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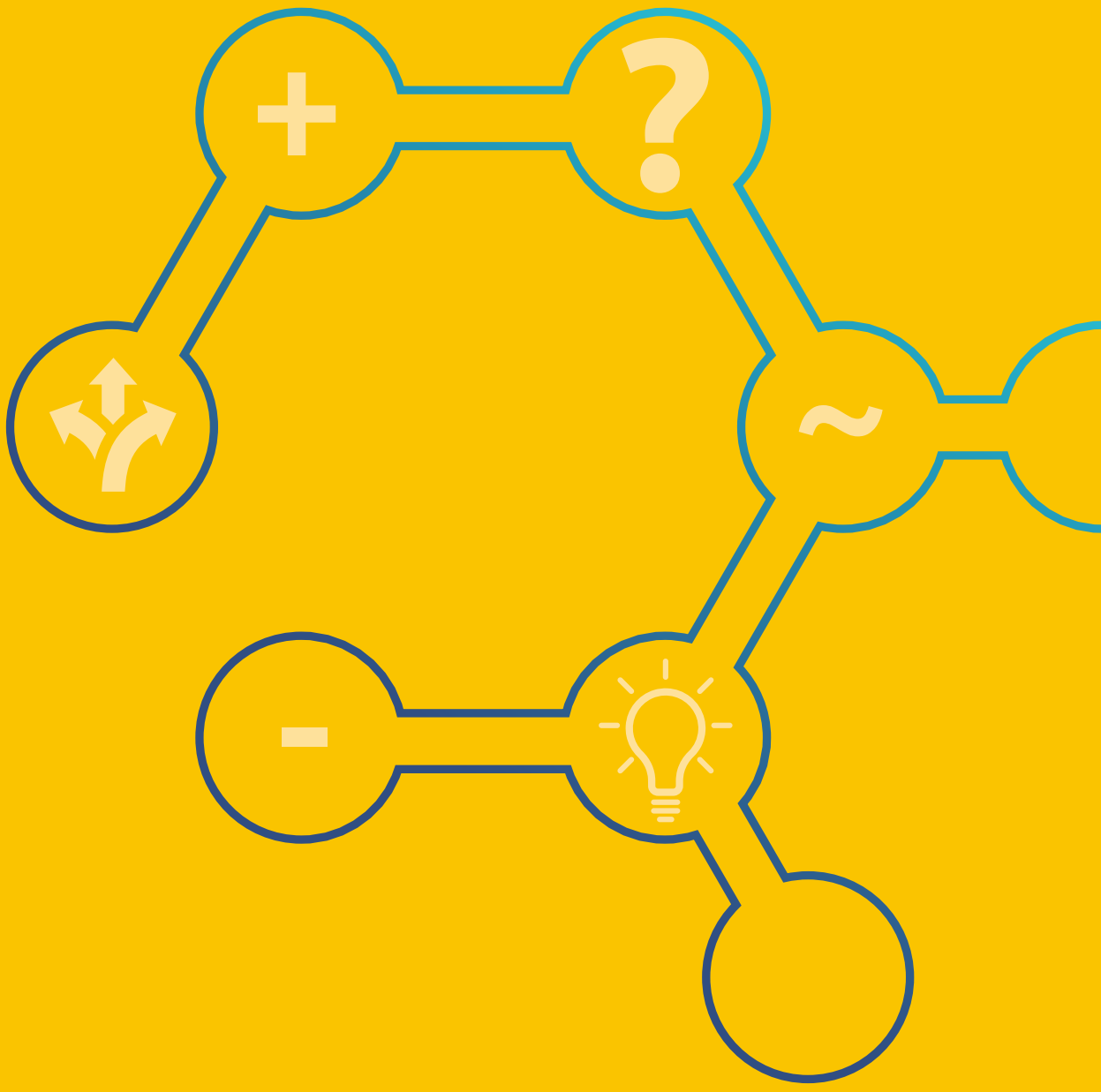

Obesogenic environments
understanding the evidence for effective action

Contents

Acknowledgements

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The Observatory Evidence Service full technical report including the review questions, source identification, selection and data extraction tables, results and evidence grading can be found here.

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Introduction

This document contains a series of intervention summaries of a range of potential public health action to prevent obesity and overweight at a population level. The intervention summaries have been prepared following an evidence review on environmental influences on obesity based on the ANGELO framework (Analysis Grid for Environments Linked to Obesity) and following methodology developed for an earlier review undertaken in Scotland[1,2]. It forms part of the work being undertaken to support Welsh Government on an Obesity Prevention and Reduction Strategy.

The evidence review, an overview of evidence addressing the obesogenic environment, has been produced by the Public Health Wales Observatory Evidence Service for the Health Improvement Division. The full technical report is available with further detail on the research underpinning the overviews reproduced in this document[3].

The framework is rooted in an ecological model recognising environmental, biological and behavioural factors. It focuses on how the environment influences obesity, facilitates understanding of how environments may be obesogenic but is also a practical tool for prioritising interventions.

The reviewers looked for research evidence on effective policy interventions or modifications to the built environment that promoted physical activity, reduced consumption of unhealthy diets or promoted consumption of healthier diets. Summaries bring together the reviews that are broadly around the same question; these summaries provide an overall evidence grade and sum up the quantity, quality and direction of evidence.

1.1 The ANGELO framework

The framework supports understanding of the environmental influences on obesity to identify opportunities for intervention. It is fundamentally a two by four grid describing two sizes and four types of environment.

The basic framework considers environmental size (macro or micro) by type: physical (what is available); economic (what are the costs); political/legislative (what are the rules) and sociocultural (what are the attitudes and beliefs) . Within this framework those things which influence food intake and physical activity can be characterised as either obesogenic (promoting weight gain) or leptogenic (promoting weight loss).

Macro environments apply to the wider population, tend to be geographically diffuse and may operate at regional, national or international levels. These environments will also influence food eaten and physical activity.

Microenvironment settings are those where groups of people may gather for specific purposes that are relevant to food and/or physical activity. Usually these are geographically distinct, relatively small and potentially influenced by individuals.

