



## Conference on ‘Childhood nutrition and obesity: current status and future challenges’ Symposium 4: Strategies for reducing childhood obesity

### Healthy incentive scheme in the Irish full-day-care pre-school setting

Charlotte Johnston Molloy<sup>1\*</sup>, John Kearney<sup>2</sup>, Nóirín Hayes<sup>3</sup>, Corina Glennon Slattery<sup>1</sup>  
and Clare Corish<sup>2</sup>

<sup>1</sup>Community Nutrition and Dietetic Service, Health Service Executive Dublin Mid-Leinster, Primary Care Unit,  
St. Loman's Hospital Campus, Mullingar, Co. Westmeath, Republic of Ireland

<sup>2</sup>Dublin Institute of Technology, School of Biological Sciences, Kevin Street, Dublin 8, Republic of Ireland

<sup>3</sup>Faculty of Applied Arts, Dublin Institute of Technology, Rathmines Road, Dublin 6, Republic of Ireland

A pre-school offering a full-day-care service provides for children aged 0–5 years for more than 4 h/d. Researchers have called for studies that will provide an understanding of nutrition and physical activity practices in this setting. Obesity prevention in pre-schools, through the development of healthy associations with food and health-related practices, has been advocated. While guidelines for the promotion of best nutrition and health-related practice in the early years' setting exist in a number of jurisdictions, associated regulations have been noted to be poor, with the environment of the child-care facility mainly evaluated for safety. Much cross-sectional research outlines poor nutrition and physical activity practice in this setting. However, there are few published environmental and policy-level interventions targeting the child-care provider with, to our knowledge, no evidence of such interventions in Ireland. The aim of the present paper is to review international guidelines and recommendations relating to health promotion best practice in the pre-school setting: service and resource provision; food service and food availability; and the role and involvement of parents in pre-schools. Intervention programmes and assessment tools available to measure such practice are outlined; and insight is provided into an intervention scheme, formulated from available best practice, that was introduced into the Irish full-day-care pre-school setting.

#### Pre-school: Health promotion: Intervention: Children: Review

The funding of early education should be prioritised over other public investments due to its diverse and sustained benefits on children's academic and developmental capabilities<sup>(1)</sup>. The education of children, in full day care, in the development of healthy eating patterns, is becoming predominantly that of the child-care provider, 'providers' being defined as 'all early learning and care professionals' that are involved with the care of children<sup>(2)</sup>.

With many parents now relying on child-care workers to share in their role of guardian to their child's nutrient intake<sup>(3)</sup>, the child-care setting has the potential to be a successful vehicle for health promotion<sup>(4)</sup> and obesity prevention<sup>(5,6)</sup>. While the quality of early care for children has been noted for some time to impact on cognitive

and school achievement from pre-school age to adolescence<sup>(7)</sup>, public health concern has recently been expressed regarding the nutritional quality and amount of food served in the pre-school setting<sup>(8)</sup>.

Young children have micronutrient requirements that are, relative to their energy needs, greater than those of adults; therefore, it is necessary that the nutrient density of their diet is high<sup>(9)</sup>. Indeed, Doyle *et al.*<sup>(10)</sup> recommended that intervening between zero and 3 years of age has the potential to alter children's development patterns thus protecting them against risk factors in their environment and Koletzko *et al.*<sup>(11)</sup> noted that a difference in nutrition provision at important points in early life, both *in utero* and after birth, can programme a person's

**Abbreviations:** NAPSACC, Nutrition and Physical Activity Self-Assessment for Child Care.

**\*Corresponding author:** Dr C. Johnston Molloy, fax 00 353 44 93 53225, email charlottekerrjohnston@gmail.com

development, metabolism and health. Young children of pre-school age need a physical and social environment that will support not only their physical requirements but also their emotional, intellectual and motor skill development<sup>(12)</sup>. Food-related experiences in the first 2 years of life have been shown to influence dietary variety in school-aged children<sup>(13)</sup>. Healthy nutrition<sup>(14,15)</sup> and physical activity habits<sup>(16)</sup> developed in childhood have been found to track into adolescence and beyond, while evidence also exists that exposure to poor practices may lead to unhealthy habits that persist into adulthood<sup>(17)</sup>.

With many people worldwide now accessing out of home child-care, and large numbers of children spending numerous hours per week in non-parental care, researchers have called for studies that explore the current nutrition and physical activity practices in child-care settings<sup>(18)</sup>. With this in mind, the need to ensure best practice in pre-school nutrition and physical activity is paramount. Although the American Dietetic Association notes that child-care regulations reflect a minimum standard and that actual practice should greatly exceed them<sup>(19)</sup>, it would appear that in many countries poor nutrition and physical practice have been documented; in the UK<sup>(20,21)</sup>, the USA<sup>(22–25)</sup>, Australia<sup>(26)</sup>, Holland<sup>(27)</sup> and Ireland<sup>(28,29)</sup>.

Kaphingst & Story<sup>(6)</sup>, however, have noted that although much research has been undertaken with regard to policy and nutrition and physical activity advocacy in the school setting, the child-care setting has, in contrast, been largely overlooked. Flynn *et al.*<sup>(30)</sup>, in reviewing best practice in reducing obesity and related chronic disease in children and young people, noted that there are a few interventions in the pre-school setting and recommended that funding should be directed to develop prevention programmes in this setting. In fact, this dearth of research interest is evident in the literature with, to date, little published intervention research from Europe, the UK and Ireland. The vast majority of child-care and health-related practice research in pre-schools emanates from the USA<sup>(24,31,32)</sup>, with a small number of similar studies coming from Australia<sup>(33–35)</sup>. It is only in the very recent past that any cross-sectional research publications have emerged regarding practice in the UK<sup>(21,36)</sup> and Europe<sup>(27)</sup>, with to our knowledge no evidence of intervention research in this area to date. Indeed, while many studies rely on reported practice<sup>(36)</sup> few are based on researcher observation of practice in the child-care setting, which is considered the 'gold standard'<sup>(37)</sup>.

At present, in Ireland, child-care regulations<sup>(38)</sup> govern the provision of out-of-family care in Ireland and inspections of child-care premises are made on a regular basis; in order to assess the health, safety and welfare, and promote the development of children attending pre-school services; however, little else is known about the nutrition and health-related practices in these settings and little data are available on the actual food served to pre-school children with previously published studies obtaining data on the food provided indirectly from the child-care providers<sup>(28)</sup>. While 'Food & Nutrition Guidelines for pre-schools'<sup>(39)</sup> are available they are not mandatory, which

would suggest that methods to encourage the provision of nutritious food in this setting must be pursued. The present paper will review the international guidelines and recommendations pertaining to health promotion best practice in the pre-school setting; outline the intervention programmes and assessment tools available to measure such practice; and provide insight into an intervention scheme, formulated from available best practice, that was introduced into the Irish pre-school setting.

### Definition of pre-school child-care

The definition of a 'full-day-care pre-school service' differs depending on the country in which it is offered; in the UK<sup>(40)</sup> it is defined as 'day care for children under eight for a continuous period of 4 h or more in any day', while in Ireland it is stated to be 'a pre-school service offering a structured day-care service for pre-school children for more than 5 h/d; and which may include a sessional pre-school service for pre-school children not attending the full day-care service'<sup>(38)</sup>. In the USA it is reported that the average time spent by 4½-year-old children in non-maternal care was 27 h/week<sup>(41)</sup>. In Ireland, the average 3-year-old was found to spend 23 h/week<sup>(42)</sup> and the average 9-month-old 29 h/week, in non-parental care<sup>(43)</sup>. As a child who attends pre-school on a full-time basis could potentially spend 10 h every day, 5 d/week and 48 weeks of the year in care, responsibility has to be placed on child-care facilities to provide sufficient nutrition and a conducive environment to encourage healthy food habit formation<sup>(44)</sup>.

### Guidelines for best nutrition and health-related practice in the child-care setting

Comprehensive best health-related practice guidelines for the child-care setting have been available in the USA for many years<sup>(45)</sup>, with benchmarks specifically for nutrition in the child-care setting published by the American Dietetic Association<sup>(3,19)</sup> and physical activity guidelines for the age group also developed by the National Association for Sport and Physical Education<sup>(46)</sup>. However, it is only recently that a set of guidelines were published for the UK<sup>(47)</sup> following a review of the need for such guidance in the setting<sup>(48)</sup> and the development of guidelines in Northern Ireland<sup>(49)</sup>, Scotland<sup>(50)</sup> and Wales<sup>(51)</sup>. The guidelines developed for Ireland, however, were published in 2004<sup>(39)</sup> and have not been updated since this time.

