Review of interventions to promote healthy behaviours for the prevention of non-communicable diseases among children and adolescents

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## Glossary

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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BMI</td>
<td>Body mass index</td>
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<tr>
<td>C &amp; A</td>
<td>Children and adolescents</td>
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<tr>
<td>COPD</td>
<td>Chronic obstructive pulmonary disease</td>
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<td>CVD</td>
<td>Cardiovascular disease</td>
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<td>DALYs</td>
<td>Disability-Adjusted Life Years</td>
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<td>EB</td>
<td>Exclusive breastfeeding</td>
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<td>FFL</td>
<td>Facts for Life</td>
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<td>FCTC</td>
<td>Framework Convention on Tobacco Control</td>
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<td>GBD</td>
<td>Global Burden of Disease</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>HBSC</td>
<td>Health behaviour in school aged children</td>
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<td>HICs</td>
<td>High Income Countries</td>
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<tr>
<td>HFSS</td>
<td>High fat, salt, sugar</td>
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<td>HPS</td>
<td>Health promoting schools</td>
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<tr>
<td>LMICs</td>
<td>Low and Middle Income Countries</td>
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<tr>
<td>MPOWER</td>
<td>Monitor tobacco use and prevention policies; Protect people from tobacco use; Offer help to quit tobacco use; Warn about the dangers of tobacco; Enforce bans on tobacco advertising, promotion and sponsorship; Raise taxes on tobacco.</td>
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<tr>
<td>NCDs</td>
<td>Non communicable diseases</td>
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<td>NRT</td>
<td>Nicotine replacement therapy</td>
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<td>PSAs</td>
<td>Public service announcements</td>
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<td>SSBs</td>
<td>Sugar sweetened beverages; sodas, soft drinks</td>
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<td>TAPS</td>
<td>Tobacco advertising, promotion and sponsorship</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WHO GAP</td>
<td>World Health Organization Global Action Plan on the Prevention and Control of NCDs</td>
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<td>WRA</td>
<td>Women of reproductive age</td>
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Executive Summary

Background and rationale
This report focuses on the promotion of health among children and adolescents and the prevention of risks to good health later in life. It reviews the evidence on the effectiveness of interventions aimed at promoting healthy behaviours related to tobacco and alcohol use, diet and physical activity among children and adolescents, and where appropriate among women of reproductive age (WRA). The rationale for this focus rests on two premises. First, these four risk factors are the major predictors of non-communicable diseases (NCDs) later in life. Second, habits, attitudes and thinking established early in life influence behaviours that are often hard to change and persist throughout the life span. Hence the need for early investments in approaches and interventions that contribute to development of healthy and safe behaviour practices. To date, there has been less attention focused on these risk behaviours and on identifying effective interventions among children and adolescents. This is particularly true in low and middle-income countries (LMICs), which bear the greatest burden of NCDs.

NCDs are health conditions of generally long duration (chronic diseases) and slow progression. The WHO Global Action Plan (WHO GAP) on NCDs focuses on four main types of NCDs:
- cardiovascular diseases (such as heart attacks and stroke)
- cancers
- chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma)
- metabolic conditions, especially diabetes

Globally 63 percent of all deaths are attributable to NCDs. Of this, 80 percent of occurs in LMICs. Over half of all NCDs are associated with behaviours that begin during adolescence, including tobacco and alcohol use, poor eating habits and food choices, and lack of physical activity. Between 1990 and 2013 worldwide, deaths due to low physical activity and dietary risks increased by 46.5 and 39.6 percent respectively. Similarly, deaths caused by tobacco smoke, and alcohol and drug use also increased by 17.8 and 51 percent respectively.

Adolescence is a critical period of transition and opportunity for improving life chances. It is a period of opportunity, growth, exploration, and creativity. It is a time to build upon gains made in early childhood by investing in opportunities that contribute to a healthy, safe, informed and empowered transition into adulthood. At the same time, adolescence can be a period of high risk due to the tendency for experimentation, peer pressure, temptation and the influences of mass media targeting adolescents. While increasingly independent from parental and other guiding influences, adolescents may have a limited ability to make informed decisions due to their incomplete and still evolving cognitive faculties. In order to make a healthy transition into adulthood, adolescents need to have access to adequate information on health related issues; quality health services; as well as supportive environment both at home, in the communities and at a larger societal level.

Purpose
The primary purpose of this review is to provide an overview of evidence on the effectiveness of interventions aimed at promoting healthy behaviours in relation to tobacco and alcohol use; physical inactivity; and unhealthy diet among children and adolescents.

1 There is no consistency in how age groups for non-adults are defined. For the purposes of this report children and adolescents is an overarching term that includes infants, toddlers, adolescents, and youth. Adolescents extends to the age of 19 years, and overlaps with the definition of an adult, which starts at 18 years of age in most UN reports. Young people is used where this term is used in cited published reports, and includes those aged under 25 years.
Methods

The focus of the review was on the evidence on the effectiveness of behaviour and social change interventions. Additionally, the evidence on prevention of obesity also examined the effect of changes in these behaviours on metabolic risk or NCD outcomes.

The search strategy was developed around five concepts: (1) the 4 risky behaviours; (2) stage of life course (the neonatal period, infancy, young childhood and adolescence; (3) women of reproductive age (WRA), and especially before and during pregnancy; (4) strategy or intervention, study design (trials, experiments); and (5) level of influence (individual, family, community, institution, or higher authority). The evidence was organised by stage of the life course and level of influence, where such evidence existed. Reviews of observational studies were included as part of the background/overview where these helped inform the consideration of potential targets for intervention.

Key findings from the review of reviews of interventions

Tobacco

Tobacco use is a major cause of NCDs worldwide. Between 1990 and 2013, deaths from tobacco smoke (smoking and second hand smoke) rose from 5.2 to 6.1 million. Children and adolescents should not smoke, or be exposed to second-hand smoke, and they should not be exposed to marketing that encourages and promotes tobacco use. The Framework Convention on Tobacco Control (FCTC) provides a powerful policy framework that has been adopted by most countries. The framework supports a range of actions to reduce the demands for, and supply of, tobacco products, including restrictions on marketing and access, as well as fiscal policies including pricing and taxation. Assessments of the FCTC’s effectiveness were generally not included, as they do not focus on the age groups of interest to this review.

Women of reproductive age

- Among young women who smoke, cessation programs were more effective if delivered in a non-judgmental and non-patronising way, which used incentives and rewards to help women take more control over their own behaviour.

Children and adolescents

- The most effective programs to stop children and adolescents from taking up tobacco use included approaches that operated from the individual, family, community and policy level in a coherent and consistent way. Such effective programmes lasted longer than 12 months and provided more frequent exposure as well as greater contacts at an individual level. They involved peers, teachers and schools, and focused on parental support in a coordinated and consistent/reinforcing way. employed multiple channels for media delivery. Additionally, the programs also required active community participation; employed multiple channels for media delivery; included policy level actions restricting marketing, access and availability of tobacco; and helped develop individual skills and confidence to resist marketing and peer pressures, among adolescents.

- The most effective interventions at the individual level were those that focused on social reinforcement to resist peer and other pressures to start smoking, together with activities that promoted self-esteem and self-reliance, and that addressed social norms. The effective programs sought to understand and address the underlying beliefs adolescents have about smoking, and focused on experiential learning rather than traditional didactic classroom sessions that emphasize the negative consequences of smoking.
• Involving families was beneficial in preventing children and adolescents from taking up tobacco use. The most effective family-based programs encouraged parenting that clearly demonstrated parental care for children and involved setting the rules, boundaries, and consensual agreement for acceptable family behaviour.

• Schools played a vital role in reinforcing positive messages, skills, and competencies to resist the pressures to take up tobacco use. All aspects of school life were important—the environment, the curricula, and the social influences including peer pressure and teachers as role models.

• Mass media programs were effective if delivered as part of a coherent package of actions and included support and reinforcement among adolescents not to start using tobacco products. The provision of information on its own was not effective in keeping adolescents from taking up tobacco use.

• Positive attitudes of health professionals were important in reinforcing the benefits of not using tobacco products, and in supporting quitting in a non-judgmental way.

• Based on only a few studies, pharmacological strategies were not effective in helping adolescents stop smoking.

• The wider policy environment that protects adolescents from the marketing of tobacco and from access to tobacco products is best developed through the implementation and enforcement of FCTC at country level.

**Alcohol**

Deaths from alcohol use rose from nearly 2 million in 1990 to 2.8 million in 2013, indicating an age-adjusted increase of 11 percent. The “harmful use” of alcohol is defined as drinking that causes detrimental health and social consequences for the drinker, the people around the drinker, and society at large. It also considers the patterns of drinking that are associated with increased risk of adverse health outcomes. Heavy consumption is drinking five or more drinks on one occasion.

Key effective policy options and interventions to reduce harmful use of alcohol in adolescents include:

• Establishing appropriate minimum age for purchase or consumption of alcoholic beverages;

• Raising barriers against sales to adolescents, including pricing policies;

• Preventing sales of alcohol to those below the legal age.

• Introducing mechanisms to place liability on sellers and servers to adolescents, and banning all forms of marketing of alcoholic beverages to those below the legal age.

**Women of reproductive age**

• Counselling sessions focused on motivational interviewing and personalized feedback increased women’s self-confidence, their ability to control behaviours, and reduced alcohol consumption among heavy drinkers.

• Brief one-on-one primary care interventions applying motivational interviewing, using a self-help manual and benefiting from partners’ support, helped sustain abstinence during pregnancy.

**Children and adolescents**

• In school settings, programs aimed at fostering decision-making skills amongst adolescents, either through raising awareness of harms, or through skill-based curricula which helped adolescents understand and develop skills to resist social influences, such as peer pressure, were most effective.

• Programs that strengthened social skills were more effective than curricula or knowledge-focused interventions and led to greater prevention of early alcohol and drug use.
Evidence on the impact of family and community based programs on reducing alcohol use in adolescents was limited. To a degree, brief interventions rather than the provision of information alone, may be more effective in reducing alcohol consumption. Such approaches focus on the delivering feedback; empathy; developing individual responsibility and self-efficacy; as well as on advice and/or menu of options for change. Despite the limited evidence, focus on the supportive role of families in reducing peer pressure remains central to efforts to address alcohol consumption among adolescents.

Physical activity

The levels of physical inactivity have increased rapidly in most countries over the last two decades. However, about 60 percent of the global population is not active enough, and 1.9 million deaths are attributable to physical inactivity. Adolescents who are highly sedentary have greater fat mass, higher body mass index (BMI) and increased risk of being obese.

Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure. Children and adolescents should spend at least 60 minutes each day in moderate to vigorous, age appropriate physical activity. Sedentary behaviour refers to activities that require very low energy expenditure and where sitting or lying is the dominant posture. Until recently, sedentary behaviour was considered same as low levels of physical activity. However, it is possible to meet or even exceed the activity guidelines and still spend a large amount of time being sedentary.

To be more active, children and adolescents need locally accessible safe places to play. The facilities should be affordable for all children, culturally sensitive, and provide opportunities for after school activities including during weekends. Access to and use of opportunities to be active need to be backed up by support from schools, families and communities. The drivers of active and sedentary behaviours may differ and hence require diverse approaches to achieve beneficial changes in behaviour.

Women of reproductive age

- The evidence about the impact of programmes promoting physical activity and reducing sedentary behaviours for women of reproductive age was limited.
- Support for self-regulatory strategies such as goal setting and self-monitoring were most effective in stimulating greater activity.
- Information alone, and programs that focused on weight control, were not as effective in motivating increased physical activity.

Children and adolescents

- Young children were more receptive to programs to increase physical activity than older children and adolescents. Short interventions designed for younger girls were more effective when boys were not present.
- Programs that included activity sessions in schools, at home, or in the community were more effective than education or information alone.
- Programs that influenced both physical activity and sedentary behaviour at the same time were more effective than when either was addressed on their own.
- Schools played a key role in promoting and supporting increased physical activity - from creating an enabling physical environment; designing curricula featuring the benefits of physical activity; to creating more opportunities for activities during the school day, and emphasis on role modeling.
- Young children were more likely to be active if their parents were also active; where they were encouraged and supported to be active; and where they had access to transportation. Even though parental influence was somewhat weaker in older children, parents were still important in supporting and encouraging adolescents to be active.
• The most effective approach to reduce sedentary behaviour appeared to be a combination of information, behavioural, environmental, and social support delivered in consistent ways across various settings including family, school and community.
• When children set their own goals around screen time and TV viewing plans; and when families support these goals and impose the rules, sedentary behaviour can be significantly reduced.

Healthy diets
Unhealthy diets are now the leading cause of deaths and disability-adjusted life years (DALYS) related to NCDs. Dietary risk responsible for 8 million deaths in 1990, rose to 11.3 million in 2013, indicating an age adjusted increase of 3 percent. Adequate nutrition before and during pregnancy, and in the first two years of life is critical to both short and longer term health and risk of NCDs. Breastfed babies are less likely to be overweight, have lower blood pressure, as well as lower risk for type-2 diabetes as adults.

Unhealthy diets are linked to the persistence of wasting and stunting, as well as to micronutrient deficiencies in many parts of the world. The co-existence of under and over nutrition in the same family and community requires a coordinated approach to food policy to ensure that double burden of malnutrition is addressed.

A healthy diet is hard to be defined. However, it has been universally accepted that it starts with exclusive breastfeeding for the first six months. From thereon, infants can be introduced to a variety of family foods including fruits, vegetables, legumes, nuts and whole grains. Ideally, a healthy diet should consist of less than 5 percent energy from free sugars; less than 30 percent energy from total fats; and less than 5 grams of salt a day.

The WHO Global Action Plan (GAP) has identified a range of policy options to support the consumption of a healthy diet by children and adolescents:
• Promotion and support of exclusive breastfeeding for the first six months of life, and of continued breastfeeding until two years of age, as well as adequate and timely complementary feeding;
• Support for the code of marketing of breast milk substitutes;
• Implementation of recommendations on the marketing of foods and non-alcoholic beverages to children;
• Guidance on ways to increase availability, affordability and consumption of fruit and vegetables, while reducing the fat, salt and added sugar content in processed foods and beverages;
• Taxation and other fiscal policies to encourage consumption of more healthy foods, and discourage consumption of less healthy options;
• Promotion of healthier diets in schools and other settings;
• Nutrition labelling according to Codex Alimentarius guidelines to help informed choices.

Women of reproductive age
• Combined approaches such as one-on-one counselling, professional support and enforcement of the code of marketing of breast-milk substitutes support breastfeeding practice most effectively.
• Successful programmes employed multiple interventions including education; continued support after the initial intervention; family involvement; and social support from peers and lay health workers.

Children and adolescents
• Targeting the home and family as well as school and community in a coordinated way, accompanied by education sessions and parental support contributed to the overall impact of interventions designed to promote increased consumption of fruits and vegetables and influence reduced consumption of - SSB. Face-to-face parental support and guidance in promoting healthier meals was
more effective than passive information sharing through distribution of newsletters and leaflets.

- Early childhood settings, where children receive up to half of their daily nutritional needs, were critical in shaping healthy eating practices. This was particularly true in cases where employees were encouraged to increase their knowledge; and supported to develop attitudes and skills around healthy foods and eating habits.

- Schools that limit access to unhealthy foods and beverages; promote healthy eating in the school curriculum; support free school fruit schemes; encourage experiential learning; provide access to school gardens have been more successful in promoting healthier eating patterns and more positive attitudes about healthy eating in children.

**Growth and body composition: overweight and obesity**

Obesity, a risk factor for many NCDs, has more than doubled in children and quadrupled in adolescents in the past 30 years. Between 1990 and 2014 the number of overweight or obese infants and young children aged 0 to 5 increased globally from 32 to 41 million. In the WHO African Region alone, the number of overweight or obese children increased from 4 to 9 million over the same period. The vast majority of overweight or obese children live in LMICs, where the rate of increase has been more than 30 percent higher than in HICs. Moreover, in most LMICs, overweight is increasing faster than underweight is decreasing in children.

**Women of reproductive age**

- The most effective package of interventions included an educational component, provision of continued support after the initial intervention, family involvement, and social support from peers or lay health workers.

**Children and adolescents**

- Children and adolescents benefited from parental and caregivers’ support, as well as from assistance provided by community, schools, institutions and overall enabling policy environment in making healthy food choices and behaviours. This support was also instrumental in limiting the adverse effects of exposure to the marketing of unhealthy foods and beverages.

- School-based interventions encompassing promotion of healthy diets, physical activity in all aspects of school life alongside the active family involvement yielded the most robust results in preventing childhood obesity.

- Multi-component approaches that addressed diet and activity together in a coordinated way were most effective. Increasing physical activity without also addressing sedentary behaviour and diet was less likely to be effective.

**Overall summary and synthesis**

One of the key findings of this review points to the fact that evidence, on the effective interventions in children and adolescents remains limited, and is virtually non-existent for children and adolescents in LMICs. The vast majority of the evidence reviewed came from HICs. Inconsistencies in the application of measures defining the exposure, the intervention, and the outcome created challenges in drawing conclusions. Furthermore, details on the intervention delivery were scarce. Finally, there was little consideration as to how the wider environmental determinants may have impacted the intervention and how they may have affected behaviour in children and adolescents.

Despite the limitations, the findings allow for across tentative conclusions as to what sorts of approaches,
Successful programs strengthen children’s ability to self-regulate by setting goals, seeking feedback, and self-monitoring their behaviour. Programs that helped children and adolescents deal with peer and other pressures to behave a certain way can also contribute to healthier behaviours. Children themselves can be effective peer leaders and role models to influence the behaviour of others. Interventions Addressing the underlying determinants of behaviour, by, alongside supportive actions at family, community and institutional levels is most effective in supporting and maintaining healthy behaviours. Interventions delivered in cooperation with schools, communities and the media have the potential to modify behaviour through role modelling, instruction, prompting practice, and strengthening motivation.

Parents, caregivers and families shape the behaviour of children. They can set standards for children such as no smoking of tobacco in the household, moderate usage of alcohol, reduce TV viewing, and limit consumption of unhealthy foods. They can be role models for healthy behaviours by providing positive reinforcement to encourage children to engage in healthy behaviours, and at the same time avoid harmful habits. Parents can be best advocates of health by cooking healthy meals and promoting children to opt for healthy foods and beverages.