[1]Egger G, Swinburn B. An 'ecological' approach to the obesity pandemic. BMJ. 1997; 315:477–480.
[2]Mooney J, Haw S, Frank J. Policy interventions to tackle the obesogenic environment: Focusing on adults of working age in Scotland. Scottish Collaboration for Public Health Research and Policy ed. Edinburgh: CSO/MRC. 2011
[3]Obesogenic evidence review technical report, Public Health Wales, 2019 http://www2.nphs.wales.nhs.uk:8080/PubHObservatoryProjDocs.nsf/3653c00e7bb6259d80256f27004900db/5120e167936affb18025837e0057bc28/$FILE/THI%20Update%20Obesogenic%20environment%20technical%20report%20.pdf
4Swinburn B0, Egger G, Raza F. Dissecting obesogenic environments: The development and application of a framework for identifying and prioritizing environmental interventions for obesity. Preventative Medicine. 1999; 29, 563-570.

A microenvironment setting may be influenced by a number of macro environments. For example a supermarket will be influenced by food production, manufacturing, distribution and marketing.

Table 1 sets out examples of different environments considered in the literature.

TABLE 1: Examples of Macro and Micro Environments Influencing Obesity

Macro includes	**Micro** includes
Technology/design (includes devices and architecture)	Homes
Media	Neighbourhoods
Food production, manufacture, importing, distribution and marketing, catering services	Workplaces, institutions (e.g. hospitals) and facilities (e.g. leisure centres)
Sports and leisure industry (e.g. instructor training programmes)	Communities (groups e.g. clubs and places e.g. parks, shopping centres)
Urban/rural development (e.g. planning, unitary authorities, town councils)	Food retailers and food service outlets
Health and social care system	Local health and social care

Based on Swinburn B, Egger G, Raza F. Dissecting obesogenic environments: The development and application of a framework for identifying and prioritizing environmental interventions for obesity. Prev Med 1999: 29: 563-570.

1.2 Methodology

This review has adopted a 'review of reviews' approach which means that the evidence considered is drawn from existing systematic review evidence rather than individual studies. This approach has been taken because of the very broad range of issues that needed to be considered – a review of the primary evidence sources would not have been feasible.

A detailed account of the methodology is provided in the associated technical report[5]. The strength, quality and direction of the intervention evidence was categorised and the evidence statements were produced on this basis. An evidence grading colour scheme (see Appendix A) has been applied to indicate the extent to which the potential effectiveness of the intervention is supported by the research evidence synthesised by the source. In brief,

- Green indicates moderate or good evidence of effectiveness
- Yellow/amber indicates inconsistent/inconclusive evidence
- Red indicates evidence of ineffectiveness
- Grey indicates lack of evidence

[5]Obesogenic evidence review technical report, Public Health Wales, 2019 http://www2.nphs.wales.nhs.uk:8080/PubHObservatoryProjDocs.nsf/3653c00e7bb6259d80256f27004900db/5120e167936affb18025837e0057bc28/$FILE/THI%20Update%20Obesogenic%20environment%20technical%20report%20.pdf

Following data extraction, in discussion with the Health Improvement Division, the review level data was used to identify interventions; these included price manipulation, labelling and nutrition information, food and portion size availability, parks and urban green space, and interventions influencing work environments and active travel.
For each identified intervention a lay and technical evidence summary has been provided. The lay summary give a description of the intervention and consideration of the potential value of the intervention in a policy or strategy context.

A technical evidence summary table and references are also provided for each intervention. This includes systematic review authors' comments that they have not included in their conclusions, relevant and/or additional findings not reflected in evidence statements, some of the methodological considerations, and strengths and weaknesses of the research undertaken. not the intervention was effective.

There are however a number of challenges in interpreting the evidence and in conducting the original research and evaluation studies for these very complex interventions.

Different interventions are designed to deliver different outcomes, in some studies the focus was on change in weight e.g. BMI or prevalence of obesity; in other studies a change in behaviour was the outcome considered, for example an increase in physical activity or a change in food or nutrient intake. In other cases, interventions may not primarily be designed to reduce obesity. An example of this would be the introduction of congestion charging, which seeks to reduce the amount of traffic travelling into urban areas, resulting in a range of potential benefits including improved air quality, road safety and increased use of public transport. A secondary benefit of increased public transport use is higher levels of physical activity as this is known to be greater in individuals who use public transport for routine commuting. Demonstrating that introduction of a congestion charge increased physical activity would however be quite difficult, so we might reasonably judge the effectiveness of this intervention by an increase in public transport use.

Overviews of the findings for each category were produced to summarise the research evidence identified by this review. In the overview the section:

- **Directional thinking** reflects the wording of the evidence statements.
- **Limits to what we know** includes the limits to the evidence base that systematic review authors or Public Health Wales reviewers have identified.
- **Other things** to consider covers other issues identified by review authors that are relevant to interpretation. This includes systematic review authors comments that they have not included in their conclusions and relevant and/or additional findings not reflected in evidence statements.

Introductory sections have been written which consider the relevance of the evidence to the Wales context and identifies appropriate actions, by applying professional judgement and expert knowledge of the topic area to interpret the evidence summaries.

2 Intervention summaries; Food and Drink Environment (FDE)

Food consumption and food production form part of the complex obesity system. What we eat and drink is the main influence on whether we remain a healthy weight. What we eat and drink is influenced by a complex range of factors including how the food is produced, its cost, promotion and availability. Understanding how the food environment influences obesity is critical to our efforts to tackle the problem.

The intervention evidence summaries cover a range of interventions as follows:

- Price manipulation through taxation
- Price manipulation with subsidies and discounts or price rises
- Shelf labelling
- Front of pack labelling
- Menu labelling
- Nutrition information in store
- Nutrition information during point of sale online
- Interventions influencing portion size
- Interventions in vending machines, pricing, stocking and nutritional information

2.1.1 FDE 1 Price manipulation

Changes in food prices are implemented though many different mechanisms; both at a macro and micro level. Many of the outcomes assessed by research studies capture the impact of pricing on buying or eating healthier foods as opposed to impact on weight outcomes, e.g. BMI.