While guidelines are available in a number of jurisdictions regarding the promotion of best nutrition and health practice for the early-years setting<sup>(39,45,47,49–52)</sup>, it is of concern that regulations for the pre-school setting, where they exist, are set to ensure minimum standards only. Advocates for quality in the pre-school setting have expressed anxiety that there is a danger that some will view these minimum standard regulations as equivalent to quality and aim to provide minimum standard service only for children in their care<sup>(53)</sup>. Added to this,



is the disquiet stemming from recent reviews of child-care regulations in the USA where many States do not in fact have strong regulations governing healthy eating and physical activity in these settings<sup>(6,54,55)</sup>. It would appear that regulations concentrate instead on safety in the child-care facility<sup>(38,56)</sup>, with less focus being placed on nutrition and the food-service environment. This finding is somewhat surprising when one considers that the nutrition environment plays a critical role in the food habit development of the pre-school-age child<sup>(8)</sup>, and because a large number of mothers now work, child-care, regardless of the setting, should be of high quality to maximise possible developmental outcomes during the early years<sup>(57)</sup>.

The main factors reported to affect nutrition and health-related practice in the child-care setting are: existence of policy on nutrition education, nutrition service and nutrition resources; nutrition curriculum, food availability; physical activity as part of the curriculum; knowledge, attitude and practices of staff; and the role and involvement of parents regarding nutrition issues<sup>(58)</sup>.

### International best practice: evidence for practice change

#### *Service and resources*

**Policy.** Development of policy allows consistent health promotion messages to be generated<sup>(47)</sup> and to be effective it should be developed by everyone in the pre-school community through a process of consultation and review<sup>(52,59)</sup>. The policy should be given to all parents and staff, and it should also be posted in a visible location<sup>(39,47)</sup>. A written policy may play a role in chronic disease prevention by facilitating the implementation of healthy nutrition and physical activity practices and habits for children in the child-care setting<sup>(60)</sup>. Policies tend to take many different formats such as parent handbooks, staff handbooks, parent notices, and other documents<sup>(61)</sup>, and there would appear to be a link between child-care practices and the presence of health policies, with written policies encouraging healthy behaviour linked with modelling of healthy staff behaviour<sup>(62)</sup> and increased healthy food consumption<sup>(63)</sup>. Little appears to be known about the prevalence of health and wellness policies in child-care services; however, studies undertaken would suggest that policy development in child-care facilities appears to be limited in the USA<sup>(61)</sup>, UK<sup>(21,36)</sup> and in Ireland<sup>(28)</sup>.

**Staff training.** Although it is acknowledged that competent and well-trained workers are key to the early education environment, it would appear that policy makers and the public are often aghast at the poor levels of education and remuneration amongst this workforce; a wide discrepancy being apparent between the importance attributed to the role of early educators and the remuneration and respect afforded to this group<sup>(64)</sup>. Training for the child-care setting can range from post-secondary school to degree level qualifications<sup>(65)</sup>.

To offer a high quality service pre-schools must: hire properly trained staff; ensure optimum group numbers

and staff to child ratios; adhere to an educational and developmentally appropriate curriculum; and provide a safe and healthy environment for the children in their care, however, these basic requirements are expensive and in most cases require additional funding and resources<sup>(66)</sup>. Clark *et al.*<sup>(67)</sup> determined that providers need more than training on best practice, particularly relating to infant feeding; they also need information on how and why they should comply with standards, and while enforcement may be one way to encourage child-care providers to follow child-care regulations, relative infrequency of site visits may prevent this from being the most effective method to improve feeding practices in child-care centres; instead it has been suggested that provision of training and professional development opportunities or compensation (suggestions for which were not outlined by the authors) may be better strategies to encourage best practice<sup>(54)</sup>.

If child-care centres are to engage in obesity prevention, then feeding practices that promote healthy weight should be stressed to staff<sup>(68)</sup>; in comparing the practices of providers who had received nutrition-related training, to those who had not, those with training were significantly more likely to engage in supportive feeding practices; however, the source of the information and the person who provided the information were found to be more important to those being trained that the frequency of training provision. Information provided by educators qualified to teach nutrition, and who were perceived to be a credible information source, was more likely to result in positive change in practice, whereas training provided by personnel in health departments who did not have relevant nutrition credentials, or experience, was negatively related to practice change. The authors speculated that this may be because health departments traditionally have a remit for environmental safety and may, in fact, prohibit positive child-feeding practices such as self-service or child food-preparation involvement.

**Health promotion and education.** Nutrition education is a key constituent of lifelong healthy eating and should start from the early stages of life<sup>(69)</sup>. Dwyer<sup>(12)</sup> recommended that pre-schools should include nutrition education to expose children to new eating experiences in a supervised and safe way and Lanigan<sup>(70)</sup> advised that care-givers play an important role in shaping childhood nutrition and activity practice through direct modelling and instruction. Learning about food and physical activity should be integrated into the curriculum of the pre-school and should be included in everyday activities<sup>(47,71)</sup>. A comfortable and supportive dining room should be provided<sup>(72)</sup> and food should never be used as a reward or punishment<sup>(45)</sup>. While food is often part of celebration, guidelines recommend that because there may be so many events and celebrations in large child-care settings other ways of marking occasions should be used i.e. party games or face painting rather than the more traditional sweets, crisps and fizzy drinks<sup>(39,49)</sup>. Indeed in Norwegian child-care the aim of a celebration is to make the child the focus of the day and activities centre on wearing a special hat or raising a flag<sup>(73)</sup>.



*Child-feeding utensils.* There are a number of different recommendations regarding the provision of age-appropriate eating and drinking utensils and other dining equipment, with the standards in the USA<sup>(45)</sup> being extremely comprehensive in outlining best practice in this area: food should be served to young children from dishes and not directly from factory containers, the correct height and sitting position for children at the table, the type and size of eating utensils to be provided, and the need for plate provision at all mealtimes for all age groups<sup>(45)</sup>. Guidance in Ireland does not include such specifics; however, it does include information on the importance of cup introduction to children<sup>(39,74–76)</sup>.

*Physical activity and outdoor time.* There is a relative lack of physical activity research in the pre-school age group, but it is thought that many activities in which pre-schoolers engage are relatively sedentary in nature<sup>(77)</sup>. Paediatricians and other health-care professionals have a role in highlighting to parents and care-givers the importance of nurturing these skills through unstructured and structured play<sup>(78)</sup>. In 2002, the National Association for Sport and Physical Education<sup>(46)</sup> developed the first set of guidelines for physical activity in pre-school-aged children. However, no specific recommendations for the child-care setting existed until a set of guidelines specifically for this setting was developed in the USA as part of the Nutrition and Physical Activity Self-Assessment for Child Care (NAPSACC) project<sup>(79)</sup>. These guidelines were collated from a number of different organisations, the exception being when no recommendations were available; a best practice guideline was developed through research evidence and expert opinion. In Ireland, the National Association for Sport and Physical Education guidelines have been adopted for use in the child-care setting<sup>(80)</sup>. It has been reported that the pre-school attended, its quality level and the presence of policy are all determinants of physical activity<sup>(81–84)</sup>.

Outdoor time has been significantly correlated with physical activity in pre-school children<sup>(85)</sup> with time spent in the outdoors being one of the most consistent predictors of physical activity levels among this group<sup>(86)</sup>. It is recommended in many countries that children in child-care should be facilitated to spend time outdoors at least once every day and preferably more often than this<sup>(19,49)</sup>. However, it would appear that outdoor time provision varies<sup>(87)</sup> with inadequate clothing, injury concerns; financial worries and a focus on prioritising academic learning being the largest barriers to physical activity and outdoor time in the pre-school setting. The development of a good rapport with parents regarding the importance of outdoor play is essential to encourage parents to provide appropriate outdoor clothing<sup>(88,89)</sup>.