Community leaders can play an important role in advocating for safe environments where children can play and in creating space for peer-to-peer support groups.

Schools can play a vital role in promoting and supporting healthy behaviours in particular for young children. They can significantly influence children’s healthy habits by providing access to healthy foods in canteens; by creating ample opportunities for physical activity; by providing positive examples through staff leadership and role modelling; and by working together with families and communities to achieve goals. Other supportive measures include development of school curriculum focused on healthy foods and diets; and policies promoting a healthy environment in and around schools.

Achieving healthy behaviour requires an enabling policy environment that regulates marketing, pricing policies, and food labelling on the one hand; and on the other, restricts all forms of marketing directed at children, or to which children are exposed. Statutory regulation is more effective than self-regulation and voluntary codes. Taxation and pricing policies can be effective in shaping behaviours, both in reducing levels of unhealthy behaviours and promoting healthy alternatives.

Strong political actions can effectively regulate both the drivers for the supply and demands for tobacco products resulting in reduced tobacco use.

1. Introduction

This report focuses on the promotion of health among children and adolescents and the prevention of risks to good health later in life. It reviews the interventions aimed at promoting healthy behaviours related to tobacco and alcohol use, diet and physical activity among children and adolescents, and where appropriate among women of reproductive age (WRA). The rationale for this focus rests on two premises. First, these four risk factors are the major predictors of non-communicable diseases (NCDs) later in life. Second, habits, attitudes and thinking established early in life influence behaviours that are often hard to change and ng

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persist throughout the life span. Hence the need for early investments in approaches and interventions that contribute to development of healthy and safe behaviour practices. To date, there has been less attention focused on these risk behaviours and on identifying effective interventions among children and adolescents. This is particularly true in low and middle-income countries (LMICs), which bear the greatest burden of NCDs.

Globally 63 percent of all deaths are attributable to NCDs, and 80 percent of them occur in low and middle income countries (LMICs). Half of these deaths occur prematurely, before age 70. The rise of NCDs is due to a complex mix of health, lifestyle and economic factors, strongly associated with rapid unplanned urbanization, ageing populations and increasingly globalized unhealthy environments and ways of living. For adolescents, urbanization and globalization are increasingly exposing them to factors and influences that pose challenges to healthy living. The rising burden and risk of NCDs in children and adolescents, warrants further research to identify opportunities to promote healthy behaviours, and address related challenges.

In the two decades leading to 2030, the cost of NCDs will exceed US$30 trillion, increasingly affecting low- and middle-income countries (LMICs). The World Economic Forum estimates that in the next twenty years NCDs will inflict $21.3 trillion in economic losses (based on medical and other costs and loss of income) in LMICs, about the equivalent of total GDP in these countries in 2013. In a recent analysis by the McKinsey Global Institute, tobacco use, obesity, and alcohol are three of the top four global economic and social burdens and together cost $5.5 trillion in 2012. Avoiding the cost of treating NCDs is a powerful economic argument, yet too few resources are devoted to primary prevention. Focusing on keeping children and adolescents healthy makes sense for helping them to grow and develop, attend school and learn, and for their future health and well-being.

The major global guidance on NCD prevention, the World Health Organization Global Action Plan on the Prevention and Control of NCDs (WHO GAP), focuses mainly on established NCDs among adults, specifically cardiovascular disease, chronic respiratory illness, metabolic conditions including diabetes, and cancer. The overarching principles that guide the WHO GAP are relevant to all age groups. The emphasis on a life-course approach suggests the need to consider actions at all ages, in particular early in life, indeed beginning before conception.

### 1.1. Purpose of this review

The primary purpose of this review was to provide an overview of evidence on the effectiveness of interventions aimed at promoting healthy behaviours in relation to tobacco and alcohol use; physical inactivity; and unhealthy diet among children and adolescents.

### 1.2. Scope

This review presents the evidence base for the actions recommended in the Facts for Life (FFL) Chapter on Healthy Living for the Prevention and Control of NCDs in Children and Adolescents produced by UNICEF; and in collaboration with the UN Interagency Task Force on Non-Communicable diseases, and NCD Child network of NCD related non-government organizations. The review provides reference for United Nations Member States and country-level policy makers to advocate for necessary changes to policies and programs
to address NCD prevention. The review does not attempt to cover treatment of established NCDs such as juvenile-onset [type 1] diabetes or cancer; injuries; or mental and sexual health or injuries.

In particular, the review explored the effectiveness of approaches used to promote healthy attitudes and behaviours among children and adolescents related to tobacco, and alcohol use, diet and physical activity across individual, family, community, institutional and societal levels. In terms of interventions at an individual level, it centred on the underlying behaviours rather than the metabolic consequences of these behaviours, except for obesity where the interventions to achieve healthy body composition have focused on the underlying behaviours related to diet and physical activity. It also explored interventions aimed at addressing physical, environmental and psychological factors that shaped behaviour in children and adolescents.
2. Rationale, Definitions and Situation Analysis

This section provides the rationale as to why it is important to focus on adolescents in the effort to prevent NCDs. It also provides definitions relevant to this review and a summary of the global situation on NCDs. The data presented in this section derive from the WHO Global Status Reports on NCDs 2012 and 2014.4

2.1. Rationale for a focus on children and adolescents

In many countries, children (defined as zero – 18 years) and adolescents (defined as 10-19 years) are the majority population group. In many LMICs, those less than 25 years of age comprise more than half of the population, while in sub-Saharan Africa, the 0-14 aged cohort represents almost 45 percent of the total population. Healthy, well-educated children and adolescents are a key asset and resource, to their families, communities and countries. Furthermore, because adolescents are future parents, their health now, and the patterns of behaviour and consumption they establish early-on are important to the health of the next generation.

Many of the behaviours that lead to adult NCDs commence during childhood and adolescence. Adolescence is a critical period of transition and opportunity for improving life chances. It is a period of opportunity, growth, exploration, and creativity. It is a time to build upon gains made in early childhood by investing in opportunities that contribute to a healthy, safe, informed and empowered transition into adulthood. At the same time, adolescence can be a period of high risk due to the tendency for experimentation, peer pressure, temptation and the influences of mass media targeting adolescents. While increasingly independent from parental and other guiding influences, adolescents may have a limited ability to make informed decisions due to their incomplete and still evolving cognitive faculties. Not surprisingly, over half of all NCDs are associated with behaviours that begin during adolescence, including tobacco and alcohol use, poor eating habits and choices, and lack of physical activity. Once established, these unhealthy behaviours tend to persist throughout life and become more difficult to change.5

There is also well-established evidence that maternal health before and during pregnancy may affect the well-being of newborns and infants. Prematurity and low birth weight, maternal under nutrition and excessive gestational weight gain have a long-term impact on the child’s overall health and risk of NCDs.6 Exclusive breastfeeding and early diet are associated with reduced risk of overweight and type 2 diabetes in later life. Growth faltering in the first two years of life, followed by too rapid catch-up growth is also associated with increased risk of NCDs in later life.7

There is also evidence of sensitive developmental stages in adolescents when social and cognitive skills, habits, coping strategies, attitudes and values are more easily acquired than at later ages. These abilities and skills strongly influence life course trajectories with implications for health in later life. Additionally, a life course approach considers the long-term health consequences of biological and social experiences in early and mid-adulthood. It addresses factors that add additional risk or interact with early life biological and social factors, to reduce or exacerbate long-term risks to health.8 9

The family and community environments in which infants and children develop help establish patterns of behaviour, based on family attitudes and behaviour, peer and community role models, cultural practices and social norms. Markers of metabolic risk (blood lipids, serum cholesterol, high blood pressure and high body mass index(BMI) are strongly affected by patterns of dietary intake and sedentary behaviour.
established early in life. Exposure to second-hand tobacco smoke and excessive alcohol consumption also shape short and long-term tobacco use and alcohol consumption, therefore impacting the overall health.

Children living with chronic conditions such as type 1 diabetes benefit from early promotion of healthy behaviors to reduce the risk of developing related cardiovascular diseases (CVDs) in later life. The majority of the factors that shape subsequent health are modifiable. Thus the earlier prevention begins, from before conception, throughout pregnancy and early life, the better the longer term chances of attaining good health. Families, community leaders, schools and other institutions and policy makers can play a major role in promoting and supporting healthy ways of living, by providing positive role models and by promoting good physical and mental health.

2.2. What are the major global NCDs?

NCDs are health conditions of generally long duration (chronic diseases) and slow progression. The WHO GAP focuses on four main types:

- Cardiovascular diseases (such as heart attacks and stroke);
- Cancers;
- Chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma);
- Metabolic conditions, especially diabetes.

These four groups of NCDs are largely preventable and yet are the leading causes of death and illness around the world. NCDs are often interrelated, in that people who have one such disease are often at increased risk for another. For example, a person with diabetes is at greater risk for cardiovascular disease. Similarly, the causes of many NCDs are linked: for example, tobacco smoke causes cardiovascular disease, cancer and chronic respiratory disease.

Many other significant health conditions are non-communicable, including diseases caused by genetic disorders; mental illness, including depression; physical disabilities; many types of blindness and deafness; and the results of accidents and injuries. Some of these conditions are preventable and many are treatable, and so merit attention in any consideration of children and NCDs. As stated previously, however, this review focusses on the behavioural risk factors that contribute to the four main NCDs described above.

2.3. Global NCD epidemiology and impact

Except for nations where HIV-related mortality is high, life expectancy has increased in most countries over the last twenty years. However, the pattern of mortality causes has changed over this time as increasingly NCDs have replaced communicable diseases as the main cause of death. NCDs are now responsible for two thirds of all deaths, and the number of deaths from NCDs is rising around the world. In 2000, 31 million people died from NCDs. By 2012 the number of deaths increased to an estimated 38 million and the number is expected to rise to 52 million by 2030. By contrast, the number of global deaths due to infectious diseases is projected to decline over the same period. The regionally standardized death rates for NCDs are highest in the Africa region (650 per 100,000 population) compared with 438 per 100,000 population in the region of the Americas (Figure 1). NCD deaths have increased most rapidly in the countries of the WHO South–East Asia Region.

Approximately 42 percent of all NCD deaths (a total of 16 million deaths) globally are premature, before the age of 70 years. Moreover, the rate of premature deaths from NCDs is higher in LMICs than high-income countries (HICs) - more than 80 percent of the premature NCD deaths occur in LMICs. For example,
over three quarters of cardiovascular diseases and diabetes, more than two thirds of all cancer deaths, and nearly 90 percent of deaths from chronic respiratory diseases occurred in LMICs. The probability of a 30-year-old man dying prematurely due to an NCD was 25 percent in South-east Asia region compared to 15 percent in the Americas (Figure 1). Around 10 percent of all NCD deaths (including those due to conditions beyond the focus of this review) are among people younger than 20 years of age.

Figure 1. Regional age–standardised NCD death rates and probability of dying prematurely from one of the four main NCDs, by WHO global region (from4).

2.3.1. Cardiovascular disease (CVDs)

Cardiovascular diseases (CVDs) are the number one cause of death globally: more people die annually from CVDs than from any other cause. An estimated 17.5 million people died from CVDs in 2012, representing 31 percent of all global deaths. Of these deaths, an estimated 7.4 million were due to coronary heart disease and 6.7 million were due to stroke. Over three quarters of CVD deaths occurred in LMICs. Out of the 16 million premature deaths (those under the age of 70) due to NCDs, 82 percent were in LMICs and 37 percent were caused by CVDs.

The process of atherosclerotic CVD begins in early life and is progressive. Strong risk factors for CVD are and adverse blood lipid profile, elevated blood pressure, and diabetes. A substantial proportion of children and adolescents in the USA have elevated concentrations of lipids and lipoproteins.11 In the 1988–1994 National Health and Nutrition Survey, approximately 10 percent of adolescents had total cholesterol concentrations of >200 mg/dL, which is a level of concern in adults. De Moraes et al. (2014)12 systematically reviewed all available literature on the prevalence of high blood pressure in adolescents. Fifty-five studies (26 school and 29 community samples) were included in the meta-regression; the pooled prevalence of high blood pressure was 13 and 9.6 percent for boys and girls respectively. Two thirds of studies were conducted in LMICs. The pooled prevalence of high blood pressure varied by region (around 7 percent in North America and Latin America; 17.5 percent in Europe; and over 24 percent in Oceania and Africa).

2.3.2. Cancer

Approximately 8.2 million cancer related deaths occurred in 2012. Of this, 70 percent occurred in Africa, Asia, Central and South America. Fourteen million new cases of cancer were reported in 2012. This number is expected to rise by about 70 percent over the next 2 decades, particularly in LMICs. Among men, the
five most common diagnosed cancers were lung, prostate, colorectum, stomach, and liver. Women were
most commonly diagnosed with: breast, colorectum, lung, cervix, and stomach cancer. Cancer causing
viral infections such as HBV/HCV and HPV are responsible for up to 20 percent of cancer deaths in LMICs.
Each year more than 175,000 children are diagnosed with cancer. Of this, 85 percent are diagnosed in
LMICs. There is a sharp contrast in the survival rates between HICs and LMICs - 90 and 10 percent
respectively.

2.3.3. Chronic respiratory disease
Chronic respiratory diseases are chronic diseases of the airways and other structures of the lung. Among
the most common are, asthma; chronic obstructive pulmonary disease (COPD), respiratory allergies,
occupational lung diseases and pulmonary hypertension. Currently 235 million people have asthma. This is
a 32 percent increase since 1990 mostly in LMICs. Sixty four million people have COPD. In 2012 more than
3 million people died of COPD, which is equal to 6 percent of all deaths globally that year. More than 90
percent of COPD deaths occur in LMICs. Asthma is the most common chronic disease among children.
In 2012, around 7 million people died - one in eight of total global deaths - as a result of air pollution
exposure. Air pollution contributes to the increase of respiratory diseases, including acute respiratory
infections and chronic obstructive pulmonary diseases. Children exposed to indoor air pollution (such as
open stoves) have two to three times higher risk of asthma and of lower respiratory conditions, including
pneumonia.

2.3.4. Diabetes
In 2012, an estimated 1.5 million deaths were directly caused by diabetes; more than 80 percent of these
deaths occurred in LMICs. In 2014, the global prevalence of diabetes was estimated to be 9 percent among
persons aged 18+ years. WHO projects that diabetes will be the 7th leading cause of death by 2030.
Type 2 diabetes, is mostly preventable and was previously unheard of before mid-life. However, it has
become increasingly common among children and adolescents.

2.4. Risk factors for NCDs
It is estimated that up to two thirds of premature deaths from NCDs (in people less than 70 years of age)
are linked to exposure to the four main risk factors: tobacco use, the harmful use of alcohol, physical
inactivity and unhealthy diet (Table 1).

<table>
<thead>
<tr>
<th>NCDs</th>
<th>Common modifiable risk behaviors for NCDs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tobacco use</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>✔</td>
</tr>
<tr>
<td>Cancer</td>
<td>✔</td>
</tr>
<tr>
<td>Chronic respiratory disease</td>
<td>✔</td>
</tr>
<tr>
<td>Diabetes</td>
<td>✔</td>
</tr>
</tbody>
</table>

The Global Burden of Disease (GBD) studies have assessed and modelled the global, regional and
national comparative risk of up to 79 risk or clusters of risks in 188 countries, most recently summarising
the evolution of risks between 1990 and 2013. Risk factors are grouped into 4 categories: behavioural,
environmental, occupational, and metabolic risks. Outcomes have been summarised as attributable
deaths, years of life lost, years lived with disability, and disability adjusted life years (DALYs).

Risk factor patterns vary across regions. Behavioural risk factors predominate in adolescents. From 1990 to
2013 overall deaths attributable to behavioural risks rose by nearly 19 percent. Deaths attributable to child
and maternal malnutrition fell by 60.8 percent. Six clusters of risk (dietary, high systolic blood pressure,
child and maternal malnutrition, tobacco smoke, air pollution, and high BMI ) each accounted for more
than 5 percent of DALYs (Table 2).

Table 2. Summary of attributable deaths and DALYS by risk factors (source \textsuperscript{GBD15}).

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Number of attributable deaths (in millions) 2013</th>
<th>Number of attributable DALYS (in millions) 2013</th>
<th>Change of attributable deaths between 1990 and 2013 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four main risk factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tobacco use</td>
<td>6.1</td>
<td>143.5</td>
<td>17.8</td>
</tr>
<tr>
<td>Harmful use of alcohol</td>
<td>2.8</td>
<td>99.3</td>
<td>51.3</td>
</tr>
<tr>
<td>Physical inactivity</td>
<td>2.2</td>
<td>45.1</td>
<td>44.3</td>
</tr>
<tr>
<td>Unhealthy diet</td>
<td>11.3</td>
<td>241.4</td>
<td>39.6</td>
</tr>
<tr>
<td>Other risk factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child and maternal malnutrition</td>
<td>1.7</td>
<td>176.9</td>
<td>-56.1</td>
</tr>
<tr>
<td>Air pollution</td>
<td>5.5</td>
<td>141.5</td>
<td>-10.5</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>10.4</td>
<td>208.1</td>
<td>45.1</td>
</tr>
<tr>
<td>High BMI</td>
<td>4.4</td>
<td>134.0</td>
<td>71.3</td>
</tr>
<tr>
<td>High fasting glucose</td>
<td>4.0</td>
<td>116.9</td>
<td>69.6</td>
</tr>
<tr>
<td>High blood cholesterol</td>
<td>2.8</td>
<td>62.7</td>
<td>26.9</td>
</tr>
</tbody>
</table>

The majority of the changes observed are attributable to modifiable causes, highlighting the potential and
importance of prevention. There have been major shifts in risk factors for global DALYs away from child
and maternal malnutrition and communicable diseases, including those caused by unsafe water, poor
sanitation and lack of hand-washing in 1990; to dietary risks and high blood pressure in 2013. Diet, tobacco
use, low physical activity and alcohol are singly and collectively also important risk factors for high blood
pressure and high BMI, and for the metabolic risk factor high serum cholesterol. Figure 2 summarises the
prevalence of the four major behavioural risk factors across WHO regions. In all regions over 60 percent
of children between ages of 1215 neither meet the recommended levels of consumption of fruits and
vegetables, nor the recommended levels of physical activity. Tobacco and alcohol use varies across regions.
For example, alcohol use reaches nearly 30 percent in the Americas, compared with only a few percent in
South East Asia. Although the prevalence of obesity is less than 10 percent on average in three of the
regions, this figure masks large country variations, as well as disparities between social groups within the
same country context. Obesity is rising rapidly in most LMICs.