At the micro level pricing interventions take the form of discounts, vouchers in food assistance programs and cash rebates. Cash rebates assessed in research studies tend to be more complex for the consumer and can include money returned for bundled purchases of healthy products rather than individual items and the benefit to the consumer can be immediate or delayed (e.g. monthly financial award).

At the macro level pricing disincentives often involve taxes. Taxing unhealthy foods can be done alone or in combination with subsidy of healthy foods.

Intervention: Changes in food pricing.

Outcomes: Food purchase, dietary consumption (e.g. consumption of sugar sweetened beverages).

What the evidence says: There have been a range of studies which have tested manipulation of price in different ways and on the whole the evidence suggests that there is likely to be a benefit although in most cases it is not conclusive. There is reasonably good evidence that reducing the price of healthier food options such and fruit and vegetables through a range of options including subsidies, rebates and discounts increases purchase and consumption. There is some evidence that using cash rebates and vouchers or coupons can promote purchase of healthier options.

Modelling studies have also been used to explore the potential impact of taxation and subsidy and suggest that a positive impact would be seen at a level of 10 – 20% reduction or price subsidy.

Policy/strategy implications: Gathering evidence on the effectiveness of price manipulation is challenging. Changes in taxation or subsidy at a national level apply to a whole population so it is difficult to have an exact comparison. A range of other unintended changes or unrelated developments can also have an impact as food price is naturally very volatile. We have judged these interventions on whether they impact on the consumption of the food e.g. sugar sweetened beverages or nutrient intended, rather than an impact on weight outcomes. This is because the diet as a whole is influenced by a wide range of measures and it would be unreasonable to expect a change in any one food product to have an impact alone.

The evidence suggests that a range of micro and macro pricing strategies are effective at influencing both the purchase and consumption of healthier and less healthy food products and should therefore be used in parallel to influence change. In addition to the use of taxation and subsidy at a national level, active consideration should be given to price manipulation in micro settings such as schools, hospitals and workplace catering outlets to encourage healthier choices and that this should be subject to rigorous evaluation to add to the available evidence base.

Price manipulation through taxation

Environment size: Macro	**Environment type:** Economic / Political / Legislative

Directional thinking

There is some evidence that taxes reduce consumption of sugar sweetened beverages but it is not conclusive[1]. Meta-analysis of 3 non-randomised intervention study arms and two cohort studies found each 10% increase in price reduced intake by 7% (95% CI 3 to 10%).
[1 systematic review including poor to moderate quality studies]

Evidence that taxes reduce the consumption of unhealthful foods is lacking[1].
[1 systematic review including 1 poor to moderate quality study]

Other things to consider

- There is some evidence from modelling studies that taxes on carbonated drinks and saturated fats would be associated with beneficial dietary changes[2, 3].
- The research studies generally examine isolated effects and do not in general consider the nature of substitute purchases, overall diet or total caloric intake in response to price manipulation.

Limits to what we know

- Sales were taken as a reasonable approximation to consumption but may not be identical[1].
- Evidence on the relationship between taxation and diet mostly came from longitudinal observational studies where confounding by other social or environmental variables is possible[1].
- Interventions manipulating price have often also included other types of intervention which may have contributed to their impact[1].
- Modelling studies are simplifications of reality, the accuracy of their findings is limited by the quality of dietary, health and economic input parameters. Modelling is preliminary work; it follows theory and precedes testing. Targeted outcome evaluations of the effect of implemented policies is better evidence of effect than modelling studies
- Structural uncertainty and selection of parameter values in modelling studies were not assessed by review authors[2].
- Less than half of the included modelling studies in one review used a complete food demand system to try to account for substitute behaviour[2].
- Most studies in one systematic review failed to account for errors and variation/ uncertainty in the modelling process and no studies attempted to validate the epidemiological model used to estimate impacts on consumption, health and disease[2].

References

1. Afshin A et al. The prospective impact of food pricing on improving dietary consumption: A systematic review and meta-analysis. PLoS One 2017; 12(3): e0172277
2. Eyles H et al. (2012) Food pricing strategies, population diets, and non-communicable disease: a systematic review of simulation studies. PLoS Med 2012; (12): e1001353
3. Thow AM et al. A systematic review of the effectiveness of food taxes and subsidies to improve diets: understanding the recent evidence. Nutr Rev 2014; 72(9): 551-565

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Price manipulation with subsidies and discounts or price rises

Environment size: Macro	**Environment type:** Economic

Directional thinking

- Offering price reductions on healthier food and drink options to increase purchase and consumption of the promoted products is supported by moderate quality evidence of its effectiveness[1].
  [1 systematic review including 20 moderate to good quality studies]
- The use of financial discounts to increase purchasing of fruit and vegetables is supported by moderate quality evidence of its effectiveness[2].
  [1 systematic review including 4 moderate to good quality studies]
- Subsidies to increase consumption of fruit and vegetables is supported by moderate quality evidence of its effectiveness[3]. Meta- analysis of 9 study arms 3 RCTS and 4 non-randomised interventional studies found 10% subsidies increased consumption of fruits and vegetables by 14% (95% CI 11 to 17%).
  [1 systematic review including 7 moderate to good quality studies]
- Subsidies to increase consumption of low fat products, whole grain pizza and dairy products is supported by moderate quality evidence of its effectiveness[3]. Meta-analysis of 5 RCT intervention arms and 5 non-randomised interventional studies found 10% subsidies increased intake by 16% (95% CI 10 to 23%).
  [1 systematic review including 10 moderate to good quality studies]
- There is some evidence that redeemable coupons or vouchers for healthy foods and beverages targeting participants in food assistance programmes [3 studies] and those not participating in food assistance programs [2 studies] increases fruit and vegetable consumption but it is not conclusive[2].
  [1 systematic review including 5 poor to moderate quality studies]
- There is some evidence that cash rebates increase purchase of healthy foods but it is not conclusive[2].
  [1 systematic review including 5 poor to moderate quality studies]
- There is some evidence that discounts the price of low calorie, reduced calorie or non-sugar sweetened beverages increases their purchasing but it is not conclusive[2].
  [2 systematic reviews including 7 poor to moderate quality studies]
- There is some evidence that increasing prices on energy dense/ high calorie for nutrient foods reduces their purchase in studies conducted in laboratory or virtual settings[4].
  [1 systematic review including 11 poor to moderate quality studies]
- There is some evidence suggesting that price discounting is associated with increased sales of less healthy high sugar products[5].
  [1 systematic review including 2 studies of weak/inappropriate design to determine effectiveness of an intervention]
- Evidence that removal of price incentives for large portions of soft drink to reduce their intake in overweight people is lacking[5].
  [1 systematic review including 1 study]