#### *Food service and availability*

Altering the type of foods available to children in schools has the potential to greatly affect their dietary intake and risk of childhood obesity<sup>(90)</sup>. Relatively little data are available on food service in the pre-school setting.

A number of studies have questioned providers about the food they provide to children, while some studies have directly observed food served or eaten by pre-school children. Guidelines in the USA recommend that food should be offered to children every 2–3 h<sup>(91)</sup>, while in the UK and Ireland guidelines recommend that children may need to be offered three meals and two to three snacks in a day depending on the length of time they spend in care<sup>(39,47)</sup>. Worryingly however a number of studies in the USA have explored the food and beverages served to children in the child-care setting and demonstrated inadequate pre-school provider<sup>(22,24,92)</sup> and parent<sup>(93)</sup> food and fluid provision while a study in Ireland detailed that thirteen of fifty-four Irish full-day-care pre-school managers reported failure to provide at least two meals and two snacks for children aged 1–5 years<sup>(28)</sup>.

The UK School Food Trust<sup>(47)</sup> recommends that children should be encouraged to serve themselves water throughout the pre-school day, while the guidelines for child-care settings produced by the Government of Nova Scotia<sup>(94)</sup> outline that dehydration, even in its mildest form, can negatively affect brain function, energy levels and alertness in children. It would appear however that self-service of fluids is not widely available<sup>(24)</sup>. Milk and water are the best drinks for pre-school children<sup>(39,75)</sup>. Squash, cordial, fizzy or carbonated drinks are not recommended as daily drinks due to their high acid content that may increase risk of tooth decay<sup>(75)</sup>. Unsweetened fruit juice should only be provided once in the day and should be diluted well with water<sup>(39,75)</sup>; sweetened juices are not recommended<sup>(75)</sup> and consumption of beverages containing artificial sweeteners is not recommended for children under the age of 5 years<sup>(39,75,94)</sup> as they have poor nutritional value and tend to displace milk, which is a nutrient-rich food<sup>(94)</sup>. However, despite these guidelines a wide variation in drink provision in this setting has been reported<sup>(28,87,95)</sup>.

*'Family style food service'.* The promotion of the 'family meal' has been advocated as a potential public health tool to improve dietary quality and educational and social outcomes and reduce overweight<sup>(96)</sup>. Education about 'family style food service' and how children's feeding issues impact on their eating behaviour is described as necessary<sup>(97)</sup>. 'Family style food service' is defined as facilitation of meals where child-sized tables are set with appropriate plates and utensils and food is passed between children and adults; children are encouraged to serve on to their own plates and pour their own drinks from small jugs, with the four main components being: table setting, food preparation, self-service and clean-up. The process provides many advantages for a child's development by promoting motor skills, language, self-esteem, social skills, table manners and independence and may help with fussy eating, encouraging a picky eater to try and accept foods that it sees its peers serving and eating<sup>(98)</sup>. The development of a positive meal-time experience for children is an important part of healthy food habit formation, and the care-giver should be a role model who sits at the table and eats with the children<sup>(3,45)</sup>.





Setting simple rules for children at the table is necessary and important<sup>(3,91)</sup> with social interaction and conversation, especially conversation regarding nutrition and food, enhancing the meal-time experience and helping children to accept food and develop appropriate eating behaviours<sup>(99)</sup>.

Guidelines exist in the USA and UK for child:adults ratios, and for their expected interaction, at meal-times<sup>(45,47)</sup>. Despite these recommendations, studies found that pre-school staff do not always sit with children and a few eat with children<sup>(23,100–103)</sup> and although the reported levels of 'family style food service', sitting and eating with children were high<sup>(23,28)</sup>, poor practice was noted through direct observation techniques<sup>(102)</sup>.

In the USA, care-givers are recommended to encourage young children to hold cups, and to use spoons and their fingers<sup>(45)</sup>, whereas Benjamin<sup>(91)</sup> recommends allowing young children to make a mess when they are eating as they need to explore food. Self-feeding delineates the roles and responsibilities of adults and children in the feeding relationship, with the adult being responsible for provision of adequate nutritious food and the child being then responsible for deciding how much to actually eat<sup>(91,94,104)</sup>. A large-scale study of meal-time practices in pre-schools across four States in the USA determined that only 38% reported allowing pre-school children to serve themselves<sup>(23)</sup>; however, studies have demonstrated that allowing children to serve themselves facilitates self-regulation<sup>(105–107)</sup>. Poor self-regulation and inability to delay gratification have been linked with weight gain<sup>(108–110)</sup>.

#### *Role and involvement of parents*

Child-care providers should inform parents regularly about children's food learning activities and offer nutrition education programmes to parents at least twice yearly<sup>(91)</sup>. While the importance of engaging parents in their child's development is undisputed, the role of the child-care centre in prompting this interaction is somewhat more tenuous, with issues apparent that may impact on the child-care establishment's ability to promote parents to undertake best practice behaviours with their children. A poor partnership between child-care providers and parents has been shown to exist; child-care workers reporting that they rarely involved parents in menu planning or dietary discussions, a few wishing to negotiate food provision with parents and the majority reporting that meal-time struggles with children were due to different foods they got from parents while at home<sup>(20)</sup>. Interestingly while parents have reported satisfaction with the quality of pre-schools that their children attend it would appear they may be unaware of the food provided to their children or they may not wish to admit that quality may be poor while they are exposing their children to such provision. Particularly, when there may be a limited choice parents do not wish to speak disparagingly of their child-care centre<sup>(111)</sup>. While parents play a valuable role and have a powerful influence on their children's eating habits by serving as a model in choosing foods, determining food availability, planning

meals and in the socialisation involved in eating<sup>(3)</sup>, and it is recommended that parents are involved in all areas of their child's child-care programme, including the planning of their meals, evidence would suggest that this is not happening<sup>(92)</sup>.

#### **Programmes, interventions and evaluation tools**

Lanigan *et al.*<sup>(112)</sup> note that there are a few nutrition interventions in the pre-school setting and recommended that funding should be directed to develop such programmes, while Ward *et al.*<sup>(113)</sup> suggest that because the pre-school environment has the capability to have a positive effect on many children's health it is a 'unique and important setting for interventions to prevent childhood overweight'. Health professionals have been encouraged to work with parents, guardians and child-care workers to both prevent and treat obesity in young children<sup>(19)</sup>. Summerbell<sup>(114)</sup>, however, expressed the need for caution when perusing intervention studies noting that one programme will not meet all needs and that methods that work with older children and adults may not, in fact, work with younger children.

To be effective it has been recommended that theory-based education programmes are not sufficient; instead practical measures need to be included, for example healthy heart behaviour promotion programmes need to teach pre-school children how to take care of themselves by helping them to: learn how to keep themselves healthy (good knowledge), believe that healthy living is really important to them (good attitude); be able to practice good behaviour, not just talk about it (good actions and behaviour)<sup>(115)</sup>.

#### *Curriculum and education-based programmes*

ToyBox is a European Union funded study that aims to develop and test an innovative evidence-based obesity prevention programme for children aged 4–6 years, based in kindergarten, but with family involvement<sup>(116)</sup>; this programme is currently being undertaken by a multi-disciplinary team of researchers from ten European countries and is ongoing.

A number of initiatives that include intervention and control arms, in various countries, have demonstrated positive effects on children within the pre-school setting. In the USA, the Color me Healthy programme, involved the measurement of 263 pre-school children's fruit and vegetable intake 1 week before the introduction of an interactive nutrition and physical activity curriculum programme, and again at 1 week and 3-month intervals post-intervention. Fruit and vegetables were weighed before, and immediately after, children's food snack time. It was demonstrated that those children who received the Color me Healthy programme curriculum, significantly increased their fruit (20.8%) and vegetable snack consumption (33.1%) from baseline to a 3-month follow-up assessment, compared to those children who did not<sup>(117)</sup>.

A clustered, randomised, controlled trial of migrant children from forty public pre-schools in Switzerland,



which implemented a lifestyle intervention demonstrated, through direct measurement, increased aerobic fitness and motor agility and improved body fat and waist circumference in children in the intervention compared to the control group. However, no effect on measured physical activity or on BMI was noted<sup>(118)</sup>.