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Figure 2. Prevalence of the four major behavioural NCD risk factors (tobacco use, alcohol use, low fruit and vegetable consumption, low physical activity levels) and obesity in about 170,000 12-15 year olds from 65 countries (source15).

Definitions: Low fruit and vegetable consumption (less than five serves a day during the last 3 days), low physical activity (fewer than 5 days of 60 minutes exercise in last seven days), and tobacco (any use of tobacco on one or more days in last 30) and alcohol (at least one alcoholic drink in the last 30 days).

2.5. Influences on individual and population level behaviour change

Most challenges to wellbeing are complex and cannot be addressed on a single level. While behaviour change relates to the actions of the individual, social change refers to changes in the social system that provide opportunities and strengthen people’s capacities to improve their own lives. Even with positive change at individual level, conditions at system, institutional and service delivery levels can support or prevent the ability of individuals to enjoy a healthy life. Communities and families usually do not have the power to change things on their own. At the highest level, enabling environment, the power structures, policies and legislation can present another layer of barriers or promotors to individual and social change. Exploring these levels of influence has been summarized as the Social Ecological Model (SEM).16

In 1990, UNICEF developed the conceptual framework on the causes of malnutrition.17 The framework showed that causes of malnutrition are multi-faceted, embracing food, health and caring practices; and multi-layered, whereby factors at one level influence other levels. The framework has been used extensively at national, district, and local levels, to help plan effective actions to improve nutrition. It has
served as a guide in assessing and analysing the causes of nutrition problems and has helped to identify the most appropriate mix of actions. The framework also provides a helpful guide for considering the basic and underlying causes of all major nutrition outcomes, including those with behavioural origins.

Michie and colleagues\textsuperscript{18} have developed a framework for designing interventions that describe three essential conditions: capability, opportunity and motivation. Capability is defined as the individual's psychological and physical capacity to engage in the activity concerned, including having the necessary knowledge and skills. Motivation is described as all those brain processes that energize and direct behaviour, including automatic or habitual processes, emotional responding and impulses, as well as reflective processes, such as analytical decision-making and planning. Opportunity is defined as all the factors that lie outside the individual that make the behaviour possible or promote it, including physical opportunity afforded by the environment and social opportunity afforded by cultural milieu.

Considering all three models together highlights that there are many layers, from within the individual to the wider environment in which people live, that can influence and shape the behaviour of children and adolescents. Interventions at all these levels need to be considered. Differences between studies may be partly explained by differences in underlying risks, environmental determinants, as well as differences in social and psychological factors, alongside the capability of children and adolescents to engage in the intervention.
3. Promoting healthy behaviours in children and adolescents

This section summarises the evidence from intervention studies addressing tobacco use, harmful use of alcohol, unhealthy diets, physical inactivity and sedentary behaviours, and also overweight and obesity. It reviews interventions targeting individuals as well as more complex school- or community-based interventions. The WHO GAP has established the links between changes in these four behavioural risk factors and obesity, and their influence on metabolic intermediate risk factors (such as blood pressure, dyslipidaemias, and blood glucose) and NCDs. For each behaviour or risk reviewed, there is a brief summary of the epidemiological context followed by a review of the evidence from intervention studies.

3.1. Methodology for reviews of interventions

The literature was searched regularly between January 2014 and November 2015 to inform the content of the Facts for Life (FFL) chapter. These ongoing reviews were supplemented by two more in-depth reviews of the literature in March-May 2015 and October-November 2015.

The review sought to assess the evidence on interventions to prevent risky and promote healthy behaviours alongside information on the supportive role of enabling environments. The review focused on primary prevention initiatives designed primarily around children and adolescents, covering any country of origin, and presented in English. Separate searches for behaviour change interventions in women of reproductive age WRA were also included.

Where there were multiple reviews of the same topic, the most recent review was used. For example, where a Cochrane review was updated, the most recent publication has been included. Although date of review was not an inclusion criterion, the overwhelming majority of reviews included in this report were conducted within the last ten years.

The search identified published and unpublished reviews across a broad range of information sources, including The Cochrane Central Register of controlled trials, Medline (PubMed), Embase, and using the Web of Science and Google Scholar. In addition, the search also included the WHO International Clinical Trials Registry Platform as well as WHO, UNICEF, FAO, and national government websites. The Healthcare Management Information Consortium was searched for grey literature.

The search strategy was built up around five concepts: behaviours; age group; strategy (prevention); design (interventions, trials, experiments); and intervention level (individual, family, community, institutional, policy). Synonyms of each of these concepts (both MeSH and free-text words) were combined using the Boolean operator “OR”. Different search strings were then combined using the Boolean operator “AND”.

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The quality of each of the reviews was assessed to ensure that they had clear exclusion and inclusion criteria; analysed original intervention research; employed a standardised data extraction process; used data collection forms; and engaged two independent reviewers, who were blind double checked for quality, and took into account the quality of the original studies when drawing conclusions. Reviews of treatments and either secondary or tertiary prevention were not included, unless otherwise indicated.

The latest literature search conducted in November 2015, identified studies primarily by using the Web of Science. The search yielded 1108 potentially eligible reviews for diet; 1404 for physical activity; 605 for smoking or tobacco use; 573 on alcohol; and 1642 for obesity. The reviews with potential for inclusion were then hand searched to match against the inclusion criteria set out above. This filtering led to 32 reviews of diet; 100 for physical activity or sedentary behaviour; 204 for alcohol; 97 for tobacco; and 95 for obesity.

The final set included abstracts of these 528 reviews.

For all of the risk behaviours reviewed, the overwhelming majority of the evidence, came from North America, and to a lesser extent Europe and Australia. There were very few studies reported from LMICs and some caution is therefore required in extrapolating the findings from HICs to LMICs where differences in the context and wider determinants may alter the effectiveness of an intervention, as discussed above. Investment is required to strengthen the evidence base in LMICs. In the absence of data from LMICs, the findings of this review can only be put forward as considerations for application in LMICs.

### 3.2 Tobacco use

#### 3.2.1. Overview

Tobacco products kill nearly 6 million people each year. More than five million of these deaths are the result of direct tobacco use while more than 600,000 are the result of exposure of non-smokers to second-hand smoke. Over 40 percent of children have at least one parent that smokes. Children account for 28 percent of the deaths attributable to second-hand smoke, due to acquired respiratory disease (asthma or infection). In some countries, children from poor households are frequently employed in tobacco farming to provide family income. They are especially vulnerable to "green tobacco sickness", which is caused by the nicotine that is absorbed through the skin from the handling of wet tobacco leaves.

Currently about 25 percent of the global population over the age of 15 uses tobacco products. The use is declining in HICs, but still rising in LMICs. In the USA in 2012, just under 7 percent of adolescents between the ages 12-17 smoke, down from peak levels reported in 1991-97. Ninety percent of adult smokers begin before they reach 18 years of age. Globally, between 80,000 and 100,000 adolescents start smoking every day, and one in four started using tobacco before the age of ten. Half of the adolescents who continue to smoke will die of tobacco-related illness. Nearly 80 percent of the world’s one billion smokers are in LMICs.

There is no safe level of exposure to second-hand tobacco smoke. In adults, second-hand smoke causes serious cardiovascular and respiratory diseases, including coronary heart disease and lung cancer. In infants, it causes sudden death. In pregnant women, it causes low offspring birth weight. Einarson and Riordan (2009) qualitatively reviewed the risks (based on observational studies) and cessation strategies in pregnancy and during lactation. Almost half of children regularly breathe air polluted by tobacco smoke in public places.

Smokeless tobacco products (chewing tobacco, snuff, gutkha) are also harmful, increasing the risk of head
and neck cancers. E-cigarettes result in nicotine addiction and are heavily marketed towards adolescents using candy, fruit, and alcohol flavourings. E-cigarette use exposes non-smokers to nicotine and to toxic chemicals from the vapour/smoke.\(^\text{24}\)

Adolescents are especially vulnerable to becoming tobacco users. Once addicted, adolescents will likely be steady consumers for many years. Advertising, promotion and marketing efforts of the tobacco industry influence adolescent smoking behaviour, often to a greater extent than it influences the behaviour of adults.\(^\text{25}\) Tobacco advertising, promotion and sponsorship (TAPS) increase the likelihood that people will start or continue to smoke.\(^\text{26}\) Although TAPS activities are designed to have broad appeal to consumers in all demographic groups, and especially among current smokers, specific efforts are made to persuade non-smokers to start. As a result, key target populations for TAPS include adolescents, who are at an age when people are most likely to start regular smoking, and women, who in most countries are less likely to be smoking compared to men. Adolescents are at a critical transitional phase in their lives, and TAPS activities communicate messages that using tobacco products will satisfy their social and psychological needs such as popularity, peer acceptance and positive self-image. Exposure to TAPS, which usually occurs at very young ages (before age 11 and often earlier), increases positive perceptions of tobacco and curiosity about tobacco use. It also makes tobacco use seem less harmful than it actually is, and influences beliefs and perceptions of tobacco use prevalence, which increase the likelihood that adolescents will start to smoke.

The duration of smoking and number of cigarettes required to establish nicotine addiction are lower for adolescents than adults, so addiction is established more quickly.\(^\text{27}\) Although studies have clearly shown the negative health effects of tobacco use, adolescents typically remain attracted by it, perhaps because they perceive smoking as adult behaviour and have a strong desire to be perceived as adult by peers.\(^\text{28}\) The WHO Health behaviour in school aged children (HBSC) study has shown that tobacco use is related to other risk behaviours and negative health outcomes in adolescents, including unhealthy dieting patterns and high levels of alcohol consumption.\(^\text{29}\)

Many family factors – such as divorce or separation, parental smoking and low family cohesion and connectedness – predict tobacco use. Positive relationships with parents are usually negatively associated with adolescent smoking, but peer relationships may encourage it through, for example, providing access to tobacco products and helping to create norms to support use.\(^\text{31}\) Intervention programs aiming to reduce tobacco use among adolescents, suggest peers can be agents of change precisely because they can have such a significant influence on behaviour.\(^\text{32}\)

The WHO Framework Convention on Tobacco Control (FCTC) came into force in February 2005.\(^\text{33}\) Since then, it has become one of the most widely embraced treaties in the history of the United Nations with 178 Parties covering 89 percent of the world’s population. The FCTC is WHO’s most important tobacco control tool and a milestone in the promotion of public health. It is an evidence-based treaty that reaffirms the right of people to the highest standard of health. The FCTC was developed in response to the globalization of the tobacco epidemic. The spread of the tobacco epidemic is facilitated through a variety of complex factors with cross-border effects, including trade liberalization and direct foreign investment. Other factors such as global marketing, transnational tobacco advertising, promotion and sponsorship, and the international movement of contraband and counterfeit cigarettes have also contributed to the explosive increase in tobacco use.

The FCTC includes a set of core demand and supply reduction provisions, as well as initiatives that can contribute to reducing smoking prevalence. In 2008, WHO introduced a practical, cost-effective way to scale up implementation of provisions of the FCTC featuring 5 measures (MPOWER): Monitor tobacco use...
and prevention policies; Protect people from tobacco use; Offer help to quit tobacco use; Warn about the dangers of tobacco; Enforce bans on tobacco advertising, promotion and sponsorship; and Raise taxes on tobacco). Each MPOWER measure corresponds to at least one provision of the WHO Framework Convention on Tobacco Control.

3.2.2 Review of Interventions

Temel et al (2013) reviewed trials of lifestyle interventions (ranging from individual consultation to group education), focusing on either prevention or modification of risk behaviours including tobacco in women of reproductive age. Overall, 44 studies were included in the qualitative review, although only one RCT on smoking cessation was reported. The trial focusing on smoking alone (n=94) used a stage of change approach with hand-outs and counselling at the hospital's cessation clinic. The study reported that after 3 months 18 percent of intervention and 12 percent of control subjects had quit smoking. However, after 12 months, more control than intervention subjects had taken up smoking again. While the gradual stage approach to change did not alter the effectiveness of cessation, it may have been beneficial for maintenance of non-smoking behaviour.

Lumley et al (2009) reviewed 72 smoking cessation interventions during pregnancy that employed cognitive behaviour therapy as well as educational and motivational interviewing strategies. Moreover, the review also included interventions using a range of media; studies reporting feedback on foetal health status or measurement of the effects of tobacco smoking on mothers’ health; studies examining the role of rewards and incentives for smoking cessation; studies exploring the effects of pharmacotherapies such as nicotine replacement therapy (NRT), bupropion or other pharmacological agents; and studies featuring hypnosis. The review covered smoking cessation; relapse prevention; smoking reduction; continued smoking cessation in the postnatal period; and perinatal outcomes. There was a high level of heterogeneity among the trial results. The review highlighted that many trials failed to consider relevant health promotion theory and knowledge; the views of women; weight concerns about giving up smoking; or women’s fear that giving up smoking might increase foetal size and risk of hard labour.

Major barriers to the implementation of interventions among health professionals included: lack of time among clinicians; staff attitudes and perceptions about effectiveness of interventions including the lack of staff skills and organisational barriers; and shortage of high quality programs that are acceptable to women. The review concluded that smoking cessation interventions do not appear to be as effective in women because the women feel they are unable to change the environmental factors that increase the risk of smoking. Rather, women feel that some of the interventions are judgmental and alienate them; and contend they are unable to change generational patterns.

Important potential bias in the evidence included misclassification due to using self-reported exposure and absence of biochemical validation. Trials with lowest risk of bias showed a statistically significant (RR 0.97, CI 0.94-0.99) reduction in smoking in late pregnancy. Similarly, there was a reduction in the prevalence of low birth weight as well as in preterm birth by about 15 percent. Eight relapse prevention trials showed no statistically significant reduction in relapse. NRT did not appear to be more effective than any other intervention. Stage-based interventions appeared to be no more effective than unstaged interventions.

Bruvold (1993) reviewed 94 adolescent smoking prevention programs focused at the individual level. This review classified programs according to their primary focus: providing information; skill-building approaches contributing to increased self-esteem, decision-making and interpersonal skills; interventions
designed to address social norms and reduce alienation; and interventions designed around social reinforcement and learning how to recognise and resist pressures to smoke.

Focus on social norms and social reinforcement to resist peer and other pressures to start smoking, accompanied with activities that promoted self-esteem and self-reliance, were among the most effective approaches. The study concluded that effective programs centered on understanding adolescents’ attitudes and beliefs about smoking; and also on the use of experiential learning rather than traditional didactic classroom sessions that revolve around the negative consequences of smoking.

Thomas et al (2015)\textsuperscript{37} reviewed 27 family-based programs for preventing smoking uptake among two cohorts – children between the ages 5-12; and adolescents between the ages 13-18. Studies featured family-based intervention on their own, or as adjuncts to school-based programs. Control groups were either usual care or no intervention. Twenty-three of the trials were from the USA. The quality of evidence was graded as moderate because at least one risk of bias was unclear for most studies. Follow-up varied from six months to 29 years. Interventions typically addressed family functioning (with the intensity grouped as low-3 trials, medium-1 trial or high-7 trials) in order to prevent multiple risky behaviours. All family intervention trials reduced the risk of new smoking compared with controls, with the greatest effect size for the high intensity programs. The common features of high intensity interventions included authoritative parenting expressed through demonstrated interest in and care for the child as well as the rule setting; and support provided by school authorities and management. The latter emphasized empowering parents to positively influence their children’s behaviour. Given the heterogeneity of interventions and settings caution is required in generalising the optimal approach.

Thomas et al (2013)\textsuperscript{38} reviewed 134 studies featuring school-based programs to prevent starting smoking. The study covered two cohorts of children and adolescents (5-12 and 13-18 age groups). The vast majority of studies were from North America or Europe, with just 5 percent from Asia. Participants were grouped by baseline smoking status. According to the standard Cochrane criteria the studies’ bias risk was low. Interventions included:

- Curricula providing basic information,
- School competency curricula featuring life skills such as problem solving and decision-making;
- Cognitive skills for resisting interpersonal or media influences: skills to promote assertiveness, increased self-control and self-esteem; and coping strategies to reduce stress;
- Social influence curricula focused on raising awareness about social influences that support substance use. For example, students learned how to deal with peer pressure and high risk situations; and how to effectively refuse attempts to persuade substance use;
- Multi-media programmes.

The review also considered the effect by gender of peer-led interventions versus those taught by a teacher or researcher; booster versus no post intervention sessions; and tobacco-focused versus tobacco together with other substances such as alcohol and drugs. Children in the intervention groups who were not smoking at the beginning of the trials were less likely to have started smoking after more than 12 months of follow-up, amounting to a 12 percent reduction in risk. The most successful intervention combined social competence and social influence curricula. Peer versus adult lead did not make any difference to the impact of the intervention, nor was there any difference between multi-component interventions and those related to smoking only. After one year, the presence or absence of booster sessions made little difference.

Grimshaw and Stanton (2010)\textsuperscript{39} reviewed trials on the effectiveness of strategies to help adolescents
(under 20 years of age) stop smoking tobacco and prevent relapse. Twenty-four trials with at least six months follow-up were included in the review. Interventions ranged from simple ones including pharmacotherapy, and individual one-on-one sessions with adolescents focusing on self-efficacy or life skills to abstain from tobacco: to programs targeting adolescents’ families or schools; to complex programs targeting the communities. The three studies that explored the effectiveness of pharmacological support showed weak results. The review highlighted the importance of biochemical verification to confirm self-reported smoking status to reduce the impact of over-reporting quitting rates. Approaches emphasizing motivational enhancement were more effective in maintain cessation and abstinence than brief six month interventions. Responding to the underlying driving causes of smoking increases the likelihood the interventions will be effective.