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Price manipulation with subsidies and discounts or price rises

Other things to consider

- In the few studies where weight or obesity outcomes have been measured no impact has been observed despite seemingly beneficial changes to dietary quality[1].
- Modelling studies estimate that subsidies on fruits and vegetables may contribute to beneficial dietary changes[6, 7].
- The research studies generally examine isolated effects and do not in general consider the nature of substitute purchases, overall diet or total caloric intake in response to price manipulation[2].

Limits to what we know

- Most studies do not have significant follow up to assess long–term effectiveness of subsidies in influencing behaviour[1].
- It is not possible to know if the effect of subsidies would persist if the incentive is withdrawn[1].
- Interventions manipulating price have often also included other types of intervention and it is difficult to isolate the independent effects of price changes[1].
- Modelling studies are simplifications of reality, the accuracy of their findings is limited by the quality of dietary, health and economic input parameters. Modelling is preliminary work; it follows theory and precedes testing. Targeted outcome of the evaluations effect of implemented policies is better evidence of effect than modelling studies.
- Structural uncertainty and selection of parameter values in modelling studies were not assessed by review authors[2].
- Less than half of the included modelling studies in one review used a complete food demand system to try to account for substitute behaviour[2].
- Most studies in one systematic review failed to account for errors and variation/uncertainty in the modelling process and no studies attempted to validate the epidemiological model used to estimate impacts on consumption, health and disease[2].

References

1. An R et al. Effectiveness of subsidies in promoting healthy food purchases and consumption: a review of field experiments. Public Health Nutrition 2013; 16(7): 1215-1228
2. Gittelsohn J et al. Pricing Strategies to Encourage Availability, Purchase, and Consumption of Healthy Foods and Beverages: A Systematic Review. Prev. Chronic. Dis. 2017; 14 E107
3. Afshin A et al. (2017). The prospective impact of food pricing on improving dietary consumption: A systematic review and meta-analysis. PLoS One 2017; 12(3): e0172277
4. Ells LJ et al. Sugar Reduction: The evidence for action Annexe 2: A mixed method review of behaviour changes resulting from experimental studies that examine the effect of fiscal measures targeted at high sugar food and non-alcoholic drink, Public Health England, 2015
5. Ells LJ et al. Sugar Reduction: The evidence for action Annex 3: Review of behaviour changes resulting from marketing strategies, Public Health England, 2015
6. Eyles H et al. Food pricing strategies, population diets, and non-communicable disease: a systematic review of simulation studies. PLoS Med 2012; 9(12): e1001353 Thow AM et al. A systematic review of the effectiveness of food taxes and subsidies to improve diets: understanding the recent evidence. Nutr Rev 2014; 72(9): 551-565

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2.1.2 FDE2 Shelf labelling

Shelf labels are situated on the supermarket shelves near the food/product and provide summary information on the overall nutritional quality. The information may be nutrient specific information, contextual information such as the daily caloric intake for an average adult and/ or interpretive information such as traffic light symbols. Nutrient information is also given in percent daily values (%DV) or guideline daily amounts (%GDA), and/ or traffic-light colours or words to indicate that a product contains "high," "medium," or "low" amounts of specific nutrients.

Intervention: Shelf labels identifying healthier options.

Outcomes: Store sales data, self-reported food purchase data, consumer food consumption and physical measures of body weight.

What the evidence says: There is evidence that shelf labelling successfully increases sale of healthy foods and reduces sales of unhealthy foods in adults. Shelf labelling has been found to be effective in potentially encouraging healthier choices.

Policy/strategy implications: Providing nutrition information on foods and menus for consumers when shopping for food or eating out can be of benefit to inform food choices. Although it is difficult to identify specific intervention options that are likely to be most effective and sustainable in grocery stores or supermarkets, multicomponent interventions which include shelf labelling along with other intervention or standalone shelf labelling should be considered as part of a package of measures to promote healthier choices.

Related intervention: Front of package labelling, price manipulation.

Shelf labelling intervention

Environment size: Micro	**Environment type:** Physical / Sociocultural

Directional thinking

The evidence to determine which type of front of pack labelling is effective in enabling consumers identify healthier products is inconsistent and it is not possible to draw a conclusion[1].
[1 Systematic review including 19 studies]

Evidence about the effectiveness of front of pack labelling in influencing consumer purchasing in real shopping environments is lacking[1].
[1 systematic review including 1 study]

Other things to consider

- Few studies have investigated whether consumers overconsume products they perceive as healthy because of labelling[2].
- In half of the studies asking consumers whether they used nutritional labelling to inform purchase (shelf labelling or front of pack) fewer than 50% did reported doing so[2].

Limits to what we know

- Many interventions that have been examined in supermarkets are multicomponent therefore it is difficult to disentangle effects of the various components.
- The majority of included studies on supermarket-based interventions were conducted in the USA so findings may not generalise to the Wales setting.
- Most supermarket interventions have focused on increasing the consumption of healthy foods; very few have targeted a reduction in the promotion or availability of unhealthy foods[1].
- Field experiments in collaboration with retailers mean that sample size, study duration, intervention scope and study design are not necessarily entirely in the researchers' control[1].

References

1. Cameron A et al. A Systematic Review of the Effectiveness of Supermarket-Based Interventions Involving Product, Promotion, or Place on the Healthiness of Consumer Purchases. Curr Nutr Rep 2016; 5: 129
2. Hersey JC et al. Effects of front-of-package and shelf nutrition labelling systems on consumers. Nutr Rev 2013; 71 (1): 1-14

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2.1.3 FDE3 Front of pack labelling

Food labelling is used to convey to consumers a range of information about the product including the nutritional attributes of a food. The laws around food labelling in the UK are based on European Union (EU) legislation.