The Munch and Move programme was initiated in Australia to support child-care professionals to promote healthy eating and physical activity. An evaluation of intervention (*n* 15) and control (*n* 14) pre-school services assessed lunchbox contents, fundamental movement skills, policies and practices and staff knowledge, attitudes and confidence regarding healthy eating, physical activity and use of screen time. A significant improvement was directly observed in fundamental movement skills in children in the intervention arm of the study and the number of movement skill sessions occurred significantly more often than in the control group after the intervention. A lunchbox audit also demonstrated significant reduction in sweetened beverages in the intervention group. No significant difference was noted in the other areas studied with the authors hypothesising this may have been due to the short implementation time (5 months) or the deliberately low intensity programme content<sup>(119)</sup>. In a separate Australian intervention, The Tooty Fruity Vegie project, researchers worked with eighteen pre-schools catering for children aged 3–6 years. The study was a clustered, randomised, controlled intervention that aimed to decrease overweight and obesity prevalence and included both nutrition and physical activity strategies. The follow-up time was greater in this study than the 'Munch and Move' intervention; 10 months. At follow-up, fundamental movement skills, lunchbox audit and anthropometric measurements of children were undertaken; in addition, parents were surveyed on their children's dietary intake and physical activity behaviours. Children in intervention pre-schools significantly improved their movement skills, ate more fruit and vegetables and were less likely to have unhealthy food in their lunchboxes. They also displayed significant and welcome changes in waist circumference and BMI Z scores when compared with the control group<sup>(26,120)</sup>.

The 'Early Years Health Promotion Project' was set up in North West Ireland to support child-care services to develop and implement healthy nutrition and physical activity policies, to implement programmes of physical activity and quality outdoor play and to promote the benefits of nutrition, physical activity, oral health and sun safety to parents, children and child-care workers<sup>(121)</sup>. Upon evaluation, the project authors reported a high incidence of healthy eating, physical activity and outdoor play policies and a significant attitudinal change to health promotion activities amongst parents, child-care services management and staff, and children. Results, however, were based on manager (*n* 31) feedback through quantitative and qualitative questionnaire administration, rather than observed practice and a control group was not available for comparison.

#### *Development of tools to assess and promote best practice in early child-care*

There is a need to develop high quality measurements for food and physical activity environments to enable an understanding of their influence on diet and activity behaviour; measurement of such environments is, however, relatively recent with both self-reported and observer-based methodologies being developed in a number of disciplines such as nutrition, psychology, geography and public health<sup>(122)</sup>. Child-care settings have unique physical and social aspects that are not measured adequately by tools designed for the assessment of the school, home or built environment<sup>(83)</sup>.

*Pre-school award schemes.* The 'health promoting schools' approach' entrenches healthy eating and physical activity into the school's policies, physical environment, curriculum and community; healthy award schemes have emerged and supply a structured framework, health-related targets and external support for schools. While these concepts have been mostly targeted to the school environment, they may also be appropriate for the early child-care and education setting<sup>(33)</sup>.

In Australia the Kids – go for your life programme employs an award system to encourage schools and early childhood settings to support healthy eating and physical activity using the health promoting schools' approach<sup>(33)</sup>. The development of the programme award scheme involved a number of phases: identification of the most appropriate design for such an award programme; determination of the most appropriate components of such a scheme; and the testing of the award programme scheme in the field. A limitation of this award scheme was that it was based on self-assessment; the child-care settings, in particular, scored their practice very well against the award criteria, perhaps overestimating the health practice status of their services.

The Start Right-Eat Right Award Scheme was implemented in Western Australia and is based on using an incentive to motivate improvement in food service in the child-care setting<sup>(35)</sup>. The development of the scheme involved four stages: needs assessment; piloting of award and development of resources; implementation of award, including training of staff, menu assessment and dietitian visit; and maintenance of award scheme, with centres receiving the award for one year; renewal follows a further application, with resubmission of menus and an award checklist, and possible random site visit to confirm award criteria are being met. A telephone evaluation of the scheme determined that those centres engaged in the incentive scheme were more likely to follow national guidelines. The promotion of practices that were conducive to appetite self-regulation, and the provision of healthy celebration foods were reported more often, when compared to centres not engaged with the intervention<sup>(34)</sup>.

#### *Assessment tools used in the child-care setting*

*Self-assessment tools.* There would appear to be a number of curriculum and education-based interventions and

programmes targeting the child-care centre; however, until the development of the NAPSACC intervention in the USA, it seemed that there were no published studies of intervention studies focused on the environment and policy and that targeted pre-school providers<sup>(56)</sup>. The authors recommended that improvements to play space, equipment, foods served, staff role modelling and health-related policies would in turn lead to sustainable improvements in nutrition and physical activity. The NAPSACC is a self-assessment, environmental intervention for the child-care sector; its aim is to improve the diet, physical activity, social and physical environment to support healthy weight amongst children, boost the marketability of the centres and provide staff with continuing education regarding nutrition and physical activity<sup>(56,123,124)</sup>. The authors note that validity testing scores on the self-assessment tool were higher than those on a simultaneously tested observation tool, but that this was expected as 'self-report may be associated with social desirability. Child-care directors may wish to describe their center in the best possible light'; concluding that the self-assessment tool was developed to 'spark interest' among child-care workers and a more objective measure such as the Environment and Policy Assessment and Observation tool may be warranted to capture accurately child-care policies and practices<sup>(123)</sup>.

A study group in Connecticut, USA<sup>(125)</sup>, developed and validated a self-administered survey to assess the nutrition and physical activity environment of child-care centres. The survey is completed by child-care directors and validation included in-person interviews with directors and 3–4 h observation of the environment. Criterion agreement was highest for policy determination and lowest for physical activity and determination of the barriers to health promotion in this setting. Food score assessment agreement was moderate.

**Observation-based tools.** The Environment and Policy Assessment and Observation instrument is a tool developed to assess child-care centres' nutrition and physical activity environments, policies and practices. It is administered by trained observers using direct observation and document review. It was developed to evaluate the NAPSACC intervention<sup>(113)</sup> and followed on from a study by Ball *et al.*<sup>(32)</sup> in which the development of an observation-based tool for use in the determination of the amount and type of food served and eaten by children in the child-care setting was established. Use of the environment and policy assessment and observation instrument to determine intervention effect of the NAPSACC intervention determined no significant difference between control and intervention pre-schools in nutrition or physical activity environment measurements<sup>(126)</sup>. The authors note that the reason for this is unclear and suggest a number of possible causes. The intervention was low cost, was introduced through the public health system and requested services to choose small areas of the environment to change, rather than requiring them to alter the whole environment. The use of self-assessment in the NAPSACC programme may

also have affected the results achieved. As the Environment and Policy Assessment and Observation instrument was the first tool developed to specifically measure the nutrition and physical activity environments of pre-school settings, it was hypothesised that insignificant results may have been due to the tool itself and the authors suggested the need for further study in this regard.

Alkon *et al.*<sup>(127)</sup> describe their development of a health and safety checklist for use in the early years' setting: the California Childcare Health Programme Health and Safety Checklist. The checklist was developed by undertaking a literature review, identifying best practice or the gold standard of practice, consulting an advisory group and revising the checklist; and piloting the checklist. The checklist consisted of a number of criteria grouped into subscales and each criterion was rated on a three point scale of 'meeting, partially meeting or not meeting' national standards. Face, content and construct validity and reliability were also established for the tool.

The Encouraging Healthy Activity and Eating in Childcare Environments pilot project was carried out with seventy-two child-care providers from forty-five child-care settings in the USA. Child-care practices were measured using an observation tool the Protocol for Mapping Policies and Practices; focus was on three areas: feeding practices; nutrition education and family communication. Providers were questioned regarding their knowledge and beliefs about their role in supporting healthy eating. Observation data and provider survey data were collected at baseline and 1 year post-intervention. The intervention consisted of a 3-h training session with providers. Results demonstrated that a reduction in reported misconceptions was significantly associated with improved feeding practices, and that changes in reported efficacy and feeding knowledge had a significant role to play in changes observed in nutrition education and family communication<sup>(2)</sup>.