Carson et al (2011) reviewed multi-component community interventions for preventing smoking in young people (under 25 years of age). Twenty-five studies met the inclusion criteria; 13 focused specifically on influencing youth smoking behaviour through tobacco prevention initiatives; 5 included an aim to reduce risk factors for cancer or CVD; 7 covered a combination of reduction or cessation initiatives. The review focused on the Interventions that:

- targeted the entire (or parts of) communities.
- attempted to influence the smoking behaviour of young people.
- included multiple-components featuring school based programs; media promotion - TV, radio, and print; public policy; organisational, health care provider, sports, retailer and workplace initiatives; anti-tobacco contests; and youth anti-smoking clubs.

Brinn et al (2010) systematically reviewed the evidence of the impact of mass media interventions in young people (up to the age of 25 years) to reduce smoking uptake. Mass media is defined here as channels of communication such as television, radio, newspapers, bill boards, posters, leaflets or booklets intended to reach large numbers of people and which are not dependent on person to person contact. Out of 84 studies reporting mass interventions, seven met all the inclusion criteria; four used mass media alone; and three used mass media together with a school based educational component.

Most studies used a social learning theory approach. The follow-up varied from 18 months to six years. Approaches included preventive messages focusing on consequences of smoking disseminated through brochures and/or TV segments; or those messages that encouraged adolescents and youth to quit smoking. School based programs emphasised skills to resist social influences to smoke TV campaigns ran for varying lengths and over varying repeat cycles. Five of the studies purchased advertising time that gave greater scope for control over the messages. Three out of the seven interventions associated with reductions in smoking behaviour lasted over a longer period of time; used multiple channels for media delivery; combined school and media components; and repeated exposure to the same cohort over at least three years. However, all included studies had important limitations. First, blinding was almost impossible in such trials. Second, baseline characteristics between groups differed. Third, while the trials employed several media channel, the majority of studies did not assess the effect of the individual channels on behaviour.

The majority of studies in this review included a two-prong approach: school-based programmes delivered by teachers; and multi-component community interventions. Nine studies also included interventions for alcohol as well as tobacco use. In five studies, community leaders were actively involved in both the development and giving on-going support to the programme. Six studies included components aimed at reducing tobacco sales to minors. Ten out of the 25 studies effectively influenced smoking behaviour in
young people at primary follow-up. Successful interventions tended to be longer than 12 months in duration; involved both teachers and parents; focused on the use of social influences or social learning theory. Projects that failed to have any effects lacked active engagement of community leaders; did not include mass-media interventions; nor explored peer influences to support community interventions. Study limitations include lack of blinding and exposure measurement.

Comprehensive tobacco control programs are cost-effective and evidence based. A review of more than one hundred econometric studies concluded that tobacco taxes and consumption are strongly inversely correlated, particularly in LMICs.

Table 3.1 Summary of tobacco intervention reviews

<table>
<thead>
<tr>
<th>Author/number of studies</th>
<th>Age group/life course stage</th>
<th>Interventions*</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temel et al 2013</td>
<td>WRA</td>
<td><em>Smoking cessation</em> &lt;br&gt;Interventions based on Stages of Change; individual level counselling and handouts</td>
<td>Only 1 trial identified, small hospital based sample with small effects, but suggestion of greater sustained non-smoking in intervention group</td>
</tr>
<tr>
<td>Lumley et al (2009)</td>
<td>Pregnancy</td>
<td><em>Smoking cessation</em> &lt;br&gt;1. Cognitive behaviour therapy, educational and motivational interviewing strategies (using a range of media). &lt;br&gt;2. Interventions based on stages of change (using a range of media). &lt;br&gt;3. Feedback on fetal health status or measurement of byproducts of tobacco smoking on mothers' health. &lt;br&gt;4. Provision of rewards and incentives for smoking cessation. &lt;br&gt;5. Provision of pharmacotherapies &lt;br&gt;6. Other strategies, including hypnosis.</td>
<td>Heterogeneous results and issues with potential bias, particularly in measurement of smoking status. In better controlled studies more positive impact of intervention on smoking cessation-effect size around 6% compared with comparison; ~15% reduction in LBW. Stage of change not more effective than un-staged; NRT not more effective; given difficulties of stopping smoking during pregnancy, better to support smoking control in whole community to reduce initiation. To avoid 'victim-blaming' and compounding of social disadvantage, use non-discriminatory approaches. Suggestion that incentive strategies may be effective</td>
</tr>
<tr>
<td>Bruvold 1993</td>
<td>Adolescents</td>
<td><em>Smoking prevention</em> &lt;br&gt;Four broad types of interventions: (1) providing information; (2) affective education-increasing self-esteem, decision making skills, interpersonal skills; (3) social norms-reduce alienation; (4) social reinforcement-recognise and resist pressures to smoke.</td>
<td>The most effective interventions were those that focused on social reinforcement to resist peer and other pressures to start smoking, together with activities that promoted self-esteem and self-reliance, and that also addressed social norms. Effective programs addressed adolescents' underlying attitudes and beliefs about smoking; and used experiential learning rather than traditional didactic classroom sessions that focus on the negative consequences of smoking.</td>
</tr>
<tr>
<td>Thomas et al</td>
<td>Children (5-14)</td>
<td><em>Smoking prevention</em></td>
<td>All family intervention trials reduced the</td>
</tr>
<tr>
<td>Year</td>
<td>Age Group</td>
<td>Study Title</td>
<td>Prevention/Cessation Methodology</td>
</tr>
<tr>
<td>-------</td>
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<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>2015</td>
<td>12) and young people (13-18)</td>
<td>interventions typically addressed family functioning, with the intensity grouped as low (3 trials), medium (1 trial) or high (7 trials), in order to prevent multiple risky behaviours. With or without school based interventions</td>
<td>risk of new smoking compared with controls, with the greatest effect size for the high intensity programs (16-32% lower risk of new smoking compared with controls). The common feature of high intensity interventions was encouraging authoritative parenting represented by showing an interest in and care for the child, often with rule setting and when supported by schools to help parents think that they could make a difference to their children's behaviour.</td>
</tr>
<tr>
<td>Thomas et al 2013</td>
<td>Children and adolescents</td>
<td>Smoking prevention</td>
<td>Interventions included: information only curricula; school competency curricula; social influence curricula; combined school competence and social influences; and multi-modal programs</td>
</tr>
<tr>
<td>Grimshaw &amp; Stanton 2013</td>
<td>Under 20 years of age</td>
<td>Smoking cessation</td>
<td>Interventions ranged from simple pharmacotherapy, targeting individual adolescents, through strategic programs targeting people or organizations associated with adolescents, to complex programs targeting the community in which adolescents study or live.</td>
</tr>
<tr>
<td>Carson et al 2011</td>
<td>Up to 25 years of age</td>
<td>Smoking cessation</td>
<td>Community Interventions were considered which: a. targeted entire or parts of entire communities or large areas, and; b. had the intention of influencing the smoking behaviour of adolescents, and ; c. focused on more than one community intervention.</td>
</tr>
<tr>
<td>Brinn et al 2010</td>
<td>Up to 25 years of age</td>
<td>Smoking cessation</td>
<td>Mass media Most used a social learning theory approach; Approaches included preventive messages on TV, messages about consequences of smoking, with or without mailed brochures to encourage not to smoke. School based programs</td>
</tr>
<tr>
<td><strong>emphasized skills to resist social influences to smoke supportive by TV segments</strong></td>
<td></td>
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</table>

* The outcome variable is presented in *italics*

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### Summary

Tobacco smoke (smoking and second hand smoke) was responsible for 5.2 million deaths in 1990, rising to 6.1 million deaths in 2013. Tobacco use is a major cause of NCDs worldwide. Children and adolescents should not smoke, or be exposed to second-hand smoke, and they should not be exposed to marketing that encourages and promotes tobacco use. The FCTC provides a powerful policy framework that has been adopted by most countries and which supports a range of actions to reduce the demands for, and supply of, tobacco products, including restrictions on marketing and access, and a range of fiscal policies including pricing and taxation.

#### Women of reproductive age

- Among young women who smoke, cessation programs are more effective if delivered in a non-judgmental and non-patronising way and use incentives and rewards to help women take more control over their behaviour.

#### Children and adolescents

- The most effective programs to stop children and adolescents from taking up tobacco use included approaches that operated from the individual, family, community and policy level in a coherent and consistent way. Characteristics of effective programs included:
  - duration longer than 12 months, with greater intensity, frequent exposure and more contacts at an individual level;
  - involvement of peers, teachers and schools, and parental support in a coordinated and consistent/reinforcing way;
  - use of multiple channels for media delivery;
  - active community participation; reinforcement by policy level actions restricting marketing, access and availability of tobacco;
  - focus on the development of individual skills and confidence in adolescents to resist marketing and peer pressures.

- The most effective interventions at the individual level were those that focused on social reinforcement to resist peer and other pressures to start smoking, together with activities that promoted self-esteem and self-reliance, and that addressed social norms. The effective programs addressed adolescents’ underlying beliefs and attitudes about smoking; and used experiential learning rather than traditional didactic classroom sessions that focused on the negative consequences of smoking.

- Involving families was beneficial in preventing children and adolescents from taking up tobacco use. The most effective family based programs included encouraging parenting. It showed children that their parents cared about them and involved agreeing and setting rules for acceptable family behaviour.

- Schools played a vital role in reinforcing positive messages and skills and competencies to resist the pressures to take up tobacco use. All aspects of school life were important— the environment, the curricula, social influences and peer pressure, and teachers as role models.

- Mass media programs were effective if delivered as part of a coherent package of actions and included support and reinforcement among adolescents not to start using tobacco products. The
provision of information on its own was not effective in keeping adolescents from taking up tobacco use.

- Positive attitudes of health professionals were important in reinforcing the benefits of not using tobacco products, and in supporting quitting in a non-judgmental way.
- Based on only a few studies, pharmacological strategies were not effective in helping adolescents stop smoking.
- The wider policy environment that protects adolescents from the marketing of tobacco and from access to tobacco products is best developed through the implementation and enforcement of FCTC at country level.
3.3 Alcohol

3.3.1 Overview

The “harmful use” of alcohol is defined as drinking that causes detrimental health and social consequences for the drinker, the people around the drinker and society at large, as well as the patterns of drinking that are associated with increased risk of adverse health outcomes. The harmful use of alcohol (in terms of public health effects, without prejudice to religious beliefs or cultural norms), covers the volume of alcohol consumed over time, the pattern of drinking that includes occasional and regular drinking to intoxication, the drinking context, and the quality or contamination of alcoholic beverages. Heavy consumption is considered drinking five or more drinks on the same occasion on each of 5 or more days in the past 30 days.43 Binge drinking is drinking more than 5 or more alcoholic drinks on the same occasion on at least one day in the past 30 days. Moderate drinking is defined as one drink per day for adult women and two drinks for men.

Globally, 320,000 adolescents and young people between the ages 15-29 die annually from alcohol-related causes, resulting in 9 percent of all deaths in that age group. Harmful use of alcohol is the leading risk factor for death in males aged 15–59 years. Alcohol consumption and related harmful health effects increase dramatically between the ages 12-20, with alcohol having a disproportionately adverse effect on brain development in those under 15 years of age; among 15-17 year olds binge drinking is associated with increased risk of unprotected sex, criminal and disorderly behaviour, suicide and self-harm (see Patton et al 2013 for review44).

Adolescents who start to drink alcoholic beverages before 15 years of age are 5 times more likely to abuse or drink excessive amounts of alcohol as adults than those who start drinking as adults. They also experience a wide range of social and health problem.45 Where alcohol consumption is legal, about 42 percent of adults report using it regularly. Rates are highest in Europe and the Americas (above 60 percent and lowest in the Eastern Mediterranean (3.5 percent).46

The highest rates of heavy drinking among adolescents are found in the WHO European Region, WHO Region of the Americas and WHO Western Pacific Region. Heavy episodic drinking is more prevalent among adolescents than among the total population aged 15 years or older in all these WHO regions. In line with sex differences among adults, there are more current drinkers and fewer lifetime abstainers among adolescent males than among adolescent females in all WHO regions. Moreover, there are about three times more young males (16.8 percent) than young females (6.2 percent) who engage in heavy episodic drinking.46

Children and adolescents are typically more vulnerable to alcohol-related harm from a given volume of alcohol than other age groups. Early initiation of use (defined as before 14 years of age) is a predictor of impaired health and is associated with alcohol dependence and abuse at later ages. At least part of the excess risk among adolescents is related to the fact that, typically, a greater proportion of the total alcohol consumed by adolescents is consumed during heavy drinking episodes. Also, adolescents are less risk-averse and may engage in more reckless behaviour while drunk.46

A variety of factors have been identified at the individual and the societal level, which affect the levels and patterns of alcohol consumption and the magnitude of alcohol-related problems in populations. In particular, parental alcohol use disorders negatively affect the family situation during childhood. Parents with alcohol use disorders display particular patterns of alcohol consumption and thereby...
increase the likelihood that their children will develop drinking patterns associated with high risk for alcohol use disorders when they are introduced to alcohol. Heavy drinking by parents affects family functioning, the parent–child relationship and parenting practices, which in turn adversely affects child development. The mistreatment of children, including sexual abuse, physical abuse and neglect, may also lead to childhood psychopathology and later to problem drinking.\textsuperscript{46}

Hughes et al. (2011)\textsuperscript{46} reviewed mainly observational studies to explore the environmental factors (grouped as physical, social and staff factors) in drinking venues that shaped alcohol use in adolescents. Thirty-four separate studies in nine countries were identified. Overall, the research suggested that the environmental setting in which alcohol was consumed had an important influence on consumption, such as a permissive environment, discounted drinks promotions, poor cleanliness, crowding, loud music and poor staff practices within drinking venues.

Exposure of adolescents to alcohol marketing increases the likelihood that they will start drinking, and that those already drinking will increase consumption.\textsuperscript{47} Patil et al. (2014)\textsuperscript{48} assessed exposure to television alcohol advertising on 10-15 year old children in UK, Netherlands and Germany. In the UK and the Netherlands adolescents were exposed to more alcohol advertising per hour than adults, whereas in Germany the opposite was the case. Despite these countries having codes that restrict advertising that appeals to adolescents, most advertising still appears to contain features that continue to appeal to adolescents, suggesting that current advertising regulations are not effective.

\textbf{3.3.2 Review of Interventions}

A substantial scientific knowledge base exists on the effectiveness and cost-effectiveness of strategies and interventions to prevent and reduce alcohol related harm. Yet much of this evidence comes from HICs.\textsuperscript{49}

Temel\textit{et al} (2013)\textsuperscript{35} reviewed interventions related to \textit{women of reproductive age (WRA and alcohol consumption Whitworh and Dowswell (2009)\textsuperscript{50} have reviewed the effectiveness of \textit{pre-pregnancy} health promotion in women of childbearing age including, smoking, drinking excess alcohol and poor nutrition. Both reviews identified one trial which followed heavy drinking, 18-44 aged women throughout their subsequent pregnancy. The intervention included four counselling sessions with personalized feedback using motivational interviewing and content aimed at increasing participant’s self-efficacy to change their behaviour. Women were recruited through six community settings including jails, drug and alcohol treatment centres, suburban primary care, hospital based and through media-recruitment. Over half of the women in both control and intervention groups reduced their alcohol consumption, although more women in the intervention group reduced their consumption. Its effects were significant (~69 percent in intervention group and ~54 percent in control group) post nine months of the intervention in a self-reported feedback.\textsuperscript{51}

Gilinsky\textit{et al} 2011\textsuperscript{52} systematically reviewed \textit{alcohol reduction interventions delivered during pregnancy. O’Donnell et al (2013)\textsuperscript{53} reviewed 24 systematic reviews (including the Gilinsky \textit{et al} 2011 review cited above) of \textit{brief alcohol interventions in primary care} in all age groups. The Gilinsky \textit{et al} 2011\textsuperscript{52} review followed up on an earlier Cochrane review. Eight trials were included in the review, including six RCTs and two non-RCTs. Risk of bias was assessed in each study and six were considered to be at high risk of bias. Interventions included brief interventions, motivational interviewing, a self-help manual, supportive counselling, high feedback ultrasound and basic educational interventions. In general, methodological quality in all but two studies was poor. In the better quality studies there was some evidence that face-to-face brief single-session interventions resulted in positive effects on the maintenance of alcohol abstinence during pregnancy. Women choosing abstinence as their drinking goals and heavier drinking women who
participated with a partner were more likely to be abstinent at follow-up.

Emmers et al (2015) analysed 21 systematic reviews (interventions designed to address alcohol and drug abuse among adolescents between 12 and 18 years of age. Of those, 9 reviews featured school-based programmes; 4 described community-based interventions; 4 introduced family-based interventions; and two described interventions with multiple components. The authors found it difficult to provide overall summary estimates of reviews because of the variety of outcome measures used and reported; and a lack of quantitative measures. Seven of the nine systematic reviews set in schools were considered to be of poor quality and of limited value in drawing conclusions. The two stronger reviews, featured the following:

- skill-building interventions, aimed to enhance students' abilities in general, with specific focus on refusal, and safety skills;
- interventions aimed to strengthen self-esteem and self-efficacy; as well as those dealing with motivational aspects such as the intention to use drugs;
- interventions aimed to enhance knowledge about drug use and its consequences

The programs that focused on social skills strengthening as opposed to usual curricula or knowledge focused interventions were more effective and led to greater prevention of early drug use.

A review by Carney et al. (2014) reviewed six brief school-based interventions to reduce consumption for substance-use (including alcohol and tobacco) among adolescents between 15 and 18 years of age. The interventions were brief, targeted, and time-limited and delivered in person. They focused on the provision of information and aimed to increase motivation not to use the substance. Successful brief interventions have included: feedback; developing individual responsibility and self-efficacy; as well as advice and menu of options for change. Brief interventions were shown to be more effective than providing information alone in reducing alcohol consumption.

Emmers et al (2015) analysed four reviews of family-based programs. Foxcroft et al (2011) reviewed 10 trials evaluating family-based prevention programs featuring psychosocial and educational components aimed at those under 18 years of age. Psychosocial interventions focused on changing behaviour norms and skill development to strengthen adolescents’ ability to resist peer pressure. The programmes with educational components focused on raising parental awareness about potential dangers of alcohol misuse as well as on ways as to how they can positively influence adolescents. Nine of the ten trials showed small statistically significant greater reduction in alcohol use in the intervention group compared with controls (follow-up ranged from 2 months to 8 years). The authors concluded, however, that there is insufficient clear evidence as to whether the programme content and/or delivery context was more influential in affecting behaviour.