Front of pack labelling provides information, about one or more nutrient and/or energy (calories) in a product. These usually include fat, saturated fat, salt and sugar and may include vitamins and minerals. Labels may provide information about both the type and amount of nutrient. This may be provided or without contextual information or interpretive information.

Contextual information is, for example, the recommended daily calorie intake for an adult. This is usually numeric information for example percentage daily guideline allowance and/or grams.

Interpretative information is, for example the traffic light symbols indicating the levels of different nutrients and whether these are low, medium or high.

Interventions: Food label including type and amount of the nutrient, nutritional labelling and interpretive labelling.

Outcome: Identification of healthier foods, healthier purchases and consumption choices.

What the evidence says: The evidence regarding whether front of pack labelling influences consumer purchasing in a real-world shopping environment is not conclusive. There is evidence that summary icons attract consumers' attention and multiple-level summary icons may influence consumers to purchase healthier products.

There is some evidence that consumers may identify healthier foods more easily using nutrient-specific schemes compared with summary systems. Particular features of front of pack labels, such as text and symbolic colour to indicate nutrient levels, allow consumers to select healthier products more easily. On the contrary, studies have found that consumers have more difficulty comprehending front of pack labels that display only numeric information such as %GDA and/or grams.

Policy/strategy implications: While more evidence is required to fully understand the impact of labelling on food choices, food labelling is currently provided to consumers in Wales. To increase the impact, labels should use traffic light systems or similar measures which enable consumers to identify whether levels of nutrients are high, medium or low relative to recommended daily levels or other contextual information. Standardised approaches which are consistent across outlets and food products are likely to be beneficial.

Related interventions: Food labelling.

Front of pack labelling

Environment size: Micro	**Environment type:** Physical / Sociocultural/ Political / Legislative

Directional thinking

The evidence to determine which type of front of pack labelling is effective in enabling consumers identify healthier products is inconsistent and it is not possible to draw a conclusion[1].
[1 Systematic review including 19 studies]

Evidence about the effectiveness of front of pack labelling in influencing consumer purchasing in real shopping environments is lacking[1].
[1 systematic review including 1 study]

Evidence about the effectiveness of nutritional labelling for healthier purchasing from grocery stores is lacking[2].
[1 systematic review including 1 study]

Other things to consider

- The systematic review contributing information on front of pack labelling only searched for evidence to 20101; further primary studies conducted on front of pack labelling in laboratory settings may be available since this review was published. The Cochrane review on nutritional labelling included participants purchasing food or drink from any retail outlet and included studies to April 20172. The latter found one study examining pack labelling in grocery stores which had uninterpretable findings. Studies assessing nutritional summary scores on shelves or logos providing summary assessment of the healthiness of a product were ineligible for the Cochrane review. To be eligible for the Cochrane review the intervention label had to include type and amount of the nutrient.
- Few studies have investigated whether consumers overconsume products they perceive as healthy because of labelling[1].

Limits to what we know

- Studies on front of pack labelling schemes have been mostly conducted in artificial laboratory settings. Only one study was identified in a real shopping environment and this investigated the impact of traffic light labelling on ready to eat meals and sandwiches. This study showed no effect on sales of healthy foods[1].

References

1. Hersey JC et al. Effects of front-of-package and shelf nutrition labeling systems on consumers. Nutr Rev 2013; 71 (1): 1-14
2. Crockett RA et al. Nutritional labelling for healthier food or non-alcoholic drink purchasing and consumption. Cochrane Database of Syst Rev 2018, Issue 2. Art. No.: CD009315

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2.1.4 FDE4 Point of sale interventions: In store nutrition education/ online nutrition education

Point-of-sale is defined as the place where the choice of food for purchase occurs; it is a potentially important opportunity to promote healthy eating through changes to the environment and nutrition education. Examples of point of sale interventions providing nutrition education in supermarkets/stores includes posters, signs, flyers, nutrition education sessions, store-tours, taste-testing and cooking demonstrations.

Intervention: Nutrition education/promotion and combinations of these in stores/ supermarkets, nutrition education plus enhanced availability of healthy food through increased stocking and nutrition intervention during online shopping

Outcome: Purchase and /or food and beverage choices and consumption.

What the evidence says: Although numerous studies at point-of-sale have been undertaken, there is a wide range of interventions and different mechanisms by which various interventions are expected to work, which makes interpretation of studies difficult. In addition, studies in this area are often of poor quality and it is therefore difficult to draw conclusions. There is evidence that providing specific nutrition advice and the chance to switch certain products for a healthier option at point-of sale resulted in higher sales of healthier food options.

Policy /strategy implications: Providing information at point of sale is an intervention that could be considered to promote healthier food and drink choices as part of a wider package of measures. Further work is needed to understand whether the benefits also apply when shopping online.

Related intervention: Shelf labelling.

Nutrition information in store

Environment size: Micro	**Environment type:** Physical

Directional thinking

The evidence that nutrition education and promotion of healthier food and drink in supermarkets or stores can increase purchase of those foods is inconsistent and it is not possible to draw a conclusion[1].
[1 systematic review including 15 studies]

The evidence that nutrition education and monetary incentives for customers and store owners in supermarkets or stores can increased availability of healthier foods is inconsistent and it is not possible to draw a conclusion[1].
[1 systematic review including 9 studies]

Evidence that nutrition education plus enhanced availability of healthy food through increased stocking is effective in increasing healthier purchases or consumption is lacking[1].
[1 systematic review including 1 study]

Other things to consider

- Review authors note that there is a need for study interventions to be more clearly defined in terms of their theoretical basis for changing behaviour and measurement of relevant outcomes and their mediating factors[1].

Limits to what we know

- Most studies had a high risk of selection bias[1].
- Included studies failed to note whether assessors were blinded to control and intervention participants[1].