Schwartz *et al.*<sup>(128)</sup> developed an instrument to measure school wellness policies from kindergarten to grade twelve. The aim was to: develop a coding system for schools wellness policies to assess them for strength and comprehensiveness; and to score each policy to enable policies to then be compared. The tool consists of ninety-six items and evaluates seven goal areas including: nutrition education; USA standards for nutrition programmes and school meals; nutrition standards for all other available foods and beverages; physical education; physical activity; communication and promotion of nutrition and health; evaluation of health-related activities. While the tool was described as a reliable and valid measure of school wellness policy quality, a limitation of the study was the impossibility of determining whether policy score assigned by the tool would predict the school environment or the student behaviours. Another tool, The Wellness Child Care Assessment Tool, is a sixty-five-item measure of five areas of pre-school practice: nutrition education; food and beverage nutrition standards; healthy eating promotion; physical activity; communication and evaluation strategy<sup>(61)</sup>. One of the limitations of this tool was its inability to predict whether



the scores attained predict the quality of the nutrition and physical activity environment and practice.

#### *Environmental and policy-led interventions in Ireland*

The placement of children in care outside the home has increased rapidly in Ireland in recent years. Between 2002 and 2007, an increase of 42–48 % was reported in the number of households using out-of home care<sup>(129)</sup> with the most common types of non-parental care reported to be: an unpaid relative; a childminder/au pair or nanny, or a crèche, Montessori, playgroup or after-school facility. The use of a crèche/Montessori or play group for pre-school children increased from 14 % of households in 2002 to 24 % of households in 2007<sup>(129)</sup>. The more recent Growing Up in Ireland study reported that 38 % of Irish 9-month-old children participate in non-parental child-care for more than 8 h/d, with 11 % attending crèches or pre-school centres<sup>(43)</sup> and by the age of 3 years, 50 % of children attend out-of-home child-care<sup>(42)</sup>. National policy encourages more women to enter the workforce thus increasing the need for non-parent care in the community. In the latter part of the decade 2000–2009, just over 68 % (60.8 %) of women were in the workforce in Ireland<sup>(130)</sup>, with rates of part-time work for women rising from 21 % of those employed in 1993, to 31 % in 2003 and 32 % in 2007<sup>(131)</sup>. Interestingly, the working arrangements of parents impacts on the use of child-care in Ireland with 68 % of pre-school aged children who lived with both their parents using child-care when both parents were working; 59 % using it when the mother worked part-time and the father worked full-time and 29 % using it when the father did not work and the mother worked full-time<sup>(129)</sup>. With the increase in demand for child-care places, successive governments have directed funding to the creation of child-care places in the community (not for profit) and private (for profit) sectors; the National Child-care Strategy 2006–2010<sup>(132)</sup> aimed to develop the child-care infrastructure in Ireland; with a budget of €575 million, an increase of 50 000 child-care places was estimated.

In Ireland, little data are available on the actual food served to pre-school children with previously published studies obtaining data on the food provided indirectly from the child-care providers<sup>(28)</sup>. The Healthy Incentive for Pre-schools project is an ongoing project in the midlands of Ireland. It was developed as an incentivised intervention to promote healthy nutrition and health-related practices in the pre-school setting, through the use of a specifically developed and validated nutrition and health-related evaluation tool (the Pre-school Health Promotion Activity Scored Evaluation Form) and accompanying educational resource (the Pre-schools Nutrition and Health Education Resource).

Forty-two pre-schools in the midlands of Ireland completed the Healthy Incentive for Pre-schools project. The study consists of three phases: pre-intervention data collection; intervention administration that involved randomly dividing pre-schools into two training groups: a 'manager trained' group, in which only the manager received

training and a 'manager and staff trained' group, in which a staff training session was provided in addition to the manager training; and collection of post-intervention data. Data were collected by direct observation of health promotion practice by a Research Dietitian spending one full day in each pre-school both pre- and post-interventions.

Pre-intervention, poor food and fluid provision and inadequate and inappropriate food service, physical activity and outdoor time were observed. Data collected using the Pre-school Health Promotion Activity Scored Evaluation Form demonstrated a significant improvement in practice across the two time-points in both training groups. No significant difference was detected between the training groups' health promotion activities post-intervention with no significant benefit of additional staff training. The ability of pre-schools to self-assess their own practice using the form was measured and it was determined that subjective (pre-school provider self-assessment) resulted in significantly higher scoring than using an objective (Research Dietitian)-based approach. These findings suggest the need to investigate pre-school health promotion practices in other regions in Ireland with the view to improving such practice if required.

#### **Conclusions**

With the high usage of non-parental child-care in Ireland<sup>(133)</sup> and the growing incidence of childhood obesity<sup>(134)</sup>, there is a need for a co-ordinated approach to ensure that the quality of child-care provided is based on best practice and not minimum standards. The provision of funding to pre-schools should be linked with quality, with financial support only provided in tandem with a scheme that promotes best practice and which incorporates a monitoring system that is based on direct observation.

#### **Acknowledgements**

The authors would like to gratefully acknowledge all pre-school services for their time and participation in the Healthy Incentive for Pre-schools project process.

#### **Financial support**

This material is based upon works supported by *safefood*, the Food Safety Promotion Board, under Grant No. (*safefood* Grant No. 01-2008); in association with the Health Service Executive, Ireland. Neither *safefood* nor the Health Service Executive, Ireland had a role in the design, analysis or writing of this article.

#### **Conflicts of interest**

None.



## Authorship

C. J. M. carried out the Healthy Incentive for Pre-schools' project research and intervention under the supervision of J. K., N. H., C. G. S and C. C. C. J. M prepared the draft manuscript and C. J. M, C. C. and J. K., N. H and C. G. S. contributed to the final manuscript.

