FV intake. In comparison, our study had fewer parental activities and we could not achieve the equivalent of what was classified as high parental involvement. This indicates the importance of a higher focus on parental involvement and the home environment when trying to increase FV intake in children/adolescents.

Furthermore, home availability has been identified as one of the most important predictors of FV intake (Larson et al., 2012), which remained unchanged by our intervention (Bandura, 2001). This suggests that newsletters have a low impact. Therefore, an intervention changing FV intake in children should address the availability of FV in the home environment but probably with other strategies. Several studies have attempted to increase home availability of FV, but with no significant effects (Ganann et al., 2014). Increasing availability of FV both in the home environment and at school is important (Krolner et al., 2011; Rasmussen et al., 2006), however the implementation of comprehensive programs focusing on increased availability in different arenas may be financially challenging.

The educational program was based on SCT, which assumes that initiation and long-term maintenance of behavioral change involves health knowledge, self-efficacy, outcome expectancies, self-regulatory skills and barriers to change (Middleton et al., 2013). Models that for a large part rely on individual decision-making processes, such as the SCT, may not be appropriate to target behavior change in young children (Golan, 2006). Nevertheless behavior change strategies based on the SCT toward young children have significantly increased physical activity and healthy eating, especially where there is high parental involvement (Nixon et al., 2012).

To our knowledge, no other studies have evaluated a multicomponent school-based educational intervention promoting an increased intake of FV with a 14-year follow-up period. Long-term adherence to health behavior is generally difficult (Middleton et al., 2013), and our SCT-based, multicomponent intervention did not yield lasting results which one might argue is a waste of resources if continued (Velde et al., 2011). On the other hand, our intervention might have been too short to expect a long-term effect as the intervention lasted only 10 months. In addition, different psychosocial and structural factors might contribute to the intake of FV in adulthood than in childhood (Shaikh et al., 2008; Brug et al., 2006). Family factors such as composition, marital status, presence of children, convenience, time, family and cultural background all impact FV intake (Rekhy and McConchie, 2014). Thus, expecting our intervention to affect adult FV intake might be unreasonable.

Free school fruit is documented to increase short-term FV intake (Bere et al., 2006b), and has also been reported to impact long-term (7 year) FV intake (Bere et al., 2015). Few studies focus and manage to increase long-term vegetable intake in children, however studies suggest that gardening increases short-term vegetable intake (Evans et al., 2012; Langellotto and Gupta, 2012). Interventions like ours do not seem to be enough to increase FV intake to the recommended levels, thus interventions combining several elements like social marketing, economic approaches and technology-based interventions might be tested to ensure that recommendations are met and sustained (Thomson and Ravia, 2011). Future interventions should focus on high parental involvement, vegetable intake, increased home availability, have a longer or sustained intervention, evaluate cost-effectiveness and the potential impact on future health outcomes.

4.1. Study limitations and strengths

A number of methodological considerations should be considered. First, the multicomponent educational program lasted approximately ten months, and it could have been longer and had higher parental involvement, which might have created lasting habits. However, such a

Table 3
Adjusted mean fruit intake in portions per day by group in the complete cohort.

	Free fruit	Baseline (2001)[a]	2002[b]	2003[b]	2005[b]	2009[b]	2016[b]
Educational program	Yes	1.5 (1.2, 1.5)	1.8 (1.7, 2.0)	1.5 (1.3, 1.7)	1.3 (1.1, 1.5)	1.4 (1.1, 1.7)	1.2 (1.0, 1.4)
	No	1.7 (1.5, 1.9)	1.4 (1.2, 1.6)	1.2 (1.0, 1.4)	1.4 (1.2, 1.6)	0.9 (0.4, 1.3)	1.2 (1.1, 1.6)
Control	Yes	1.4 (1.2, 1.6)	1.8 (1.6, 2.9)	NA	1.3 (1.1, 1.5)	1.1 (0.7, 1.5)	1.3 (1.1, 1.6)
	No	1.6 (1.5, 1.7)	1.2 (1.1, 1.3)	1.2 (1.0, 1.3)	1.2 (1.1, 1.3)	1.0 (0.7, 1.2)	1.3 (1.2, 1.5)
p-Value[c]		0.925	0.915	NA	0.985	0.380	0.481

CI: Confidence interval. NA = not applicable.
[a] Adjusted for gender and parental education level.
[b] Adjusted for baseline data, gender and parental education level.
[c] P-values from comparing the two groups who received free fruit.

Table 4
Adjusted mean vegetable intake in portions per day by group in the complete cohort.

	Free fruit	Baseline (2001)[a]	2002[b]	2003[b]	2005[b]	2009[b]	2016[b]
Educational program	Yes	0.9 (0.8, 1.1)	0.7 (0.6, 0.8)	0.7 (0.6, 0.8)	1.1 (0.9, 1.2)	1.1 (0.8, 1.4)	1.6 (1.3, 1.8)
	No	1.0 (0.8, 1.2)	0.7 (0.5, 0.8)	0.7 (0.5, 0.8)	1.0 (0.8, 1.2)	1.0 (0.6, 1.4)	1.5 (1.3, 1.8)
Control	Yes	0.8 (0.7, 1.0)	0.6 (0.5, 0.8)	NA	1.0 (0.9, 1.2)	1.0 (0.7, 1.3)	1.7 (1.5, 1.9)
	No	0.9 (0.9, 1.0)	0.7 (0.6, 0.8)	0.7 (0.6, 0.8)	0.9 (0.8, 1.0)	1.0 (0.8, 1.2)	1.6 (1.4, 1.7)
p-Value[c]		0.406	0.663	NA	0.869	0.812	0.360

CI: Confidence interval. NA = not applicable.
[a] Adjusted for gender and parental education level.
[b] Adjusted for baseline data, gender and parental education level.
[c] *p*-Values from comparing the two groups who received free fruit.

comprehensive approach is probably not feasible. Additionally, in the subcohort only one school implemented all sessions as planned which might have affected the impact of the intervention, however six out of eight intervention schools did complete more than five sessions (Bere et al., 2006a). Furthermore, during the intervention, all schools in Norway could choose to administrate a fruit subscription program (Bere et al., 2005) that we could not control. Additionally, lacking information on important confounders, such as e.g. psychosocial factors and economy, may have affected our results. Moreover, a dropout rate of 50% does affect the generalizability. Although with limitations, this study is to our knowledge the only long-term study evaluating a multicomponent educational program aimed to increase FV intake, and thus contributes to the limited knowledge on improving long-term intake of FV. The randomized controlled design in the subcohort and the well-developed educational program adds to show the difficulty of increasing long-term FV intake in children.

5. Conclusion

We show that a well-developed multicomponent, school-based educational program had no effect on FV intake, neither in synergy with free school fruit. This shows the difficulty in affecting long-term FV intake. Future studies may benefit from a higher parental involvement, increased home availability and a longer intervention period. More studies are needed to evaluate the effects of school-based intervention in adulthood.

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Conflicts of interest

None.

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