References

1. Liberato SC et al. Nutrition interventions at point-of-sale to encourage healthier food purchasing: a systematic review. BMC Public Health 2014; 14 919

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Nutrition information during point of sale online

Environment size: Micro	**Environment type:** Physical / Sociocultural

Directional thinking

Evidence that tailored nutrition advice, and opportunity to swap certain products for a healthier option at online point-of sale to increase sales of healthier foods is lacking[1].
[1 systematic review including 1study]

Other things to consider

- The healthier option offered to consumers was a lower fat alternative[1].

Limits to what we know

- The included study on online shopping had a high risk of selection bias however the overall quality rating for the study was moderate[1].
- The study was conducted over a period of 5 months[1].

References

1. Liberato SC et al. Nutrition interventions at point-of-sale to encourage healthier food purchasing: a systematic review. BMC Public Health 2014; 14 919

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2.1.5 FDE 5 Menu labelling

Menu labelling provides information about one or more nutrients and/or energy (calories) in a product or meal. The nutrients that are often labelled are fat, saturated fat, salt and sugar as well as energy (calories). Menu labelling may be provided with or without contextual information or interpretive information. Contextual information provides additional information such as the recommended daily intake for an average adult. Interpretive information, such as traffic light symbols, indicate whether the levels of different nutrients are low, medium or high.

Interventions: Informative, contextual or interpretive menu-based nutritional information.

Outcomes: Energy consumption, food selection.

What the evidence says: There are a number of formats of menu labelling. Menu labelling has mixed effects on whether consumers make healthier choices across out-of-home settings. Using contextual or interpretive nutrition information alongside calories appears to be more effective than approaches using calorie content only. The evidence of whether labelling menus with calories influences food choice is inconsistent; in part this is because the quality of research studies in this area has not been high.

Policy and strategic implications: Although the evidence currently available is inconclusive, including menu labelling as one part of a range of actions to influence out of home calorie consumption should be considered. This should include contextual information such as proportion of daily calorie requirements and should be using a consistent approach across outlets. Further research in this area would be beneficial.

Related interventions: Shelf labelling, front of pack labelling, point of sale interventions.

Menu labelling

Environment size: Micro	**Environment type:** Physical / Political / Legislative

Directional thinking

There is some evidence that calorie content labelling of menus may contribute to reducing energy intake but the evidence is not conclusive1. Meta-analysis of three randomised controlled trials conducted in real world settings demonstrated a reduction of 47kcal in energy purchased (MD -46.72 kcal, 95% CI -78.35 to -15.10, N=1877).
[1 systematic review including poor to moderate quality studies]

There is some evidence that calorie content labels incorporating additional contextual or interpretive information e.g. traffic light symbols may be more effective than those without such information but the evidence is not conclusive2. Meta-analysis of calories selected across 10 comparisons was significant; -67 calories (95% CI-116.99 to -17.79; P=0.008). Meta-analysis of calories consumed across 16 comparisons was also significant; -81 calories (95% CI -138.99 to -22.36; P=0.007).
[1 systematic review including poor to moderate quality studies]

There is some evidence that calorie content labels without additional contextual or interpretive information are ineffective in reducing energy selected or consumed but it is not conclusive2. Meta-analysis of calories selected across eight comparisons was not significant; -31 calories (95% CI -95.85 to 34.18; P=0.35). Meta-analysis of calories consumed across 8 comparisons was also not significant; -13 calories (95% CI -95.85 to 34.18; P=0.35)
[1 systematic review including poor to moderate quality studies]

There is some evidence that healthy food choice or traffic light labelling in cafeterias (workplace/canteens) is effective in influencing food choices but the evidence is not conclusive[3].
[1 systematic review including 16 poor to moderate quality studies]

The evidence for menu labelling in restaurants having desirable influences on food choices is inconsistent[3].
[1 systematic review including 22 studies].

The evidence on whether making menu-labelling compulsory will encourage food outlets to reformulate or provide healthier options is inconsistent and it is not possible to draw a conclusion[4].
[1 systematic review including 3 studies]

Menu labelling

Other things to consider

- The evidence on labelling relates to immediate short-term choices and is not based on overall daily diet or long-term effects on weight over time[2]. The possibility of compensatory behaviour, at different times of the day, influencing impact on weight is not addressed.
- In some labelling studies concurrent survey results suggested that taste was the main reason for food choices[3].
- The percentage of customers noticing calorie information has varied in research studies. A lower percentage of customers report using calorie information than the percentage that report noticing it[4].
- Better research is required to assess the impact of menu labels varying in content and format on purchasing and consumption[1], [2].

Limits to what we know

- Populations in key studies supporting menu labelling are frequently in university or health care settings; effects in general populations may be different[1], [2], [3].
- There was an absence of evidence assessing potential moderators of the effect of nutritional labelling including the ability to stratify results by socioeconomic status or health literacy[1], [2].
- Many quasi experimental studies identified did not adjust for the potential confounding that can arise when comparison groups are drawn from different populations[2].
- Randomization methods and blinding of analysis of calories selected or consumed were not reported[2].

References

1. Crockett RA et al. Nutritional labelling for healthier food or non-alcoholic drink purchasing and consumption. Cochrane Database of Syst Rev 2018, Issue 2. Art. No.: CD009315. DOI: 10.1002/14651858.CD009315.pub2.
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3. Fernandes AC, Oliveira RC, Proena RPC et al. Influence of menu labeling on food choices in real-life settings: a systematic review. Nutr Rev 2016; 74(8): 534-548
4. Sisnowski J, Street JM, Merlin T. Improving food environments and tackling obesity: A realist systematic review of the policy success of regulatory interventions targeting population nutrition. PLoS One 2017; 12(8): e0182581

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2.1.6 FDE 6a Interventions influencing portion size – Tableware

One of the growing areas of concern is a trend in recent years towards larger portion sizes and there is interest in interventions which encourage or mandate smaller portion sizes. Larger sized tableware e.g. plates, cups, glasses and cutlery may influence how much food or drink we choose and eat.

Intervention: Change in the size and/or shape of crockery, glasses or cutlery.

Outcomes: Food chosen and food consumed.