## References

- Belfield CR (2007) Introduction to the special issue 'The economics of early childhood education'. *Econ Educ Rev* **26**, 1–2.
- Lanigan JD (2012) The relationship between practices and child care providers' beliefs related to child feeding and obesity prevention. *J Nutr Educ Behav* **44**, 521–529.
- American Dietetic Association (2005) Position of the American Dietetic Association: benchmarks for nutrition programs in child care settings. *J Am Diet Assoc* **105**, 979–986.
- Gupta RS, Shuman S, Taveras EM *et al.* (2005) Opportunities for health promotion education in child care. *Pediatrics* **116**, e499–e505.
- Story M, Kaphingst KM & French S (2006) The role of child care settings in obesity prevention. *Future Child* **16**, 143–168.
- Kaphingst KM & Story M (2009) Child care as an untapped setting for obesity prevention: state child care licensing regulations related to nutrition, physical activity, and media use for preschool-aged children in the United States. [http://www.cdc.gov/pcd/issues/2009/jan/07\\_0240.htm](http://www.cdc.gov/pcd/issues/2009/jan/07_0240.htm) (accessed 23 September 2012).
- Vandell DL, Belsky J, Burchinal M *et al.* (2010) Do effects of early child care extend to age 15 years? Results from the NICHD study of early child care and youth development. *Child Dev* **81**, 737–756.
- Briley M & McAllaster M (2011) Nutrition and the child-care setting. *J Am Diet Assoc* **111**, 1298–1300.
- Dwyer JT, Butte NF, Deming DM *et al.* (2010) Feeding Infants and Toddlers Study 2008: progress, continuing concerns, and implications. *J Am Diet Assoc* **110**, S60–S67.
- Doyle O, Harmon CP, Heckman JJ *et al.* (2009) Investing in early human development: timing and economic efficiency. *Econ Hum Biol* **7**, 1–6.
- Koletzko BV, Brands B & Demmelmair H (2011) The Early Nutrition Programming Project (EARNest): 5 y of successful multidisciplinary collaborative research. *Am J Clin Nutr* **94**, Suppl. 6, S1749–S1753.
- Dwyer JT (1993) Childhood, youth and old age. In *Human Nutrition and Dietetics*, 9th ed., pp. 394–408 [JS Garrow & WPT James, editors]. Edinburgh: Churchill Livingstone.
- Skinner JD, Carruth BR, Bounds W *et al.* (2002) Do food-related experiences in the first 2 years of life predict dietary variety in school-aged children? *J Nutr Educ Behav* **34**, 310–315.
- Singer MR, Moore LL, Garrahie EJ *et al.* (1995) The tracking of nutrient intake in young children: the Framingham Children's Study. *Am J Public Health* **85**, 1673–1673.
- teVelde S, Twisk JWR & Brug J (2007) Tracking of fruit and vegetables consumption from adolescence into adulthood and its longitudinal association with overweight. *Br J Nutr* **98**, 431–438.
- Telama R (2009) Tracking of physical activity from childhood to adulthood: a review. *Obes Facts* **2**, 187–195.
- Batsell RW, Brown AS, Ansfield ME *et al.* (2002) You will eat all of that!: a retrospective analysis of forced consumption episodes. *Appetite* **38**, 211–219.
- Larson N, Ward D, Benjamin Neelon S *et al.* (2011) Preventing obesity among preschool children: how can child-care settings promote healthy eating and physical activity? [http://www.healthyeatingresearch.org/images/RS\\_ChildCare\\_For\\_posting\\_on\\_web\\_FINAL\\_10-27-11.pdf](http://www.healthyeatingresearch.org/images/RS_ChildCare_For_posting_on_web_FINAL_10-27-11.pdf) (accessed 26 September 2012).
- American Dietetic Association (2011) Position of the American Dietetic Association: benchmarks for nutrition in child care. *J Am Diet Assoc* **111**, 607–615.
- Moore H, Nelson P, Marshall J *et al.* (2005) Laying foundations for health: food provision for under 5's in day care. *Appetite* **44**, 207–213.
- Parker M, Lloyd-Williams F, Weston G *et al.* (2011) Nursery nutrition in Liverpool: an exploration of practice and nutritional analysis of food provided. *Public Health Nutr* **14**, 1867–1875.
- Ball SC, Benjamin SE, Dunne S *et al.* (2008) Dietary intakes in North Carolina child-care centers: are children meeting current recommendations? *J Am Diet Assoc* **108**, 718–721.
- Sigman-Grant M, Christiansen E, Brannen L *et al.* (2008) About feeding children: mealtimes in child-care centers in four western states. *J Am Diet Assoc* **108**, 340–346.
- Erinosho T, Dixon LB, Young C *et al.* (2011) Nutrition practices and children's dietary intakes at 40 child-care centers in New York city. *J Am Diet Assoc* **111**, 1391–1397.
- Sisson SB, Campbell JE, May KB *et al.* (2012) Assessment of food, nutrition, and physical activity practices in Oklahoma child-care centers. *J Acad Nutr Diet* **112**, 1230–1240.
- Zask A, Adams JK, Brooks LO *et al.* (2012) Tooty Fruity Veggie: an obesity prevention intervention evaluation in Australian preschools. *Health Promot J Austr* **23**, 10–15.
- Gubbels JS, Kremers SPJ, Stafleu A *et al.* (2010) Child-care environment and dietary intake of 2- and 3-year-old children. *J Hum Nutr Diet* **23**, 97–101.
- Jennings A, McEvoy S & Corish C (2011) Nutritional practices in full-day-care pre-schools. *J Hum Nutr Diet* **24**, 245–259.
- Johnston Molloy C, Corish C, Kearney J *et al.* (2011) Developing a nutrition assessment tool for Irish pre-schools. *Nutr Food Sci* **41**, 44–53.
- Flynn MAT, McNeill DA, Maloff B *et al.* (2006) Reducing obesity and related chronic disease in children and youth: a synthesis of evidence with 'best practice' recommendations. *Obes Rev* **7**, 7–66.
- Benjamin SE, Ammerman A, Sommers J *et al.* (2007) Nutrition and physical activity self-assessment for (NAP SACC): results from a child care pilot intervention. *J Nutr Educ Behav* **39**, 142–149.
- Ball SC, Benjamin SE & Ward DS (2007) Development and reliability of an observation method to assess food intake of young children in child care. *J Am Diet Assoc* **107**, 656–661.
- Honisset S, Woolcock S, Porter C *et al.* (2009) Developing an award program for children's settings to support healthy eating and physical activity and reduce the risk of overweight and obesity. *BMC Public Health* **9**, 345; Epublication 22 November 2012.
- Golley RK, Bell L, Matwiejczyk L *et al.* (2012) South Australian Long Day Care Centres engaged with a



- nutrition incentive scheme show consistency with mealtime practice guidelines. *Nutr Diet* **69**, 130–136.
35. Pollard C, Lewis J & Miller M (2001) Start Right-Eat Right Award Scheme: implementing food and nutrition policy in child care centers. *Health Educ Behav* **28**, 320–330.
  36. Lloyd-Williams F, Bristow K, Capewell S *et al.* (2011) Young children's food in Liverpool day-care settings: a qualitative study of pre-school nutrition policy and practice. *Public Health Nutr* **14**, 1858–1866.
  37. Gittelsohn J, Shankar AV, Pokhrel RP *et al.* (1994) Accuracy of estimating food intake by observation. *J Am Diet Assoc* **94**, 1273–1277.
  38. Department of Health and Children (Ireland) (2006) Child care (pre-school services) (No 2) regulations 2006 and explanatory guide to requirements and procedures for notification and inspection. <http://www.dohc.ie/publications/childcaresi20060604.html> (accessed 2 February 2011).
  39. Department of Health and Children (Ireland) (2004) *Food and Nutrition Guidelines for Pre-School Services*. Dublin: Health Promotion Unit.
  40. Surestart (2012) Full day care: national standards for under 8s day care and childminding. <http://www.3.imperial.ac.uk/pls/portallive/docs/1/46973696.pdf> (accessed 13 June 2013).
  41. Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institute of Health & Department of Health and Human Services (2006) *The NICHD Study of Early Child Care and Youth Development (SECCYD): Findings for Children up to Age 4 1/2 Years*. US: Government Printing Office.
  42. Growing Up in Ireland (2011) Growing Up in Ireland: National Longitudinal Study of Children. Key findings: Infant cohort (at 3 years). <http://www.growingup.ie> (accessed 3 August 2013).
  43. Growing Up in Ireland (2011) Growing Up in Ireland: National Longitudinal Study of Children. Key findings: Infant cohort (at 9 months). <http://www.growingup.ie> (accessed 3rd August 2013).
  44. Bristow K, Capewell S, Abba K *et al.* (2011) Healthy eating in early years settings: a review of current national to local guidance for North West England. *Public Health Nutr* **14**, 1008–1016.
  45. American Academy of Pediatrics & American Public Health Association (2002) Caring for our Children, National Health and Safety Performance Standards: Guidelines for Out-of-Home Child Care. <http://nrckids.org/CFOC/PDFVersion/National%20Health%20and%20Safety%20Performance%20Standards.pdf> (accessed 29 October 2009).
  46. National Association for Sport and Physical Education (2002) Active Start: A Statement of Physical Activity Guidelines for Children Birth to Five Years. <http://www.aahperd.org/NASPE> (accessed 12 June 2010).
  47. School Food Trust (2012) *Eat Better Start Better: Voluntary Food and Drink Guidelines for Early Years Settings in England – a Practical Guide*. UK: The Children's Food Trust, School Food Trust.
  48. Sharp L, Mucavele P & Nelson M (2010) Preliminary review of early years food, nutrition and healthy eating guidance in England: a summary. [http://www.childrensfoodtrust.org.uk/assets/eat-better-start-better/sft\\_early\\_years\\_preliminary\\_review\\_summary.pdf](http://www.childrensfoodtrust.org.uk/assets/eat-better-start-better/sft_early_years_preliminary_review_summary.pdf) (accessed 14 January 2011).
  49. Health Promotion Agency for Northern Ireland (2005) *Nutrition Matters for the Early Years: Healthy Eating for the Under Fives in Childcare*. Belfast: Health Promotion Agency for Northern Ireland.
  50. Scottish Executive (2006) *Nutritional Guidance for Early Years: food Choices for Children Aged 1–5 Years in Early Education and Childcare Settings*. Edinburgh: Scottish Executive.
  51. Welsh Assembly Government (2009) *Food and Health Guidelines for Early Years and Childcare Settings*. Cardiff: Welsh Assembly Government.
  52. Government of South Australia (2005) *Eat Well SA Schools and Preschools: Healthy Eating Guidelines Implementation Tool. Developing a Whole School/Preschool Healthy Eating Policy*. Australia: Department of Education and Children's Services & Department of Health.
  53. Horgan D (2001) Childcare in Ireland: themes and issues. *Ir J Appl Soc Stud* **2**, 104–117.
  54. Benjamin SE, Taveras EM, Cradock AL *et al.* (2009) State and regional variation in regulations related to feeding infants in child care. *Pediatrics* **124**, 104–111.
  55. Benjamin SE, Copeland KA, Cradock A *et al.* (2009) Menus in child care: a comparison of state regulations with national standards. *J Am Diet Assoc* **109**, 109–115.
  56. Ammerman AS, Ward DS, Benjamin SE *et al.* (2007) An intervention to promote healthy weight: Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC) theory and design. *Prev Chronic Dis* **4**; Available at: [http://www.cdc.gov/pcd/issues/2007/jul/06\\_0115.htm](http://www.cdc.gov/pcd/issues/2007/jul/06_0115.htm)
  57. Rosenthal MS, Crowley AA & Curry L (2009) Promoting child development and behavioral health: family child care providers' perspectives. *J Pediatr Health Care* **23**, 289–297; Epublication 22 December 2010.
  58. Montague M (2002) *Public Health Nutrition Policy in Organised Settings for Children Aged 0–12: an Overview of Policy, Knowledge and Interventions. A Report to the Eat Well Victoria Partnership*. Eat Well Victoria Partnership.
  59. United Nations Educational Scientific and Cultural Organization (2004) FRESH tools for effective school health. School health policy development: basic first steps. <http://www.unesco.org/education/fresh> (accessed 22 October 2008).
  60. Story M, Kaphingst KM, Robinson-O'Brien R *et al.* (2008) Creating healthy food and eating environments: policy and environmental approaches. *Annu Rev Public Health* **29**, 253–272.
  61. Falbe J, Kenney EL, Henderson KE *et al.* (2011) The Wellness Child Care Assessment Tool: a measure to assess the quality of written nutrition and physical activity policies. *J Am Diet Assoc* **111**, 1852–1860.
  62. Erinosho TO, Hales DP, McWilliams CP *et al.* (2012) Nutrition policies at child-care centers and impact on role modeling of healthy eating behaviors of caregivers. *J Acad Nutr Diet* **112**, 119–124.
  63. Vereecken C, Huybrechts I, Maes L *et al.* (2008) Food consumption among preschoolers. Does the school make a difference? *Appetite* **51**, 723–726.
  64. Early DM & Winton PJ (2001) Preparing the workforce: early childhood teacher preparation at 2- and 4-year institutions of higher education. *Early Child Res Q* **16**, 285–306.
  65. Mahoney K & Hayes N (2006) *In Search of Quality: Multiple Perspectives*. Final report. [http://www.cccde.ie/english/pdf/Targeted\\_Projects/In\\_Search\\_of\\_Quality\\_\(CSER\).pdf](http://www.cccde.ie/english/pdf/Targeted_Projects/In_Search_of_Quality_(CSER).pdf) (accessed 17 August 2013).
  66. Eichman C (1994) Financing child care: public- and private-sector approaches. *Pediatrics* **94**, 1093–1096.