Gates et al (2006) reviewed 49 RCTs of prevention of drug use in adolescents (under 25 years) in non-school settings, either with or without a school-based comparison group. The types of interventions included training workshops for community leaders; community mobilization to engage in drug prevention activities; media releases; youth action teams; and parent support programs. Brief interventions were found to be effective, but they found no clear evidence for educational and skills training interventions. Thomas et al reviewed four trials (all based in the USA) of mentoring to reduce alcohol and drug use in adolescents. Participants were recruited through either schools or community organizations. The pooled results for alcohol suggested that mentoring reduced alcohol consumption. Altena et al (2010) reviewed trials in homeless adolescents; results were inconclusive. Werb et al. (2011) reviewed seven trials of public service announcement (PSA) of anti-illicit drug use. A meta-analysis showed no significant effects of
the PSA. There was even some suggestion of increased intention to drug use as a result of exposure to the PSAs.

Emmers et al (2015) identified two high quality reviews of multi-component interventions (Gates et al; Foxcroft and Tsertsavadze (2011b)). The reviews highlighted that the quality of evidence was poor and conclusions could not be drawn.

Patton et al (2013) reviewed the effectiveness of alcohol screening and brief interventions for reducing alcohol consumption in adolescents. The interventions encompassed a range of therapeutic processes from providing advice to extended counselling, were typically delivered in short sessions on one or more occasions. The most recent of these have focused on the use of internet, computer and mobile phone technologies, collectively referred to as electronic brief interventions. Seven trials recruited subjects from a range of settings: emergency departments in hospitals, primary care services; and homeless adolescents. Brief interventions in primary care using motivational interviewing appears to be effective, but it is not yet clear whether web-based or face-to-face interviews are even more effective. The authors concluded that there are no clear indications as to which target population setting screening tool or intervention approach should be recommended.

Kohler and Hofman (2015) reviewed the effectiveness of brief motivation interviewing interventions to reduce alcohol consumption in an accident and emergency department/emergency care contact. The control comparison was either usual care or written information without further intervention. The review included six trials in adolescents and young people between 13 and 25 years of age, with a varied follow-up from three to 12 months. In two trials the intervention group also received ‘booster’ phone calls after 10 days or after one and three months. A variety of different self-reported outcomes were used to measure alcohol consumption. The quality of the studies varied from poor to good. Only two of the six trials showed that motivational interventions were more efficacious in reducing alcohol consumption than other brief interventions in emergency care. Initial declines in alcohol consumption in intervention and control groups were not sustained when followed for longer than a few months.

Hindmarsh et al (2015) reviewed ten interventions in eight studies (seven in the USA) assessing the impact of media literacy skills. The skills aimed to enhance adolescents’ cognition, attitudes and behavioural intentions around alcohol use. The sample included 6-12 year old children and adolescents in school settings. The authors concluded that there was a lack standardization regarding approaches, applications and evaluations of curricula. Despite this heterogeneity, the review noted a positive impact of most studies.

Guiding principles for the development and implementation of alcohol policies at all levels have been developed and agreed. The WHO Global Strategy to reduce harmful use of alcohol highlights ten recommended target areas for national action. Key among these are: community action; availability of alcohol, marketing of alcoholic beverages; and pricing policies. These priorities are supported by US Surgeon General report, with particular emphasis on increasing the legal age of drinking alcohol. One of the key policy options is to establish appropriate minimum age for purchase or consumption of alcoholic beverages and polices to raise barriers against sales to, and consumption of alcoholic beverages, by adolescents. In addition, polices should prevent sales to those below the legal age and introduce mechanisms for placing liability on sellers and servers to adolescents.
The evidence shows that controlled trials of community action projects using multicomponent approaches were effective in reducing alcohol-related harm. These approaches focused on reducing physical availability of alcohol and increased enforcement of laws on under age purchase and drunk driving. Alcohol is marketed through a wide range of cross-border advertising and promotional techniques that are hard to regulate. A precautionary approach to protecting adolescents against these marketing techniques should be considered.

### Table 3.2 Summary of alcohol intervention reviews.

<table>
<thead>
<tr>
<th>Author /number of studies</th>
<th>Age group</th>
<th>Interventions*</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temel et al 2013</td>
<td>WRA</td>
<td>Counselling sessions among heavy drinkers using feedback and motivational interviewing</td>
<td>Motivational interviewing helped reduce consumption</td>
</tr>
<tr>
<td>Gilinsky et al 2011</td>
<td>Pregnancy</td>
<td>Brief intervention in primary care; motivational interviewing; self-help manual;</td>
<td>Single face-to-face brief interventions sustained abstinence; support from partners important</td>
</tr>
</tbody>
</table>
| Emmers et al 2015 Review of reviews | 12-18 years | School based Family based Community based
1. skills focused, aimed to enhance students’ abilities in general, refusal, and safety skills;
2. affective focused, aimed to modify inner qualities (personality traits such as self-esteem and self-efficacy, and motivational aspects such as the intention to use drugs);
3. knowledge focused programs, aimed to enhance knowledge, effects, and consequences of drug use; and (iv) usual curricula. Public service announcements (PSAs) | School based more effective when delivered by peers using comprehensive and skills based approach to strengthen self-esteem, decision making and interpersonal skills. Public service announcements were not useful for the prevention of alcohol and drug misuse among adolescents |
| Carney et al 2014         | 15-18 years | School based: substance abuse generally; brief interventions: feedback; developing individual responsibility; advice for change; menu of options for change; empathy; and self-efficacy for change | Brief interventions that provide feedback, increase empathy and strengthen self-esteem and decision making to resist peer and other pressures were more effective than providing information alone |
| Paton et al 2013          | <18 years  | Alcohol screening and brief electronic interventions; advice to extensive counselling; using internet and computer games; motivational interviewing in primary care | Primary care based motivational interviewing effective; not clear whether web-based or face-to-face more effective |
Summary
Alcohol use was responsible for nearly 2 million deaths in 1990, rising to 2.8 million in 2013, an age adjusted increase of 11 percent. The “harmful use” of alcohol is defined as drinking that causes detrimental health and social consequences for the drinker, the people around the drinker and society at large, as well as the patterns of drinking that are associated with increased risk of adverse health outcomes. Heavy consumption is drinking five or more drinks on one occasion.

Key effective policy options to reduce harmful use of alcohol in adolescents include:
- Establishing appropriate minimum age for purchase or consumption of alcoholic beverages;
- Policies to raise barriers against sales to, and consumption of alcoholic beverages, by adolescents including pricing policies;
- Policies to prevent sales of alcohol to those below the legal age and to introduce mechanisms for placing liability on sellers and servers to adolescents;
- Policies banning all forms of marketing of alcoholic beverages to those below the legal age.

Overall, the reviews of interventions pointed to the generally poor quality of evidence available to make firm conclusions as to which actions were most effective in delaying and then limiting the use of alcohol in adolescents. Interpretation of reviews was hampered by the heterogeneity of populations, interventions and outcomes, and the poor reporting of outcomes in the individual studies included in each review.

Women of reproductive age
- Counselling improved women’s self-confidence in their ability to control their behaviour were highly effective.
- Among heavy drinkers, counselling sessions using feedback and motivational interviewing led to reduced alcohol consumption.
- Brief one-to-one interventions in primary care using motivational interviewing and using a self-help manual and with support from partners, helped sustain abstinence during pregnancy.

Children and adolescents
- The most effective programmes in school settings aimed at fostering adolescents’ decision making skills to understand and resist social influences such as peer pressure either through raising awareness of harms, or through skill-based curricula.
- Programs that strengthened social skills were more effective than usual curricula or knowledge-focused interventions and led to greater prevention of early drug use.
- There was limited evidence to assess the impact of family and community based programs on reducing alcohol use in adolescents. It was suggested that brief interventions focused on providing feedback; developing individual responsibility and self-efficacy for change; advice and menu of options for change;) may be more effective than providing information alone in reducing alcohol consumption. There was limited evidence on the role of families in helping children and

3 A & E accident and emergency care setting in hospital
* Setting of the interventions in italics
adolescents to resist peer pressures to start consuming alcohol. However, this support should still be considered as part of any coherent strategy.

3.3. Being physically active

3.3.1 Overview

Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure. It is recommended that adolescents engage in at least 60 minutes of moderate to vigorous intensity physical activity each day. Sedentary behaviour refers to activities that require very low energy expenditure and where sitting or lying is the dominant posture. Until recently, it was considered that sedentary behaviour was the same as low levels of physical activity. However it is possible to meet or even exceed the activity guidelines and still spend a large amount of time being sedentary. Studies in children under the age 11; and adolescents between the ages 12-18 showed a small negative association between sedentary behaviours and physical activity.

The levels of physical inactivity have increased rapidly in most countries over the last two decades. About 60 percent of the global population is not active enough, and 1.9 million deaths are attributable to physical inactivity. Adolescents who were highly sedentary had greater fat mass, higher BMI and increased risk of being obese, irrespective of their level of physical activity when not sedentary. As urbanization increases there is a need to ensure adolescents have the opportunity to be appropriately physically active.

De Vet et al. (2011) analysed 12 reviews of observational studies of the environmental correlates of physical activity in adolescents. The reviews covered 439 individual studies. The analysis focused on interpersonal, school, neighbourhood, and macro-societal factors. Seven of the 12 physical activity reviews were considered of good quality. Neighbourhood appearance, availability of facilities and general accessibility were positively related to physical activity. Exercise culture was positively related to physical activity in adolescents. The authors suggested that parental activity is a stronger predictor of childhood activity, than that in adolescence. Overall, physical activity during adolescence is more consistently influenced by characteristics of the school and community environment than by features of the interpersonal environment. This may partly be explained by the fact that many physical activities occur outside the home environment. It may be that families select those schools and neighbourhoods to live in that provide greater support for physical activities.

Edwardson and Gorley (2010) reviewed 96 observational studies on the parental influences on type and intensities of physical activity in adolescents. Of this, 36 studies covered the cohort between the ages 6-11; 55 studies focused on adolescents between the ages 12-18 years; and five covered both cohorts. Few studies used objective measures of physical activity. Parents had an important influence on the activity of young children, but less so for adolescents. Young children were more likely to be active if their parents were also active, and if they encouraged and supported their child to be physically active (i.e. by providing transport). Even though parental influences may be weaker in adolescence, parents were still important in supporting and enabling adolescents to be active.

3.3.2 Interventions

This section focus on reviews of studies that were aimed at improving levels of physical activity (PA) or sedentary behaviour (studies that focused on BMI as an outcome are summarized in section 3.5 below).

Interventions can be grouped into those that attempt to promote increased physical activity and those that attempt to reduce sedentary behaviour. The vast majority of the studies conducted to date have been in...
HICs, with only a few in Mexico or Latin America. Many of the trials undertaken have used schools as a setting to engage with children, and as a point of access to communities. The school-based interventions were often part of a multi-component/multi-risk factor intervention where it was not always possible to disentangle the specific factors that affected levels of physical activity or sedentary behaviour.

Gilinsky et al (2015)\textsuperscript{79} reviewed the efficacy of behaviour change techniques (BCT) for physical activity interventions designed for mothers in the immediate post-natal period. The interventions involved healthy inactive, overweight, low-income, first-time mothers, recruited within community settings, not hospitals. Majority of the studies focused on improving walking behaviour mostly through face-to-face counselling, follow-up support calls, SMS-texts, DVDs and print materials. Activity was generally measured using participant recall; only two studies used an objective measure. Overall methodological quality was poor, with 9 out of 13 studies having a high risk of bias.

Kader et al (2015)\textsuperscript{80} reviewed the effectiveness of interventions addressing dietary habits, physical activity and bodyweight. Four intervention types were identified: face-to-face counselling, group education, information sent home, and telephone counselling. The quality of these studies was poor and provided limited evidence for the effect of parental involvement on either PA or sedentary behaviour.

Metcalf and colleagues (2012)\textsuperscript{81} reviewed 30 school or home-based studies on interventions designed to increase physical activity in children under the age of 16. The review selected studies on interventions that lasted at least 4 weeks and which used an accelerometer to measure outcomes. Nineteen of the studies provided activity/exercise sessions as part of the intervention. Interventions had a small effect on levels of activity, a little more so in overweight children. Baseline characteristics did not explain any heterogeneity of the effects of the intervention.

Reviews of interventions designed to increase physical activity in girls (Biddle et al 2014\textsuperscript{82}; and Pearson et al 2015\textsuperscript{83}) both showed weak but significant effects of the interventions. The former focused on girls under the age 11 while the latter covered the 11-18 age group. Interventions were grouped around educational, environmental or multicomponent aspects. Some of the interventions combined 4 week summer camp exercise with 8 week home programme while other mixed weekly exercise sessions. The reviews also featured interventions on the environmental opportunities to be active; funding to redesign school playground; more school time for physical activity; intensive education; training for school staff to support children to be active; and those that focused on weekly community meetings. Both reviews used Cochrane Collaboration tool for assessing risk of bias to assess the studies reviewed. Results were heterogeneous. The analysis of girls’ cohort under the age 11 suggested that interventions were more effective when they engaged girls only and lasted a short period of time. Overall, theory driven, school-based interventions, that targeted both physical activity and sedentary behaviour were more effective in both age groups.

Atkin et al (2011)\textsuperscript{84} reviewed interventions to promote physical activity after school in adolescents under 18 years of age. The National Institute for Health and Clinical Excellence guidelines informed the review.\textsuperscript{85} The review included nine studies, seven conducted in the USA; six of these targeted the African-American population. The results suggested that after school activity interventions were not effective in increasing levels of physical activity, although flaws in the methodology such as uncertain implementation and weak measurements limited researchers’ ability to draw clear conclusions.
Biddle et al (2014a) analysed ten reviews of interventions aimed at reducing sedentary behaviour. The lack of standard definitions of sedentary behaviour made pooling results from different studies difficult. Interventions were grouped according to the following criteria: information delivery; provision of behavioural, environmental, or social support; and settings (family/home, community, school, primary care). Family involvement appeared to have enhanced the effect of interventions when compared to those focused on the child alone. Most interventions had a short-term effect which tended to diminish over time without reinforcement. Many of the interventions involved helping children set their own goals around screen time, TV viewing plans, and alternate activities. The use of an electronic device to control screen time helped reinforce family rules. Interventions among young children (below the age of six) appeared to be more effective than for older children.

Table 3.3 Summary of physical activity intervention reviews based on good quality studies.

<table>
<thead>
<tr>
<th>Author /number of studies</th>
<th>Age group</th>
<th>Interventions*</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metcalf 2012</td>
<td>Under 16 years</td>
<td>Physical activity: School/home based: Included activity sessions; objectively measured activity as inclusion criteria</td>
<td>Including activity sessions increased overall activity levels</td>
</tr>
<tr>
<td>Biddle et al 2014 &amp; Pearson et al 2015</td>
<td>&lt;11; 11-18 year olds</td>
<td>Physical activity in girls Interventions were grouped into those that focused on education, environmental or multicomponent, including mix of summer camps and home programs; school staff training; weekly community meetings</td>
<td>Interventions were more effective when given to girls on their own (not with boys) and of short duration. Among both young and adolescent girls sub-group analyses suggested that interventions that are multicomponent, theory based, school based, and that target both physical activity and sedentary behavior were more effective.</td>
</tr>
<tr>
<td>Biddle et al 2014</td>
<td>adolescents</td>
<td>Sedentary behavior Interventions were grouped as being either: about giving information; behavioral; environmental or social support and were delivered through a variety of settings</td>
<td>Many of the interventions involved helping children set their own goals around screen time, and TV viewing plans, and setting alternate activities. Using an electronic device to control screen time helped reinforce family rules about screen time. Interventions among children younger than six years appeared to be more effective than those targeting older children.</td>
</tr>
</tbody>
</table>

* The outcome variable is presented in italics

Summary

Physical activity

The levels of physical inactivity have increased rapidly in most countries over the last two decades. However, about 60 percent of the global population is not active enough, and 1.9 million deaths are attributable to physical inactivity. Adolescents who are highly sedentary have greater fat mass, higher BMI and increased risk of being obese, irrespective of their level of physical activity when not sedentary.
Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure. It is recommended that adolescents do at least 60 minutes each day of moderate to vigorous intensity physical activity. Sedentary behaviour refers to activities that require very little energy expenditure and where sitting or lying is the dominant posture. Until recently, sedentary behaviour was considered equal to low levels of physical activity. However, it is possible to meet or even exceed the activity guidelines and still spend a significant amount of time being sedentary.

To be more active, children and adolescents need locally accessible safe places to play. The facilities should be affordable for all children, culturally sensitive, and provide opportunities for after school activities including during weekends. Access to and use of opportunities to be active need to be backed up by support from schools, families and communities. The drivers of active and sedentary behaviours may differ and hence require diverse approaches to achieve beneficial changes in behaviour.

The reviews highlighted several methodological limitations in the studies that were analysed such as the lack of consistency in the way exposure and the intervention were measured and delivered; variety of approaches; as well as the use of different outcome measures to assess the intervention impact.

**Women of reproductive age**
- The evidence about the impact of programmes promoting physical activity and reducing sedentary behaviours for women of reproductive age was limited.
- Support for self-regulatory strategies such as goal setting and self-monitoring were most effective in stimulating greater activity.
- Information alone, and programs that focused on weight control, were not as effective in motivating increased physical activity.