What the evidence says: Changing the plate size affects the amount people eat. There is evidence that people consistently consume more food and drink when offered larger-sized tableware than when offered smaller-sized versions. Exposure to larger tableware for food results in increased consumption. Exposure to larger tableware increased the quantities of food adults selected for subsequent consumption. Exposure to shorter, wider glasses or bottles increased the quantities selected for subsequent consumption among adults.

Policy/Strategy implications: Policies and practices that successfully reduce the size, availability and appeal of larger-sized tableware can contribute to meaningful reductions in the quantities of food (including non-alcoholic beverages) people select and consume in the immediate and short term. Encouraging the voluntary use of smaller plate sizes in commercial outlets; restricting the maximum sizes of beverages that can be sold and mandating the use of smaller plates, cutlery etc. in public sector provision should be considered.

Nutrition education should include the influence of tableware and cutlery size to help families to make healthier choices.

Related intervention: Price manipulation.

2.1.7 FDE 6b Interventions influencing portion size

Larger portions and packets of food have become increasingly prevalent over time and may contribute to the increasing obesity rates.

Interventions: Change in size of portion offered/available.

Outcomes: Food chosen and food consumed.

What the evidence says: Changing the food portion size, affects the amount people eat. There is evidence that people consistently consume more food and drink when offered larger-sized portions, than when offered smaller-sized versions.

Exposure to larger portions influences what people consume. Less healthy and energy dense foods may be particularly affected by tighter portion control but the effect is also true for healthier low energy-dense foods, suggesting that interventions that successfully increase people's exposure to larger portions of these foods (healthier low energy-dense foods) may be effective to increase their consumption.

Policy/Strategy implications: Introducing measures which reduce portion size in less healthy products and increase portion size for healthier options should be considered through a range of means and in a range of settings. This may include encouraging voluntary reductions among food producers and food outlets. Restrictions on pricing and promotion strategies that promote purchase of large portion sizes or multiples of less health options should also be considered. Encouraging the use of promotion and pricing strategies for healthier options should also be considered.

Related intervention: Price manipulation.

Technical evidence summary: Interventions influencing portion size.

Interventions influencing portion size

Environment size: Micro	**Environment type:** Physical

Directional thinking

There is some evidence that exposure to larger portions, packages, units or associated tableware for food results in increased or consumption1. Meta-analysis of 86 independent comparisons showed a standard mean difference in unregulated consumption of 0.46 (95%CI 0.29 to 0.52). The size of this effect suggests that, if sustained reductions in exposure to larger-sized food portions, packages and tableware could be achieved across the whole diet, this could reduce average daily energy consumed from food by between 215 and 279 kcal in adults
[1 systematic review including poor to moderate quality studies]

There is some evidence that exposure to larger portions or tableware increased the quantities of food adults selected for subsequent consumption1. Meta-analysis of 13 independent comparisons found a standard mean difference of 0.55 (95% CI 0.35 to 0.75). The size of this effect suggests that, if sustained reductions in exposure to larger-sized food portions and tableware could be achieved across the whole diet, this could reduce average daily energy selected for subsequent consumption from food by between 188 and 403 kcal
[1 systematic review including poor to moderate quality studies]

There is some evidence that exposure to shorter, wider glasses or bottles increased the quantities selected for subsequent consumption among adults1. Meta-analysis of 3 independent comparisons found a standard mean difference of 2.31 (95% CI 1.79 to 2.83). The size of this effect suggests that, if sustained reductions in exposure to shorter, wider glasses and bottles could be achieved across the whole diet, this could reduce the quantity of non-alcoholic beverages selected for subsequent consumption by between 95g and 296g.
[1 systematic review including poor to moderate quality studies]

The evidence for the use of portion-controlled packaging to reduce intake by young adults in tertiary education settings is inconsistent and it is not possible to draw a conclusion[3].
[1 systematic review, 2 studies]

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Interventions influencing portion size

Other things to consider

- The available research does not capture the influence of interventions on overall diet or changes in weight/ BMI over time; outcomes focus on immediate choices and for the most part are unable to account for compensatory behaviours[1], [2], and [3].
- Systematic review authors have proposed potential intervention strategies to tackle the portion size effect. These include eliminating pricing practices whereby larger portion and package sizes offer value for money or are offered within price promotions and social marketing campaign to engender public acceptability for interventions to reduce the effects of exposure to large portions[1].
- Systematic review authors tentatively suggest that less healthy and energy dense food may be particularly affected by tighter portion control[1].Systematic review authors highlight that portion size effects are still present for healthier low energy-dense foods suggesting that their consumption could potentially be differentially increased[1].
- Scaling up interventions on portion sizing will be challenging in the commercial and legal context of a complex food environment[1].
- Where smaller portion sizes have been offered in real world settings, this has often been alongside availability of larger portions. One study showed no effect on calorie intake and one study demonstrated downsizing of portions in some participants[2]. The study demonstrating uptake of smaller portions assessed compensatory eating later in the day and found that those eating smaller portions by day ate more out of the workplace[2].

Limits to what we know

- Portion sizes investigated in laboratory research studies were at the larger end of the size continuum. Absolute effect sizes may vary with a range of size differentials[1].
- Research on effects of portion size exposure have been conducted in highly controlled experimental conditions over short periods. Long term sustainability of the effects of prolonged/repeated exposure to smaller portion sizes under free-living conditions remain to be established[1].
- The research on portion sizes does not enable analysis of social differentiation of effects as no studies disaggregated effects by socioeconomic group[1].

References

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2. Roy et al. Food environment interventions to improve the dietary behaviour of young adults in tertiary education settings: A systematic literature review J Acad Nutr Diet 2015, 115: 1647-1681

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2.1.8 FDE 7 Interventions for vending machines

Vending machines traditionally stock unhealthy choices and are generally located where there is limited choice or access to alternatives. There is interest therefore in the benefits of influencing what is available through vending machines.

Interventions: Point of sale information, availability of healthier choices, and price reductions on healthier choices.

Outcome: Dietary behaviours change, sales data, dietary intake, BMI.