67. Clark A, Anderson J, Adams E *et al.* (2008) Assessing the knowledge, attitudes, behaviors and training needs related to infant feeding, specifically breastfeeding, of child care providers. *Matern Child Health J* **12**, 128–135.
68. Sigman-Grant M, Christiansen E, Fernandez G *et al.* (2011) Child care provider training and a supportive feeding environment in child care settings in 4 states, 2003. *Prev Chronic Dis* **8**, A113; Epublication 24 August 2012.
69. Pérez-Rodrigo C & Aranceta J (2001) School-based nutrition education: lessons learned and new perspectives. *Public Health Nutr* **4**, 131–139.
70. Lanigan JD (2011) The substance and source of young children's healthy eating and physical activity knowledge: implications for obesity prevention efforts. *Child Care Health Dev* **37**, 368–376.
71. Contra Costa Child Care Council (2006) CHOICE: Creating healthy opportunities in child care environments. Child Health and Nutrition Program. <http://www.cocokids.org> (accessed 27 January 2013).
72. Gable S & Lutz S (2001) Nutrition socialization experiences of children in the Head Start Program. *J Am Diet Assoc* **101**, 572–577.
73. Skjalgstova Kindergarten (2012) Year plan for Skjalgstova Kindergarten 2012/13. [http://minbarnehage.no/MinBarnehage/skjalgstova/pilot.nsf/ntr/85DA1EFC AE69ED16C1257A720027A7B3/\\$FI](http://minbarnehage.no/MinBarnehage/skjalgstova/pilot.nsf/ntr/85DA1EFC AE69ED16C1257A720027A7B3/$FI) (accessed 16 August 2013).
74. Health Service Executive (2005) *Give Your Baby a Winning Start*. 2005 ed., Northern Area: Health Service Executive.
75. Irish Nutrition and Dietetic Institute (2012) Drinks for pre-school children (1–5 years). <http://www.indi.ie> (accessed 20th November 2012).
76. Food Safety Authority of Ireland (2012) *Best Practice for Infant Feeding in Ireland: from Conception through the First Year of an Infant's Life*. Dublin: Food Safety Authority of Ireland.
77. Hodges EA, Smith C, Tidwell S *et al.* (2013) Promoting physical activity in preschoolers to prevent obesity: a review of the literature. *J Pediatr Nurs* **28**, 3–19; Epublication 15 August 2013.
78. Riethmuller AM, Jones RA & Okely AD (2009) Efficacy of interventions to improve motor development in young children: a systematic review. *Pediatrics* **124**, e782–e792.
79. McWilliams C, Ball SC, Benjamin SE *et al.* (2009) Best-practice guidelines for physical activity at child care. *Pediatrics* **124**, 1650–1659.
80. Department of Health (Ireland) & Health Service Executive (2011) Fact sheet for childcare providers. <http://www.getirelandactive.ie> (accessed 20 September 2011).
81. Pate RR, Pfeiffer KA, Trost SG *et al.* (2004) Physical activity among children attending preschools. *Pediatrics* **114**, 1258–1263.
82. Dowda M, Brown WH, McIver KL *et al.* (2009) Policies and characteristics of the preschool environment and physical activity of young children. *Pediatrics* **123**, e261–e266.
83. Bower JK, Hales DP, Tate DF *et al.* (2008) The childcare environment and children's physical activity. *Am J Prev Med* **34**, 23–29.
84. Cardon G, Labarque V, Smits D *et al.* (2009) Promoting physical activity at the pre-school playground: the effects of providing markings and play equipment. *Prev Med* **48**, 335–340.
85. Burdette HL, Whitaker RC & Daniels SR (2004) Parental report of outdoor playtime as a measure of physical activity in preschool-aged children. *Arch Pediatr Adolesc Med* **158**, 353–357.
86. Sallis JF, Prochaska JJ & Taylor WC (2000) A review of correlates of physical activity of children and adolescents. *Med Sci Sports Exerc* **32**, 963–975.
87. Tandon PS, Garrison MM & Christakis DA (2012) Physical activity and beverages in home and center-based child care programs. *J Nutr Educ Behav* **44**, 355–359.
88. Copeland KA, Sherman SN, Kendeigh CA *et al.* (2009) Flip flops, dress clothes, and no coat: clothing barriers to children's physical activity in child-care centers identified from a qualitative study. *Int J Behav Nutr Phys Act* **6**, 74; Epublication 13 June 2012.
89. Copeland KA, Sherman SN, Kendeigh CA *et al.* (2012) Societal values and policies may curtail preschool children's physical activity in child care centers. *Pediatrics* **129**, 265–274.
90. Fox MK (2010) Improving food environments in schools: tracking progress. *J Am Diet Assoc* **110**, 1010–1013.
91. Benjamin SE (editor) (2007) *Making Food Healthy and Safe for Children: how to Meet the National Health and Safety Performance Standards – Guidelines for Out-of-home Child Care Programs*, 2nd ed., Chapel Hill, NC: The National Training Institute for Child Care Health Consultants.
92. Padget A & Briley ME (2005) Dietary Intakes at child-care centers in central Texas fail to meet Food Guide Pyramid recommendations. *J Am Diet Assoc* **105**, 790–793.
93. Sweitzer SJ, Briley ME & Robert-Gray C (2009) Do sack lunches provided by parents meet the nutritional needs of young children who attend child care? *J Am Diet Assoc* **109**, 141–144.
94. Government of Nova Scotia (2011) *Manual for Food and Nutrition in Regulated Child Care Settings*. Nova Scotia: Food and Nutrition Support for Licensed Child Care Centres Advisory Group.
95. Wilson JF (2000) Lunch eating behaviour of preschool children: effects of age, gender, and type of beverage served. *Physiol Behav* **70**, 27–33.
96. Cason K (2006) Family mealtimes: more than just eating together. *J Am Diet Assoc* **106**, 532–533.
97. Lohse B, Rifkin R, Arnold K *et al.* (2012) A digital program informs low-income caregivers of preschool-age children about family meals. *J Nutr Educ Behav* **44**, 256–261.
98. National Food Service Management Institute (United States) (2003) Mealtime Memo for child care: serving meals family-style. <http://www.nfsmi.org/ResourceOverview.aspx?ID=87> (accessed 7 August 2012).
99. Hendy HM & Raudenbush B (2000) Effectiveness of teacher modeling to encourage food acceptance in preschool children. *Appetite* **34**, 61–76.
100. Addressi E, Galloway AT, Visalberghi E *et al.* (2005) Specific social influences on the acceptance of novel foods in 2–5-year-old children. *Appetite* **45**, 264–271.
101. Salvy S-J, Vartanian LR, Coelho JS *et al.* (2008) The role of familiarity on modeling of eating and food consumption in children. *Appetite* **50**, 514–518.
102. Nahikian-Nelms M (1997) Influential factors of caregiver behavior at mealtime: A study of 24 child-care programs. *J Am Diet Assoc* **97**, 505–509.
103. Hendy HM (2002) Effectiveness of trained peer models to encourage food acceptance in preschool children. *Appetite* **39**, 217–225.
104. Satter E (2012) Ellyn Satter child feeding policy. <http://www.ellynsatter.com/ellyn-satters-division-of-responsibility-in-feeding-i-80.html> (accessed 24 August 2012).