**Children and adolescents**
- Young children were more receptive to programs to increase physical activity than older children and adolescents. Short Interventions delivered to younger girls on their own were more effective when boys were not present.
- Programs that included activity sessions either in schools, at home or in the community were more effective than education or information alone.
- Programs that addressed physical activity and sedentary behaviour at the same time were more effective than when either were addressed on their own.
- Schools had a key role to play in promoting and supporting increased physical activity. This included creating an enabling physical environment; developing curricula that support the benefits of physical activity together with more opportunities to be active during the school day; and using staff as role models.
- Young children were more likely to be active if their parents were also active; and in situations where they were encouraged and supported to be active (getting access to transport). Even though parental influences may be weaker in older children, parents were still important in supporting and enabling adolescents to be active.
- The most effective approach to reduce sedentary behaviour appeared to be a combination of information, behavioural, environmental, and social support delivered in consistent ways across settings (family/home; school and community).
- Reduction in sedentary behaviour was greatest where children set their own goals around screen time and TV viewing plans, and where these goals were supported and reinforced by family rules and electronic devices to control screen time.
3.4 Healthy eating

3.4.1 Overview

A healthy diet protects against all forms of malnutrition. The exact make-up of a diversified, balanced and healthy diet varies according to individual needs, cultural context, local availability and dietary customs. WHO has recently defined a set of guidelines what should constitute a healthy diet in broad terms.\(^\text{87}\)

A healthy diet starts with exclusive breastfeeding for the first six months of life. Breastfeeding should continue throughout the first two years of life. Starting at 6 months, infants can be introduced to a variety of family foods; by the age of two, a child should eat the same foods as the rest of the family.\(^\text{8}\) A healthy diet after weaning includes: consumption of fruits, vegetables, legumes, nuts and whole grains; less than 10 percent % (ideally less than 5 percent) total energy from free sugars; less than 30 percent of total energy from fats, and less than 5 grams of salt a day.\(^\text{88}\)

Dietary patterns are changing across the world with rapid urbanization and increased consumption of highly processed foods and beverages. People are now consuming more foods high in energy, fats, free/added sugars and salt, and not enough fruit, vegetables and dietary fibre.\(^\text{88}\) Unhealthy diets are now the leading cause of deaths and DALYS related to NCDs. They are also linked to persistent and high rates of hunger, wasting and stunting in children and micronutrient deficiencies in children and WRA. There is now strong evidence linking maternal and early childhood undernutrition with subsequent infant and childhood growth with long-term risk of metabolic and cardiovascular diseases. Children who are undernourished in the first 2 years of life and who put on weight rapidly later in childhood and in adolescence are at high risk of cardiovascular and metabolic disease in adulthood.\(^\text{88}\)

Ranges of modifiable factors were reported to be associated with higher intakes of fruit and vegetables (F & V) in children and adolescents (6-18 years).\(^\text{89}\) The Pro Children Project developed a conceptual framework and grouped determinants into proximal and distal factors operating at the following levels:

- cultural (focus on country level, and specifically on ethnicity, socio-economic status),
- physical (focus on national level policies and guidelines; community level polices and access; school level policies including school meals and access; availability of healthy food at home and school),
- social environmental level (including exposure to mass media; and focus on behavioural norms among pupils, peer pressures, and other family factors),
- personal level (focused on knowledge, attitudes, behaviours, preferences and intentions).

Fruit and vegetables intakes decline with age and tend to be lower in boys and in lower socio-economic groups. Parental intake and the home environment are important determinants of consumption.

De Vet et al (2011)\(^\text{90}\) have analysed observational studies of the environmental correlates of diet at interpersonal school neighbourhood societal and macro level. Altogether the analysis covered seven reviews featuring 232 unique studies in adolescents under 18 years of age. Five of the seven reviews were

\(^4\) The Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition sets out clear targets and actions to reduce childhood stunting, anaemia in WRA, low birth weight, overweight in children, promotion of breastfeeding

\(^8\) The Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition sets out clear targets and actions to reduce childhood stunting, anaemia in WRA, low birth weight, overweight in children, promotion of breastfeeding
rated as good quality reviews. Overall, the observational studies suggested that healthy eating goes hand in hand with having a positive family atmosphere, in which parents give the right example, have a good understanding of their children’s lives and parents and children feel emotionally connected. Higher exposure to food advertising/marketing was associated with poorer diet quality.

Consumption of sugar-sweetened beverages (SSBs) in young children was strongly influenced by exposure to multi-media promoting consumption. The influence was particularly strong in children from lower socio-economic group families; and in cases where families did not provide positive role models for children to follow. The school environment also had a key role in shaping exposure to SSBs and consumption.

In 2006, the Institute of Medicine (IOM) of the National Academies concluded that food marketing is a risk factor for unhealthy diets and contributes to childhood obesity. In the US 40 percent of all food and beverage TV ads viewed by children are for snack foods. Hingle et al. (2015) recently compared children’s food advertising with proposed US government guidelines on marketing to children. Based on a sample of 103 children’s TV programs aired between February and April 2013, the sample contained 354 ads. Overall 1.4 percent of all children targeted ads met all aspects of the new guidelines with respect to the limits set on levels of trans fats, saturated fats, added sugar, and salt contained in foods advertised to children. Kelly et al. (2015) have recently reviewed the impact of ‘new media’ - digital technologies, internet and mobile devices on the diets of children, noting marketing shifts from traditional TV ads to these new approaches. These new methods include facilitation of peer endorsements of brands; embedding new media advertisement in activities such as gaming and dedicating web pages for brands all targeted in engaging children for an extended time. This diversification of messages enhances issues in recognising advertising content and has a higher probability of surpassing parental surveillance.

3.4.2. Interventions

The interventions covered in this section focus on those studies aimed at improving dietary consumption patterns (studies that focused on achieving changes in body weight or BMI as a result of dietary change with or without PA change, are covered in section 3.5 below)

Baird et al (2009) analysed six systematic reviews aimed at improving the diet among WRA. Dietary reviews focused on knowledge and attitudes; consumption of fruits and vegetables; healthy eating in general; and diet and smoking. The majority of studies reviewed came from the USA; three focused on disadvantaged groups. The interventions centered around goal setting and self-monitoring, as well as education and counselling. The focus was mainly on school setting, however, the interventions also targeted families and general populations. Four aspects of intervention design were effective at changing one or more of the health behaviours: 1) the use of an educational component; 2) provision of continued support after the initial intervention; 3) family involvement; and 4) social support from peers or lay health workers.

The short-term benefits of exclusive breastfeeding for six months have been well established and agreed internationally, particularly for lowering risk of death from infectious diseases in infants in LMICs. Breastfeeding is also good for the mother. Horta and Victora (2013) have reviewed the long-term effects of breastfeeding. The analysis of three interventions promoting breastfeeding showed that in disadvantaged communities one-to-one counselling and professional support were effective in improving initiation and prolonging breastfeeding rates (Baird et al. 2009). Recording exclusive breastfeeding accurately, as well as duration of feeding presented challenges, particularly in methods that relied on recall. Most of the long-term follow-up studies included in this review were conducted in HICs. Horta and
Victora studied 71 papers that analyzed obesity as an outcome. Basing their findings only on quality studies with low risk of bias, the authors concluded that the prevalence of overweight or obesity was 10 percent lower in children exposed to longer durations of breastfeeding. The review also showed that breastfeed children had lower blood pressure and type -2 diabetes rates at follow-up. The review found no evidence for an effect of breastfeeding on total cholesterol.

Bell and Golley (2015) reviewed interventions for improving young children’s dietary intake through early childhood settings. The review included 26 studies (14 weak, 12 moderate quality). A characteristic of these settings was the combination of the provision of meals to meet 50 percent of children’s daily needs, staff training and the creation of a supportive environment. Improving the knowledge, attitudes and skills of parents and care-providers had a positive effect on the quality of foods provided in these early childhood settings.

Paes et al (2015) identified 13 intervention studies in their review of the determinants of SSBs consumption in young children including preschool and childcare settings for children up to age 7. Four studies were conducted in USA; 4 in Australia; 4 in Europe; and 1 in Asia. Of this, five were rated as high quality. Eight trials targeted multi-level determinants; four targeted parental determinants; and two targeted reduced SSBs consumption. Interventions that operated at all levels of the socio-ecological model were most effective. Positive parental modelling and feeding practices and reducing TV viewing time positively influenced SSB consumption in young children.

Dudley et al (2015) reviewed trials of different teaching strategies on reduced food or energy consumption; increased fruit and vegetable consumption or preference; reduced sugar consumption or preference; and increased nutrition knowledge in primary schools. Forty-nine studies were included and quality assessed following best practice guidelines for reviews. Of the total batch, one study was RCT; 13 were quasi-experimental; and 34 were cluster randomised. The review covered studies from 13 countries (12 in HICs; half the studies were conducted in USA, 7 in UK) Eight teaching strategies were commonly used across studies: enhanced curriculum approaches; cross-curricula approaches; parental involvement; experimental learning approaches; contingent reinforcement approaches; literary extraction approaches; games-based approaches; web-based approaches. There was a lot of heterogeneity across studies in the design and implementation of interventions. Across the four outcomes reviewed, experiential learning approaches had the greatest effect on reducing food consumption, energy intake, and nutritional knowledge. For fruit and vegetables, cross-curricular and quality curriculum interventions were effective. The effects of contingent reinforcement and parental involvement were considered promising but lacked sufficient data to be confident of their benefits.

Cushing et al (2014) reviewed health promotion interventions in healthy adolescents of either diet, physical activity and tobacco use, either singly or collectively. Eighty-nine studies were identified that fitted the inclusion and exclusion criteria, and the quality of studies was reviewed. In aggregate, the review concluded that health promotion interventions were effective (although the size of the effect was small), and that it was important to focus on both individual and ecological level interventions, addressing capability, opportunity and motivation to achieve a healthy diet.

Evans et al (2012) reviewed trials in primary schools to promote fruit and vegetable consumption. Twenty-seven programs were identified; the quality of the studies was generally poor. Based on a meta-analysis of 21 of the studies among children between ages 5 and 12 average portion size increased by 0.25 of a portion after intervention, mainly due to increases in fruit consumption. Studies
using multi-component programs showed greater effects on consumption than single-component programs. It was not clear to what extent poor implementation and compliance were responsible for relatively weak effects. Schemes that distributed fruit and vegetables to children in schools, either free or at marginal costs improved consumption, although they may to some extent displace fruit eaten at home.

Bourke et al (2014) found that three out of seven trials aiming to increase fruit and vegetable intake actually achieved statistically significant increases in intake. The most effective intervention targeted school, home, and community settings and addressed education, parental support and the food environment.

Kader et al (2015) reviewed the effectiveness of 35 trials of parental support interventions using face-to-face counselling (13 studies), group education (9 studies), information sent home (9 studies), and telephone counselling (4 studies). Fifteen trials assessed diet as an outcome; 10 diet and physical activity, 5 PA and sedentaryism, and 5 overweight. Nine studies were conducted in home, 9 in schools, 10 in childcare, and 7 in communities. Fifteen studies were in 2-5 year olds, 10 in 6-11 year olds, and 5 in 12-18 year olds. Of the 25 studies that included diet individual counselling was most effective, followed by group counselling to involve parents. Sending home newsletters or health information packs were least effective. Taking study quality into account did not alter the conclusions reached.

A wide range of approaches have been proposed to reduce children’s exposure to commercial marketing, given the strong evidence linking exposure to consumption patterns, and the predominance of unhealthy foods in the marketing aimed at children. Interventions show that reduced marketing exposure reduces consumption of the marketed foods. Harris et al (2009) reviewed the range of possible approaches: ranging from doing nothing to national regulations and international rules through, for example, Codex alimentarius and through the World trade Organization.

Most reviews of the evidence have shown that voluntary codes and self-regulation are relatively ineffective compared with statutory regulation. Chambers et al identified 19 reviews of statutory actions, 25 of various self-regulatory approaches, and six using an educational approach. The outcomes were to assess the effectiveness of these actions on the impact of children’s exposure to advertising of foods high in fat, sugar and salt (HFSS). Statutory actions included total bans on all advertising, and bans on advertising of HFSS foods during specified hours, length of advertising. Self-regulation actions included voluntary codes not to advertise HFSS food during children’s programs or directly to children under 12 years of age. Six studies reported on educational measures to curb the influence of advertising of HFSS foods, including media literacy with parents and children, and parental communication about advertising Voluntary codes included. The designs of the studies varied from controlled trials, to quasi-experimental studies to using commercial data on advertising monitoring, to studies based on modelling. Overall, the review showed that statutory approaches were most effective in reducing the exposure and impact of advertising of HFSS foods.

The review highlighted results from Quebec where a total ban is in place, but noted that children are still exposed to adverts of HFSS. Educational actions also positively affected children’s beliefs regarding food advertising. The majority of studies carried out by academics or other independent bodies showed that self-regulation was ineffective in reducing exposure to HFSS foods, whereas the seven studies conducted by food industry representatives all showed positive effects of self-regulation on all outcomes.

• In May 2010, the World Health Assembly (WHA), through resolution WHA 63.14, endorsed a set of recommendations on the marketing of foods and non-alcoholic beverages to children. WHO in
2012 prepared a framework for implementing the set of recommendations on the marketing of foods and non-alcoholic beverages to children. The interagency working group from the USA has recently proposed principles for the marketing of foods to children and adolescents between ages 2-17. Key recommendations for consideration (as they are not yet ratified by government as of 2015) include the following principles: food marketed to children should provide a meaningful contribution to a healthful diet; food markets to children should be formulated to minimize the content of nutrients that could have a negative impact on health or weight (with recommended limits for saturated fat, trans fats, added sugars, and sodium).

A WHO Europe report has recently summarized available evidence for the effectiveness of pricing policies on consumption and health. Data from experimental choice studies and randomized controlled trials demonstrate that consumers can be highly responsive to food prices and that taxation (aimed at increasing prices of unhealthy foods) and subsidies (to make healthy foods cheaper), either alone or together, are both effective means of influencing consumption of targeted foods. HFSS food products, and for which there are healthier substitutes are most often recommended for increased taxation. Soft drink taxes, and targeted subsidies on fruits and vegetables appear to be the most effective measures in inducing changes in consumption.

Price elasticity of demand vary according to people’s preferences and habits. People with less available income spend a greater proportion of their income on food and are thus more affected by price increases. Systematic reviews of the modelling evidence showed an overall improved food and nutrient consumption and health benefits for low socioeconomic groups, indicating that taxes have the potential to reduce inequalities in health outcomes.

After reviewing all the available evidence the WHO Europe report draws the following conclusions: (1) price policies influence what people buy; (2) the primary effect is to influence point-of-purchase decision-making; (3) the effects of taxes and subsidies depend on the way they are designed; (4) taxes are more effective when applied to non-core foods for which there are close untaxed healthy alternatives; (5) targeted subsidies on fruits and vegetables are effective at increasing consumption; (6) the size of the tax may be critical; (7) the relative impact of taxes may be greater in low SES groups and may thus reduce health inequalities.

Table 3.4. Summary of healthy eating intervention reviews based on good quality studies.

<table>
<thead>
<tr>
<th>Author /number of studies</th>
<th>Age group</th>
<th>Interventions*</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baird et al 2009</td>
<td>WRA; focus on disadvantaged communities</td>
<td>A variety of interventions for diet and breastfeeding Predominately focusing on goal setting and self-monitoring, as well as education and counselling</td>
<td>Effective intervention included: 1) the use of an educational component; 2) provision of continued support after the initial intervention; 3) family involvement; and 4) social support from peers or lay health workers. One-to-one counselling and professional support critical to promote breastfeeding</td>
</tr>
<tr>
<td>Study</td>
<td>Age Range</td>
<td>Intervention</td>
<td>Outcome</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Horta &amp; Victora 2013</td>
<td>&lt; 6 year olds</td>
<td>Education component; social support from peers and lay health workers; on-going support; family involvement</td>
<td>Longer exclusive breastfeeding linked with lower childhood overweight, lower blood pressure and lower risk for diabetes</td>
</tr>
<tr>
<td>Bell and Golley 2015</td>
<td>&lt; 6 year olds</td>
<td>All aspects of diet Early childcare settings; provision of meals; staff training and family education and attitudes, improved and creative environments</td>
<td>Staff training improved quality of meals prepared</td>
</tr>
<tr>
<td>Paes et al 2015</td>
<td>&lt;7 years</td>
<td>SSBs consumption Preschool and childcare multi-level or targeted parental determinants;</td>
<td>Interventions that target parent and environment- restricting access and availability in school and surrounds were most effective in reducing SSBs consumption</td>
</tr>
<tr>
<td>Dudley et al 2015</td>
<td>&lt;12 years</td>
<td>All aspects of diet School based, with community, and wider environment Curriculum initiatives; nutrition-friendly school initiatives; community programs linked to curricula; health/nutrition education; school change environmental; wider environmental interventions; social marketing campaigns; policies</td>
<td>Experiential learning approaches were most effective in enhancing diet quality; cross-curricular and enhanced curricula; parental involvement promising but limited data</td>
</tr>
<tr>
<td>Cushing et al 2014</td>
<td>&lt;18 years</td>
<td>Diet, physical activity and tobacco use individual and settings approaches including schools, families, and communities; use of print media; using activities that addressed capability, opportunity and motivation</td>
<td>Small but statistically significant effects achieved when combined focus on individual and wider environmental factors at some time:</td>
</tr>
<tr>
<td>Bourke et al 2014</td>
<td>&lt;18 years</td>
<td>Fruit and vegetables: school, home and community settings; education, parental support, environment</td>
<td>Education, parental support, and environmental actions were most effective when combined.</td>
</tr>
<tr>
<td>Kader et al 2015</td>
<td>2-5 and 6-11; 12-18 years</td>
<td>Diet and physical activity Variety of settings Parental support: face-to-face or telephone one to one; group counselling; newsletters and information</td>
<td>One to one more effective than group counselling in enhancing diet quality; information alone not effective in improving diet</td>
</tr>
</tbody>
</table>

* The outcome variable is presented in italics

SSBs: sugar-sweetened beverages

Summary

Unhealthy diets are now the leading cause of deaths and DALYs related to NCDs. Dietary risk responsible for 8 million deaths in 1990, rose to 11.3 million in 2013, indicating an age adjusted increase of 3 percent. Adequate nutrition before and during pregnancy, and in the first two years of life is critical to both short and longer term health and risk of NCDs. Breastfed babies are less likely to be overweight, have lower blood pressure, as well as lower risk for type-2 diabetes as adults.

Unhealthy diets are linked to the persistence of wasting and stunting, as well as to micronutrient deficits. Based on review of observational studies as unethical to conduct trials of breastfeeding.
deficiencies in many parts of the world. The co-existence of under and over nutrition in the same family and community requires a coordinated approach to food policy to ensure that double burden of malnutrition is addressed.

A healthy diet starts with exclusive breastfeeding for the first six months of life. Breastfeeding should continue throughout the first two years of life. Starting at 6 months, infants can be introduced to a variety of family foods; by the age of two, a child should eat the same foods as the rest of the family. A healthy diet after weaning includes: consumption of fruits, vegetables, legumes, nuts and whole grains; less than 10 percent % (ideally less than 5 percent) total energy from free sugars; less than 30 percent of total energy from fats, and less than 5 grams of salt a day.