105. Mrdjenovic G & Levitsky DA (2005) Children eat what they are served: the imprecise regulation of energy intake. *Appetite* **44**, 273–282.
106. Rolls BJ, Engell D & Birch LL (2000) Serving portion size influences 5-year-old but not 3-year-old children's food intakes. *J Am Diet Assoc* **100**, 232–234.
107. Orlet Fisher J, Rolls BJ & Birch LL (2003) Children's bite size and intake of an entrée are greater with large portions than with age-appropriate or self-selected portions. *Am J Clin Nutr* **77**, 1164–1170.
108. Francis LA & Susman EJ (2009) Self-regulation and rapid weight gain in children from age 3 to 12 years. *Arch Pediatr Adolesc Med* **163**, 297–302.
109. Seeyave DM, Coleman S, Appugliese D *et al.* (2009) Ability to delay gratification at age 4 years and risk of overweight at age 11 Years. *Arch Pediatr Adolesc Med* **163**, 303–308.
110. Tsukayama E, Toomey SL, Faith MS *et al.* (2010) Self-control as a protective factor against overweight status in the transition from childhood to adolescence. *Arch Pediatr Adolesc Med* **164**, 631–635.
111. Benjamin SE, Haines J, Ball SC *et al.* (2008) Improving nutrition and physical activity in child care: what parents recommend. *J Am Diet Assoc* **108**, 1907–1911.
112. Lanigan J, Barber S & Singhal A (2010) Prevention of obesity in preschool children. *Proc Nutr Soc* **69**, 204–210.
113. Ward DS, Hales D, Haverly K *et al.* (2008) An instrument to assess the obesogenic environment of child care centers. *Am J Health Behav* **32**, 380–386.
114. Summerbell CD (2007) The identification of effective programs to prevent and treat overweight preschool children. *Obesity* **15**, 1341–1342.
115. Hayman LL, Williams CL, Daniels SR *et al.* (2004) Cardiovascular health promotion in the schools: a statement for health and education professionals and child health advocates from the Committee on Atherosclerosis, Hypertension, and Obesity in Youth (AHOY) of the Council on Cardiovascular Disease in the Young, American Heart Association. *Circulation* **110**, 2266–2275.
116. ToyBox (2012) ToyBox – a European multi-country study of obesity prevention for pre-school children: newsletter spring 2012. <http://www.toybox-study.eu> (accessed 9 November 2012).
117. Witt KE & Dunn C (2012) Increasing fruit and vegetable consumption among preschoolers: evaluation of Color Me Healthy. *J Nutr Educ Behav* **44**, 107–113.
118. Puder JJ, Marques-Vidal P, Schindler C *et al.* (2011) Effect of multidimensional lifestyle intervention on fitness and adiposity in predominantly migrant preschool children (Ballabeina): cluster randomised controlled trial. *Br Med J* **343**, d6195.
119. Hardy L, King L, Kelly B *et al.* (2010) Munch and Move: evaluation of a preschool healthy eating and movement skill program. *Int J Behav Nutr Phys Act* **7**, 80; Epublication 20 November 2012.
120. Adams J, Zask A & Dietrich U (2009) Tooty Fruity Veggie in Preschools: an obesity prevention intervention in preschools targeting children's movement skills and eating behaviours. *Health Promot J Austr* **20**, 112–119.
121. Health Service Executive, Leitrim County Childcare Committee & Sligo Childcare Committee (2010) *The Early Years Health Promotion Project: Summary of Evaluations*. County Childcare Committees.
122. McKinnon RA, Reedy J, Handy SL *et al.* (2009) Measuring the food and physical activity environments: shaping the research agenda. *Am J Prev Med* **36**, S81–S85.
123. Benjamin SE, Neelon B, Ball SC *et al.* (2007) Reliability and validity of a nutrition and physical activity environmental self-assessment for child care. *Int J Behav Nutr Phys Act* **4**, 29; Epublication 20 November 2012.
124. Trost SG, Messner L, Fitzgerald K *et al.* (2011) A nutrition and physical activity intervention for family child care homes. *Am J Prev Med* **41**, 392–398.
125. Henderson KE, Grode GM, Middleton AE *et al.* (2011) Validity of a measure to assess the child-care nutrition and physical activity environment. *J Am Diet Assoc* **111**, 1306–1313.
126. Ward DS, Benjamin SE, Ammerman AS *et al.* (2008) Nutrition and physical activity in child care: results from an environmental intervention. *Am J Prev Med* **35**, 352–356.
127. Alkon A, To K, Wolff M *et al.* (2008) Assessing health and safety in early care and education programs: development of the CCHP health and safety checklist. *J Pediatr Health Care* **22**, 368–377.
128. Schwartz MB, Lund AE & Grow HM (2009) A comprehensive coding system to measure the quality of school wellness policies. *J Am Diet Assoc* **109**, 1256–1262.
129. Central Statistics Office (Ireland) (2009) Quarterly National Household Survey: Childcare: quarter 4. [http://www.cso.ie/releasespublications/documents/labour\\_market/2007/childcareq42007.pdf](http://www.cso.ie/releasespublications/documents/labour_market/2007/childcareq42007.pdf) (accessed 2 February 2011).
130. Central Statistics Office (Ireland) (2008) Quarterly National Household Survey: Childcare: quarter 4. [http://www.cso.ie/releasespublications/documents/labour\\_market/2007/childcareq42007.pdf](http://www.cso.ie/releasespublications/documents/labour_market/2007/childcareq42007.pdf) (accessed 24 August 2012).
131. Russell H & McGinnity F (2011) *Workplace Equality in the Recession? The Incidence and Impact of Equality Policies and Flexible Working*. Equality Authority/The Economic and Social Research Institute.
132. National Children's Office (2006) Minister for Children will deliver major National Childcare Investment Programme. [http://www.nco.ie/press\\_room/49/](http://www.nco.ie/press_room/49/) (accessed 23 May 2006).
133. Growing Up in Ireland (2013) Growing Up in Ireland: National Longitudinal Study of Children. Mothers' return to work and childcare choices for infants in Ireland: infant cohort. <http://www.growingup.ie> (accessed 13 August 2013).
134. Irish Universities Nutrition Alliance (2012) National Pre-school Nutrition Survey. Summary report. <http://www.iuna.net> (accessed 2 July 2012).