The WHO GAP has identified a range of policy options to support the consumption of a healthy diet by children and adolescents:
- promotion and support of exclusive breastfeeding for the first six months of life, and of continued breastfeeding until two years of age and adequate and timely complementary feeding;
- support for the code of marketing of breast milk substitutes;
- recommendations on the marketing of foods and non-alcoholic beverages to children;
- guidance on ways to increase availability, affordability and consumption of fruit and vegetables, while reducing the fat, salt and added sugar content in processed foods and beverages;
- taxation and other fiscal policies to encourage consumption of more healthy foods, and discourage consumption of less healthy options;
- promotion of healthier diets in schools and other settings.
- nutrition labelling according to Codex Alimentarius guidelines to help informed choices.

Statutory regulation was found to be more effective in regulating the marketing of unhealthy foods than voluntary codes and self-regulation.

For children and adolescents, the majority of the reviews highlighted that dietary interventions focused on promoting an overall healthy diet, or promoting fruits and vegetables, or SSBs consumption, and were predominately undertaken in HICs. No reviews were identified which focused specifically on changing fat, or salt intake in children and adolescents. Different approaches may work for changing different aspects of diet, for example reducing consumption of less healthy foods and increasing consumption of healthier foods. Poor study design and execution were highlighted in many reviews, limiting the strength of conclusions that can be drawn.

Women of reproductive age
- Breastfeeding was best supported by a combination of one-to-one counselling, professional support and enforcement of the code of marketing of breast-milk substitutes.
- Programs that were most effective included multiple interventions: education; ongoing support after the initial intervention; family involvement; and social support from peers and lay health workers.

Children and adolescents
- Targeting the home and family as well as school and community in a coordinated way, accompanied by education sessions and parental support contributed to the overall impact of interventions designed to promote increased consumption of fruits and vegetables and influence reduced
consumption of SSB. Face-to-face parental support and guidance in promoting healthier meals was more effective than passive information sharing through distribution of newsletters and leaflets.

- Early childhood settings, where children receive up to half of their daily nutritional needs, were critical in shaping healthy eating practices. This was particularly true in cases where employees were encouraged to increase their knowledge; and supported to develop attitudes and skills around healthy foods and eating habits.
- Schools that limit access to unhealthy foods and beverages; promote healthy eating in the school curriculum; support free school fruit schemes; encourage experiential learning; provide access to school gardens have been more successful in promoting healthier eating patterns and more positive attitudes about healthy eating in children.

Training staff to adequately deliver healthy meals enhances consumption of fruit and meals provided in school settings.

### 3.5. Growth and body composition: overweight and obesity

#### 3.5.1. Overview

Obesity, a risk factor for many NCDs, has more than doubled in children and quadrupled in adolescents in the past 30 years. Between 1990 and 2014 the number of overweight or obese infants and young children aged 0 to 5 increased globally from 32 to 41 million. In the WHO African Region alone, the number of overweight or obese children increased from 4 to 9 million over the same period. The vast majority of overweight or obese children live in LMICs, where the rate of increase has been more than 30 percent higher than in HICs. Moreover, in most LMICs, overweight is increasing faster than underweight is decreasing in children.

Four large cohort studies (the Bogalusa Heart Study and the Muscatine Study in the United States; the Childhood Determinants of Adult Health study in Australia; and the Cardiovascular Risk in Young Finns Study) followed up children to assess the associations between childhood adiposity measured by BMI and subsequent adult adiposity and risk of CVD. Overweight children tended to become overweight adults. Overweight adults had increased CVD risk (diabetes, hypertension and dyslipidaemia) irrespective of childhood adiposity. Reducing the BMI of overweight children lowers the CVD risk in adulthood.

In many LMICs, stunting and other aspects of undernutrition are still common. Children who were undernourished in utero or in the first two years of life, and then have increased access to energy dense nutrient poor foods are much more likely to become overweight in later life, have higher rates of diabetes and other NCDs. In South Africa, girls that were stunted in infancy were more likely to have greater body fat and risk of NCDs than their non-stunted peers with the same BMI at puberty. A Delhi cohort study that followed the growth of infants into adult life showed that those whose growth faltered in the first two years of life, and then caught up in puberty, were subsequently more likely to develop metabolic syndrome. This study also showed that a BMI measured at one point in time in growing children may not reflect overall risk for subsequent NCDs.

Although the prevalence of childhood obesity may be plateauing in some HICs, the rate is on the rise in LMICs. Globally the prevalence is at an all time high, and is predicted to reach 70 million by 2025. Within countries, the prevalence of obesity is not distributed evenly, indicating a strong influence of social gradients; differences by gender; and higher levels among migrant and indigenous children. Childhood obesity arises from an interplay between biological and contextual factors that affect diet and physical activity. Maternal malnutrition (over and under) prior to conception and during pregnancy alters the way...
a child responds to nutritional exposures in early and later life. Behavioural norms are established in infancy, which are reinforced by schooling and other experiences. Leech et al (2014)\textsuperscript{119} showed that diet, physical inactivity and sedentary behaviour cluster together in children in both healthy and unhealthy ways. Girls, older children and those from a low socioeconomic background are more likely to be sedentary.

Pre-pregnancy obesity has been associated with both short-\textsuperscript{120} and longer- term consequences for the mother\textsuperscript{121} and offspring. A review of cohort studies of weight gain during pregnancy by Kapadia et al (2015)\textsuperscript{122} suggests that the relationships between gestational weight loss and maternal and newborn outcomes are complex with increased odds of small for gestational age and low birth weight contrasting with decreased odds for large for gestational age, macrosomia and caesarean birth. Given the increased risk of low birthweight for gestational age, a key predictor of neonatal morbidity and mortality, and the lack of adequate investigation of important pregnancy outcomes, particularly preterm birth, the authors concluded that weight loss during pregnancy should not be recommended for obese women. A recent review of trends in gestational weight gain in US women by Johnson et al (2015)\textsuperscript{123} suggested that between 2000 and 2009 the percentage of women gaining weight within the recommended amount had fallen slightly to ~36 percent. According to the Institute of Medicine guideline, the gestational weight gain should be 12.5-18Kg for women with BMI <18.5kg/m\textsuperscript{2}; 11.5-16 Kg for women with BMI between 18.5; and 24.9 kg/m\textsuperscript{2}; 7-11.5Kg for women with BMI between 25 and 29.9 kg/m\textsuperscript{2}; and 5-9Kg for women with BMI over 30 kg/m\textsuperscript{2}.

Ambrosini (2014)\textsuperscript{124} reviewed results from seven cohort studies that assess the associations between dietary patterns and development of obesity. Loss to follow-up was major concern in these studies. The authors concluded that dietary patterns high in energy-dense, high-fat, and low fibre foods predispose adolescents to later overweight and obesity.

Paes et al (2015)\textsuperscript{125} reviewed factors influencing obesogenic dietary intakes in young children (0-6 years). Several consistent themes regarding parental factors that influence children’s behaviour emerged: negative parent/family/peer role modelling; lack of knowledge, time constraints, using food as a reward, affordability, and concerns about child’s health. Environmental factors linked with obesogenic dietary intakes included: availability, advertising, and societal, cultural and preschool/childcare influences. While families and caregivers have a key role in shaping healthy behaviours, the obesity epidemic will not be reduced without addressing these environmental factors.

WHO has summarized the global mandates for, and population-based approaches to, prevent childhood obesity.\textsuperscript{126} Three broad components were identified:

- structures within government to support childhood obesity prevention policies and interventions (“health-in-all” policies);
- population wide policies and initiatives (laws and regulations, taxes and subsidies, social marketing campaigns, restriction on marketing, labelling, supportive built environment and transport policies);
- community-based interventions (applied across multiple settings- early childcare, schools and other community settings, with strong/substantial community involvement to set priorities).

### 3.5.2 Interventions

There have been a number of systematic reviews of obesity prevention interventions in childhood adolescence,\textsuperscript{127,128}.

**Women of reproductive age**
Muktabhant et al (2015) reviewed 65 RCTs (6 in LMICs, 59 in HICs) showing that diet (counselling and low glycemic load) or physical activity alone or in combination, reduced excessive gestational weight gain by on average 20 percent. The intensity of interventions varied across studies, and no data were presented as to the average level of energy deficit (increased expenditure or decreased intake) required to achieve the weight effect reported.

Preschool setting

Laws et al (2014) reviewed the effectiveness of 32 obesity prevention programs in disadvantaged (30 studies) or indigenous children (only two studies) between ages 0-5. The review found that intervention initiated in infancy (0-2 years) had a positive impact on obesity related behaviours (diet quality) but few measured long-term impact on healthy weight gain. The interventions among preschool cohort (ages 3-5) varied - components of the more successful programs included high levels of parental engagement use of behaviour change techniques, a focus on skills building and links to community resources.

Larson et al (2011) reviewed 18 preschool centre interventions for children between ages 2-5. Of this, 16 were implemented in the USA: four focused on nutrition outcomes; seven focused on physical activity or sedentary activity outcomes; and seven addressed a combination of nutrition and activity outcomes. Five studies included a measure of impact on child weight status. Most interventions provided curriculum enhancements or classroom education for children and seven programs also included a component designed to educate and engage parents in making positive changes at home. Just five of the interventions targeted environmental factors such as improvements in classroom policies, foodservice practices, and playground environments. All interventions aimed at improving diet and activity showed on average positive impacts. Only two (of the five) studies that showed an impact of the intervention on risk of obesity were multicomponent interventions. They included one or more of the following strategies: integrating additional opportunities for physical activity into classroom curriculum; modifying foodservice practices; providing classroom-based nutrition education; and engaging parents through educational newsletters or activities.

Foster et al (2015) reviewed trials among overweight preschool children between ages 2-7. Six trials (three in USA) were identified, four with post-intervention follow-up. Half of the studies were judged to be of high risk of bias because of a lack of blinding. The content and intensity of interventions varied: from dietary advice, health education, to healthy lifestyle education and motivational interviewing. The more intensive multidisciplinary interventions showed greater impact on reducing adiposity, but the authors questioned the cost and sustainability of such intensive engagement.

School setting

Wang et al (2015), Peirson et al (2015) (updating an earlier systematic review by Waters), and Kambalia et al (2014) reviewed school-based behavioural interventions for controlling or preventing obesity. The individual reviews differed in terms of methodology (search years, information sources, inclusion/exclusion criteria and outcomes); presentation of results; and interpretation of findings. The majority of the studies were conducted in the USA, and often in overweight children. Effect sizes tended to be small (around 5 percent reduction in risk of overweight and obesity), partly due to the short length of follow-up, and heterogeneity of interventions. Successful programs included: combining diet and physical activity interventions; involving the family, in longer-term rather than short term interventions; and making healthy food choices and options readily available. The review suggested that boys and girls do not respond in the same way. For example, girls favour dietary interventions, whereas boys favour activity.
Similarly, girls respond more to social learning while boys respond to structural and environmental changes facilitating physical activity.

Most reviews suggested that to be effective interventions needed to address the whole environment in which children lived, involving multiple strategies that covered different settings including the home, schools, and the community. Moreover, effective interventions would place greater emphasis on provision of healthy foods by improving meals and protecting the school environment from unhealthy foods and beverages. Meeting the agreed standards; emphasizing activity during school hours; going beyond the provision of information and education while covering all aspects of the socio-ecological mode and social determinants are also some of the features of more successful interventions.  

*Avery et al (2015)*\(^{138}\) reviewed the effect of trials to reduce the effect of SSBs consumption on body fatness in children and adolescents between ages 8-15. Eight studies met their inclusion criteria and were assessed for quality. Of those 5 were in Europe; 1 in USA; and 2 in Brazil; 7 of the trials were in normal weight children. The length of follow-up varied from 4-18 months. Six of the reviewed trials reported statistically significant reductions in SSBs consumption, which was however not sustained. The effects on overweight were mixed. The review suggested that school based education programs focusing on reducing SSBs consumption could be effective particularly if supported by school environmental policies focusing on provision of water or replacement drinks. There was no suggestion that results differed by setting.

*Langford et al. (2014)*\(^{139}\) have reviewed the WHO health promoting school (HPS) framework for improving health and well-being of students. The review included 67 cluster-randomised trials where randomisation was at school, district or other geographical level. HPS interventions covered input to the curriculum, changes to the school ethos or environment or both, and engagement with families or communities or both. *Bonnell et al. (2013)*\(^{140}\) have completed a thorough and high quality systematic review of the influence of the school environment on the health of children. The quality of evidence was judged to be low to moderate, with heavy reliance on self-reported data and high attrition rates. There was also a lack of long-term follow-up. Intervention effects were generally small but they were statistically significant for BMI, physical activity and physical fitness, fruit and vegetable intake and tobacco use. The review also found that physical activity interventions reduced BMI.

Based on the review evidence up to 2012, WHO\(^{127}\) recommended the following standard practices in educational settings to support childhood obesity prevention:

- Integrate components on healthy eating, physical activity and body image into the regular curriculum.
- Include sessions for physical activity and the development of fundamental movement skills throughout the school week.
- Closely monitor and improve the nutritional quality of foods made available to students (e.g. in school canteens).
- Create an environment and culture that supports healthy eating habits and physical activity among children throughout each day.
- Support teachers and other staff to implement health-promotion strategies and activities through professional development and capacity building activities.
- Engage parents to support activities in the home setting to encourage children to become more active, eat more nutritious foods and spend less time in screen-based activities.
The WHO School Policy Framework\[141\] provides guidance to countries on how to implement policies that promote healthy eating and physical activity in the school setting through changes in environment, behaviour and education.

**Family setting**

A review by Seo and Sa (2011)\[142\] among US multi-ethnic and minority children found somewhat different results from the review cited above by Liao et al (2014).\[124\] Seo and Sa found, based on 32 controlled trials, that multi-component interventions were more efficacious than single component interventions (including sedentary behaviour) in achieving weight change. They concluded that parental involvement, lifestyle change, culturally-based adaptation, and interactive computer programs showed promise in the reduction of adiposity in US minority children.

Oude Luttikhuis et al (2009)\[143\] reviewed 54 studies on lifestyle treatments (with a focus on diet, physical activity or behaviour change) and 10 studies on drug treatment to help overweight and obese children. The studies covered children and adolescents up to age 18; two-thirds of studies included children under 12 and their families with weight control. Fourteen studies lasted at least two years. Of the 54 lifestyle studies, 30 were based in North America and 12 in Europe. Both settings included children from motivated middle-class families. Allocation concealment was unclear in 38 out of 54 studies. Behavioural therapy aimed at changing thinking patterns and actions about diet and physical activity as well as changing the family food and physical environment. Most studies reported beneficial effects on adiposity; the most effective interventions were a combination of diet and physical activity with behavioural components, including parental involvement particularly for those less than 12 years of age. Drug treatments were effective but there were concerns raised about side effects.

Kader et al (2015)\[105\] also reviewed studies that included outcomes linking the role of parental interventions to child weight status. The review of sixteen studies found group education to be more effective than individual counselling. Moreover, parental interventions were possibly more effective in girls than boys; and parental interventions were more likely to be effective in younger than older children.

**Community setting**

Brand et al (2014)\[144\] analysed seven systematic reviews (2 meta-analyses and 5 narrative) of community-based interventions aimed at weight change in 8-12 year old children. All the reviews included both diet and physical activity, interventions that focused on multiple social-ecological levels or environmental change were more effective in targeting weight change than single level interventions.

Van’t Riet et al (2014 and 2015)\[145\] reviewed the effectiveness of active video games for obesity prevention in children and adolescents in nine studies. Relatively small sample sizes limited the power of the pooled analysis but suggested that there was a beneficial effect in both age groups.

**Multiple settings**

Brown et al (2015)\[146\] reviewed complex interventions (diet and or PA) in South Asian children, living either in or outside Asia. Seven trials featuring school based prevention programmes were identified (3 RCTs and 2 CCTs - 3 were in children living in South Asia; 3 included before-after trials ). Overall results were inconclusive, partly because of study design weaknesses and small study sizes.

Hillier-Brown et al (2014)\[147\] reviewed studies on the effectiveness of different approaches in reducing socio-economic inequalities in the prevention of obesity-related outcomes in 6-12 year old children. The
review looked at levels (individual, community, societal-environmental/macro); and approaches (improving absolute position of disadvantaged; reducing the gap- relative position; or gradient) to reduce inequalities. Interventions were either targeted (at the most disadvantaged) or universal (altering social gradient). Interventions that aimed to prevent obesity, treat obesity, or improve obesity-related behaviours (diet and/or physical activity) were considered relevant, so long as they provided information and analysis on both socioeconomic status and obesity-related outcomes. Individual level interventions were defined as those that included individualised/one-to-one health promotion, education, advice, counselling or subsidy and were conducted in a health care or research setting, or in participant’s homes. Community-level interventions were defined as group-based health promotion, education, advice, counselling or subsidy only interventions, or interventions conducted in a community setting (for example a school, community centre, sports centre and shop). Group-based educational interventions were classified as community. Societal-environment level interventions were those that included a change in environment or access to environment; and Societal-policy level interventions included macro-level policies such as taxation, advertising restrictions or subsidies. The review included 23 high quality studies, mainly from USA, that lasted at least 12 weeks. At the individual level (4 studies), reducing screen time and mentoring health promotion were effective approaches in reducing inequalities in obesity. At community level (17 studies), evidence suggested that a multi-faceted school-based approach (exercise sessions, screen-time reduction support) were effective in longer term follow-up in pre-school children but not older children. There was one societal level intervention with inconclusive results.

Liao et al (2014) reviewed interventions aimed at reducing BMI in children and adolescents under the age 18 by focusing on sedentary behaviour. Of the 25 controlled trials, 10 were rated strong for study quality. They included either single or multi-component interventions (10 studies looked at sedentary behaviour and physical activity; 10 had an additional dietary component. The selection of the intervention sample was based on the following criteria: interventions designed to reduce sedentary behaviours, such as watching TV/DVD/VCR; focus on playing sedentary video/ computer games; and emphasis on sitting time in general. Studies were included if children were randomly assigned to an intervention; an active control group that received some non-obesity prevention-related information (e.g. a general parenting skill training or a fire drill training); a control group with usual-programming (e.g. standard physical education classes or any standard school curriculum classes); or an assessment-only control group. Decreasing sedentary behaviour was effective in reducing BMI, and including either physical activity or dietary advice did not enhance the impact further.

Web-based
An et al 2009 reviewed trials of web-based weight management programs for children and adolescents. Their review was expanded and updated to cover studies published up to 2010 (and also include observational studies) by Nguyen et al (2011). Twenty-four studies (four in children and 18 in adolescents) met the inclusion criteria for interventions delivered electronically. Of this, 15 studies focused on prevention and none on treatment interventions. Most included studies had methodological weaknesses and were not ranked strongly for quality.; Furthermore, they did not assess the independent effect of the electronic intervention from other interventions; and did not take account of age and gender. Fewer than half of the studies included targeted both adolescents and their parents. Seventeen of the 20 studies that included a comparison group showed a positive effect of the intervention on obesity or obesity-related outcomes. There was insufficient quality data to assess whether the electronic interventions were more effective for prevention or treatment or whether they worked better in young children or adolescents.
Table 3.5 Review of effectiveness of weight change intervention reviews, based on higher quality studies

<table>
<thead>
<tr>
<th>Author /number of studies</th>
<th>Age group</th>
<th>Interventions*</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muktabhant et al 2015</td>
<td>WRA</td>
<td>Diet, PA or both for optimal Gestational weight gain Counselling as main approach</td>
<td>Counselling was effective in supporting optimal pregnancy weight gain</td>
</tr>
<tr>
<td>Laws et al 2015</td>
<td>0-2, 2-5 years; disadvantaged children</td>
<td>Preschool High level parental engagement with behavior change techniques focusing on skills building</td>
<td>Interventions starting before age of 2 were more effective than those starting after 2 years of age; parental engagement with skills building most effective in obesity prevention</td>
</tr>
<tr>
<td>Larson et al 2011</td>
<td>2-5 years</td>
<td>Preschool Curriculum enhancement or classroom education combined with nutrition and activity outcomes; parental engagement; school environment and food provision</td>
<td>Improved food provision and opportunities to be active, supported by parental engagement were most effective in maintaining desired weight</td>
</tr>
<tr>
<td>Foster et al 2015</td>
<td>2-7 years overweight children</td>
<td>Preschool setting Education and advice, motivational interviewing</td>
<td>More intensive multidisciplinary interventions supported by motivational interviewing were most effective, but expensive</td>
</tr>
<tr>
<td>Khambalia et al 2014; Wang et al 2015; Peirson et al 2015</td>
<td>&lt;12 years</td>
<td>School setting Prevention and control of obesity Wide range of approaches, often including family and community. School based diet and PA, involving family; longer term follow-up</td>
<td>Multi setting that address whole environment that combined Diet and physical activity, with family and community support were most effective; coherent school policy approach was important- including food provision and opportunities to be more active; different approaches were effective in boys compared with girls-girls responded to social learning and boys to more structural or environmental change</td>
</tr>
<tr>
<td>Study</td>
<td>Setting</td>
<td>Interventions</td>
<td>Findings</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>------------------</td>
<td>---------------------------------------------------</td>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>Avery et al (2015)</td>
<td>School setting</td>
<td>School wide policies, including replacing SSBs with water were effective in reducing SSB consumption, with mixed impact on overweight</td>
<td></td>
</tr>
<tr>
<td>Seo and Sa (2011)</td>
<td>Family setting</td>
<td>Multi component more efficacious than single component interventions; interactive computer games may be helpful to achieve weight change</td>
<td></td>
</tr>
<tr>
<td>Ode Luttikhuis 2009</td>
<td>Family setting</td>
<td>Combining diet and PA with parental involvement most effective in reducing weight</td>
<td></td>
</tr>
<tr>
<td>Brand et al 2014</td>
<td>Community-based</td>
<td>Multi-level more effective than single interventions</td>
<td></td>
</tr>
<tr>
<td>Van’t Riet et al 2015</td>
<td>Active video games</td>
<td>Limited findings based on small sample size</td>
<td></td>
</tr>
<tr>
<td>Hillier-Brown et al 2014</td>
<td>Multiple settings</td>
<td>Individual level: Reduced screen time and mentoring effective Community: multi-faceted school-based approach including exercise sessions reduced inequalities in obesity Societal: limited data available</td>
<td></td>
</tr>
<tr>
<td>Liao et al 2014</td>
<td>Multiple settings</td>
<td>Decreasing sedentary behaviour effective in weight change</td>
<td></td>
</tr>
</tbody>
</table>

**Summary**

**Growth and body composition: overweight and obesity**

Obesity, a risk factor for many NCDs, has more than doubled in children and quadrupled in adolescents in the past 30 years. In most LMICs, overweight is increasing faster than underweight is decreasing in children. Obesity rates have tripled in LMICs in just two decades. The number of overweight or obese infants and young children (aged 0 to 5 years) increased from 32 million globally in 1990 to 41 million in 2014. In the WHO African Region alone the number of overweight or obese children increased from 4 to 9 million over the same period. The vast majority of overweight or obese children live in LMICs, where the rate of increase has been more than 30% higher than that of HICs.

The actions to support higher physical activity levels and the consumption of a healthier diet highlighted above need to be coordinated and harmonized for maximum benefit.

The interpretation of findings from the reviews was complicated by the mixed composition of the baseline body composition of the children included in the studies. Most reviews highlighted the importance in
addressing the whole environment in which children live, and that the provision of information on its own
was of limited value in achieving optimal growth. The impact of interventions to prevent overweight may
be quite different from those that are needed to reduce the level of overweight in children who are already
overweight.

**Women of reproductive age**
- The use of an educational component; provision of continued support after the initial intervention;
  family involvement; and social support from peers or lay health workers -together were an
effective package of interventions.

**Children and adolescents**
- Children and adolescents benefited from parental and caregivers’ support, as well as from assistance
  provided by community, schools, institutions and overall enabling policy environment in making
  healthy food choices and behaviours. This support was also instrumental in limiting the adverse effects
  of exposure to the marketing of unhealthy foods and beverages.
- School-based interventions encompassing promotion of healthy diets, physical activity in all aspects
  of school life alongside the active family involvement yielded the most robust results in preventing
  childhood obesity.
- Multi-component approaches that addressed diet and activity together in a coordinated way were
  most effective. Increasing physical activity without also addressing sedentary behaviour and diet was
  less likely to be effective.
4. Discussion

The primary purpose of this review was to bring together all the available evidence from systematic reviews on the effectiveness of interventions aimed at improving healthy behaviours and health among children and adolescents and, where appropriate, also among WRA. The review focused on behaviour change in specific risk factors for NCDs, and not in detail on metabolic risk factors, except for obesity. The rationale was based on the findings of the WHO Global Action Plan (GAP) which argued that these underlying behaviours played a critical role in elevating the risk of NCDs, both singly and collectively. The four major modifiable risk behaviours covered in this review account for over half of all deaths due to NCDs.

Methodological considerations

The review focused on reviews of systematic reviews, rather than the original research. It assessed the evidence on interventions to change behaviour (tobacco use, alcohol, physical inactivity, unhealthy diets) and body composition (overweight/obesity). The search strategy was developed around five concepts: behaviours; age group/life-stage (children and adolescents, women of reproductive age WRA, breastfeeding); strategy (prevention); design (interventions, trials, experiments); and level of intervention (individual, family, community, institution, policy). Observational studies were included only as part of the background/overview where these helped inform the consideration of potential targets for interventions in adolescents, or highlighted different approaches that might be considered for different age, gender or other groups of participants.

The analysis of reviews has highlighted a number of important limitations of the current evidence base for action in children and adolescents. The first, and most important observation is the limited evidence available from LMICs. The overwhelming majority of the evidence included in these reviews came from North America, and to a lesser extent Europe and Australia. It may be misleading to extrapolate from
findings in these HICs to LMICs, where the wider environmental determinants may be quite different and may affect how interventions work. Various models featuring the factors that shape behaviour have been developed and used in the present review. All of these models show that there are complex factors that operate at the individual level shaping the way children and adolescents behave and respond to the opportunities available to them. Even if they were motivated to behave in a healthy way they may not be able to do, because of the limitations of the wider environment in which they live. For example, being more physically active requires a supporting environment such as availability of spaces, safety and accessibility to areas where children and adolescents can be physically active. Thus, what may work to support and motivate individual behaviour in one setting may not be relevant for another setting because of the lack of opportunity to do so.

The second important methodological consideration that arises from this review is that, despite the appearance of a large body of evidence, most of the included reviews highlighted a range of study design and methodological problems that increased the likelihood of bias. For each of the behaviours reviewed in this report, a wide range of approaches was used to define the exposure and outcome, making pooling of results difficult. Few studies adequately measured the delivery of the intervention with objective process indicators. The failure of the intervention to affect change in behaviour may therefore be due to non-proper delivery of the intervention; lack of proper process evaluation; or an actual lack of intervention effect. As indicated above the intervention may only work in certain circumstances where other constraints are not limiting behaviour, such as access and affordability. The quality of the delivery of the intervention may vary according to the skill and training of those delivering it; and the degree to which the intervention was standardised across different schools or settings in which it was applied.

Challenges

The review also raised an non-methodological question by looking at the relevance of the research studies findings to day-to-day practice in the community. Many of the studies included in the analysis of reviews reported here were conducted under what may be considered ideal conditions. Those may be hard to replicate when included as part of normal school or institutional level practice. Relatively few of the reviews included any cost-benefit or cost-effectiveness analysis, so it is not possible to establish what it would cost to deliver these interventions as part of routine school or local government budgets. On the other hand, evidence showed that the current cost of treating the effects of obesity, alcohol and tobacco use is beyond the scope of most governments, even in HICs, for them to be able to afford it. Further work is required to undertake full impact assessment analyses on the real costs and benefits of the interventions described in this report on the prevention of NCDs now and in the future. There is wide agreement, however, that a public health preventive approach is the only long term affordable approach, despite that most countries spend less than 1 percent of health budgets on prevention. There is a need to re-orient services away from treatment toward prevention.

Another question raised in this report has to do with expectation., There is indication that school is a key setting to engage with children and adolescents to support healthy behaviour change. This places a large expectation on schools to take up and deliver these programs - to rearrange the school environment and school curricula on one side, and on the other to improve staff skills and attitudes. Little consideration has been given as to how to support this financially; and against a background where schools are under increasing pressure to focus on key aspects of the basic school curriculum to raise standards. The same issues arise for those staff working in community and other institutions. Unless the impact of delivering these interventions on daily workload is considered, it will be less likely that these actions would be considered. Job descriptions and training to address gaps in knowledge, skills and attitudes may be
required; it cannot be assumed that these already exist.

**Recommendations on strengthening the evidence base**

This review has highlighted the need for the following:

1. There is a need for more high quality research that provides relevant information to address key priorities, in particular in LMICs. Specifically, research needs to capture change in outcomes, but also how well the intervention was delivered; the audience it reached and to what degree, etc., etc.

   This research will need to be properly funded and include consideration as to how to strengthen local capacity.

2. Greater consideration as to the impact of the study on the population and the wider circumstances in which they live on both the design and interpretation of findings.

3. For all behaviours studied, greater standardization and quality control is required in all measures used including baseline exposure, process measures, and outcomes measures. There is a need for process indicators to show how, for whom and in what circumstances the intervention works. To date too few studies used robust validated independent measures of outcome to assess impact.

   The methods need to be applicable in each setting and population.

4. Greater detail is required on implementation challenges. This starts with gaining clarity on the exact nature and mechanisms of the impact of the intervention that is being implemented. Moreover, it continues with consideration as to how the impact can be measured, and then reported in the final report. This would provide the basis for an objective evaluation.

The rapidly rising burden of NCDs and the impact of the behaviours reviewed here on NCD risk is such that actions cannot wait until better quality evidence is available. While it is desirable to strengthen the evidence base for effective actions, particularly in LMICs, it is also important to ensure that interventions that are being implemented are properly evaluated to facilitate full application of the most effective interventions. Thus there is a need for the readily available and properly used progress monitoring indicators.

**Overall summary and synthesis**

- Despite the appearance of a large body of evidence, when study quality was taken into account, the evidence base for effective interventions in children and adolescents across all 4 behaviours was limited, and virtually non-existent for children and adolescents in LMICs. The vast majority of the evidence reviewed here came from HICs. One of the challenges in trying to draw conclusions was that for each behaviour, very often different measures were used to define the exposure, the intervention, and the outcome. Furthermore, there were few details as to how well the intervention was actually delivered. Similarly, little consideration was given to the wider environmental determinants and how they may have influenced the intervention and affected behaviour in children and adolescents.

- Although there is enough evidence to begin effective programs now, resources and capacity will be needed to strengthen the evidence base, particularly in LMICs, and also to monitor progress with programs as they go forward.

- Having highlighted the limitations, there was sufficient consistency in findings across reviews to draw some tentative conclusions as to what sorts of approaches, and at what levels, would be most likely to help promote better health behaviours in children and young people.

- Successful programs strengthened children’s ability to self-regulate their behaviour—by setting goals, seeking feedback, and by self-monitoring their behaviour. Programs that helped children and adolescents deal with peer and other pressures were also important in supporting healthier behaviours. Children themselves can be effective peer leaders and role models to influence the
behaviour of others.

- Interventions that addressed the underlying determinants of behaviour, and that were supported by, and coherent across, family, community and institutional settings were consistently most effective in supporting and maintaining healthy behaviours. Interventions delivered in cooperation with schools, communities and the media have the potential to modify behaviour through positive modelling, instruction, prompting practice, and prompting intention formation (strengthening motivation).

- Parents, caregivers and families shape the behaviour of children. They can set standards for no smoking of tobacco in the household; for using alcohol in moderation; for limiting TV viewing; cooking and eating healthy foods and beverages; limiting consumption of unhealthy foods; and by ensuring regular health checks. Parents can be role models for healthy behaviours and provide positive reinforcement to encourage children to engage in healthy avoid harmful behaviours and to be advocates of their own health.

- Community leaders can play an important role in advocating for safe environments where children can play; in facilitating peer to peer support groups; and in helping families promote healthy behaviours.

- Schools can play a vital role in promoting and supporting healthy behaviours, particularly for young children. This includes a variety of modalities from providing role models through staff leadership and work with families and communities; to provision of supportive school curriculum; to facilitating access to healthy foods and opportunities to be physically active; to endorsing policies that avoid conflicts of interest and promote a healthy environment in and around schools.

- The actions were most effective when supported by strong government policy that control the opportunities to adopt, support, or enable unhealthy behaviours. To achieve healthy behaviour requires a supportive policy environment that regulates marketing, pricing policies and labelling. Restricting all forms of marketing to children, or that children are exposed to, is a key component of effective multi-component actions. Statutory regulation is more effective than self-regulation and voluntary codes. Taxation and pricing policies can be effective in shaping behaviours, both in reducing levels of unhealthy behaviours and promoting healthy alternatives.

- FCTC has shown that strong political actions to regulate both the supply and demand drivers for tobacco products can be effective in reducing tobacco use.
<table>
<thead>
<tr>
<th>Behavior</th>
<th>Individual</th>
<th>Family</th>
<th>Community</th>
<th>Institutions</th>
<th>Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tobacco use</strong></td>
<td>WRA(^6): Deliver programs in non judgmental way; C&amp;A(^7): Develop skills to resist peer and marketing pressures; Supported by family community and institutional actions;</td>
<td>Role models and support; positive reinforcement; promotion of smoke free homes</td>
<td>Multi component; Role models and support</td>
<td>Vital role in reinforcing positive messages and skills to resist pressure stop smoke; Strong leadership and engagement; Total ban and education; Positive attitudes of health professional critical</td>
<td>Ban sale to minors and ban smoking in public places; ban direct and indirect advertising, promotion and sponsorship of tobacco products; including smokeless tobacco products; Enforce and implement FCTC</td>
</tr>
<tr>
<td><strong>Alcohol</strong></td>
<td>WRA: Counselling to improve self-confidence; C &amp; A: develop skills to resist peer pressure; strengthen social skills (decision making; self-esteem)</td>
<td>Support of families and partners; set clear expectations, limits and consequences</td>
<td>Multi-component</td>
<td>Individual counselling in primary care; in schools programs aimed at fostering decision making skills and ways; Total ban and education</td>
<td>Increase legal age of drinking alcohol; ban sale to minors; increase penalties for drunk-driving; ban marketing of alcoholic beverages to adolescents; taxation and pricing</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>WRA: Counselling; self-regulatory strategies such as goal-setting and prompting self-monitoring of behavior; C &amp; A: Include activity sessions, separate boys and girls; sedentary behavior-goal setting around screen time</td>
<td>Family involvement in social settings, particularly young children; limiting of screen time; Role models</td>
<td>General population settings; Create enabling environment; mobilize engagement</td>
<td>Schools: key role in creating supportive environment; local government to build enabling environment</td>
<td>Create an environment that promotes physical activity; develop school based polices that integrate physical activity into the school curriculum</td>
</tr>
<tr>
<td><strong>Diet</strong></td>
<td>WRA: One to one counselling; mix of education, ongoing support; peer support; C &amp; A:</td>
<td>Family healthy meals, role models; limit media viewing;</td>
<td>In WRA social support, ongoing support and education</td>
<td>Early school food provision and staff support; School policies; school meals; restrict marketing and access in and around school for SSBs; provision of clean water;</td>
<td>Introduce food taxes to increase prices of unhealthy foods and to make healthy foods cheaper; nutrition labelling on foods; introduce school based polices for food services to provide healthy meals and snacks and sugar sweetened beverages; protect</td>
</tr>
</tbody>
</table>

\(^6\) WRA women of reproductive age
\(^7\) C & A children and adolescents
| **Obesity** | **WRA:** breastfeeding; as per diet; C &A Link diet and activity | Family and peer support for breastfeeding | Multi-component community support; Community leaders/champions | School policies and environment; early detection in health service and child growth monitoring clinics | Integrate diet and activity policies across all sectors | improve goal setting and small group activities; | Mass media campaigns | environments around schools form unhealthy marketing; strengthen the code of marketing of breast milk substitutes; strengthen the regulation of marketing of foods and beverages in children |

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