What the evidence says: There is some evidence that pricing and availability strategies are effective at improving the nutritional quality of foods and beverages purchased from vending machines. The evidence suggests that if prices are competitive and healthier items are made available to them, vending machine customers will buy healthier snacks.

Policy/strategy implications: Vending machines have traditionally only sold unhealthier snacks and beverages and anecdotal evidence suggests that a barrier to change is the belief that healthier items will not sell well. The findings of this review provide evidence to the contrary. If prices are competitive and healthier items are made available to them, vending machine customers will buy healthier snacks. Successful implementation is about adoption by and changing the behaviour of the suppliers who are concerned about the commercial aspects of sales, stock and profit. This has potential in the workplace and in tertiary settings and should be considered by commissioners who can request that their vending machines holders stock healthy food.

Interventions in vending machines, pricing, stocking and nutritional information

Environment size: Micro	**Environment type:** Physical / Economic / Sociocultural

Directional thinking

There is some evidence that reducing the price of healthier snack options in vending machines increases their purchase but the evidence is not conclusive[1].
[1 systematic review including 5 poor to moderate quality studies]

There is some evidence that increasing the availability of healthier snacks in vending machines increases their purchase but the evidence is not conclusive[1].
[1 systematic review including 6 poor to moderate quality studies]

The evidence that point of purchase nutrition information is effective in increasing purchases of healthier items from vending machines is inconsistent and it is not possible to draw a conclusion[1].
[1 systematic review including 8 studies]

Other things to consider

- Systematic review authors note that anecdotal evidence suggests that a barrier to change in vending machines stocking is the belief that healthier items will not sell well. However these authors conclude that if prices are competitive and healthier items are made available, vending machine customers will buy healthier snacks[1].

Limits to what we know

- Interventions involving vending machines included a lack of measured changes to diet or weight and the inability to determine if measured changes were due to the existing clients changing choices they would normally make or due to new customers[1].
- Many interventions were of short duration of interventions and included small sample sizes[1].

References

1. Grech A, Allman-Farinelli M. A systematic literature review of nutrition interventions in vending machines that encourage consumers to make healthier choices. Obes Rev 2015; 16 (12): 1030-1041

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3 Intervention summaries; Physical Activity and the Built and Natural Environment (PABNE)

Our environment influences our ability to be active. This can include whether we have easy access to safe places to play or be active; attractive green space in which to walk, run or cycle; safe routes for active commuting and exercise, sport, and leisure facilities. Reversing downward trends in physical activity needs multicomponent strategies aimed at the individual, social-cultural, environmental and policy determinants of inactivity.

The built environment includes roads, pavements, the external areas of buildings and open 'grey' space, such as urban squares and pedestrianised areas.

The natural environment includes 'green' and 'blue' spaces. Green spaces include: urban parks, open green areas, woods and forests, coastland and countryside, and paths and routes connecting them. Blue spaces include: the sea, lakes, rivers and canals.

The design and layout of towns and cities can enable and encourage walking and cycling, and using public transport may also mean people build physical activity into their daily lives. Understanding the way our natural and built environment and our transport system influences how active we are is essential to encouraging increases in physical activity.

Understanding this evidence is particularly challenging as many of the interventions that have been considered for inclusion in systematic reviews may not have been introduced with health outcomes in mind but for other reasons.

The intervention evidence summaries cover a range of intervention to reduce the impact of the obesogenic environment on physical activity as follows:

- Building new parks
- Upgrading parks or urban green space
- Promotion of parks and urban green space
- Community wide multi-component physical activity intervention
- Standing or treadmill workstations
- Subsidised public transport
- Congestion charging
- Walking and cycle infrastructure

Each is also likely to have only a small impact on activity levels but across a whole population this can be effective. Studies which are able to detect these small changes can be difficult and expensive to conduct. Much more good quality research is needed in this area. It is also likely that Public Health Wales will be undertaking more detailed reviews which consider primary studies not just systematic review so that we can better understand the evidence in this area and use this as part of our ongoing partnership with Sport Wales and Natural Resources Wales to increase physical activity levels in the Welsh population.

3.1.1 PABNE1 Building new parks

Municipal parks are a feature of Welsh villages, towns and cities and are one of the easiest local places for people to enjoy being active outdoors. They provide places for people to play and to walk and run. Understanding how important parks are for physical activity and the park attributes which influence its use will assist decision making at a local level. Park attributes can be classified as Physical; features, condition, access, aesthetics, and safety and Social; relating to use as a social space.

Intervention: The construction of new parks on undeveloped green space.

Outcomes: Physical activity.

What the evidence says: The quality and range of the research that has been undertaken in this area is limited and this makes it difficult to draw conclusions. It may also be unrealistic to measure physical activity as an outcome rather than use of parks. There is a need to consider the evidence that exists for the relationship between the availability of local parks and physical activity as a first step.

Policy and strategic implications: Maintaining local parks is a challenge for local authorities in the current financial climate and there are concerns about loss of local parks or a deterioration in local facilities which means that people are less likely to use them. There are also concerns about parks being used for anti-social activities and the actual or perceived level of these affects how safe people feel and whether they are willing to use parks. Understanding how important parks are for physical activity is important to assist in decision making at a local level. It is important to ensure that where steps are being taken to build new parks as part of regeneration or development, or where improvement schemes are being undertaken, these are accompanied by high quality research and evaluation Opportunities to connect local authorities and researchers in this area should be prioritised.

Related summary: Upgrading parks or urban green space.

Building new parks

Environment size: Micro	**Environment type:** Physical

Directional thinking

Evidence that introducing new parks increases park visits and physical activity is lacking[1].
[1 systematic review, 2 studies]

Other things to consider

- People report that their use of parks is influenced by specific features and condition of a park, access to it, aesthetics, safety and whether it offers a social environment[2].
- People report that safety and security, environmental aesthetics, social relations, convenience and efficiency influence their walking experiences[3].
- Poor perception of personal security appears to be a significant deterrent to using existing or new parks and trails however while interventions tend to result in improved perceptions of personal security, there is not always increased park or trail use and physical activity[1].
- Factors outside the scope of interventions such as incomplete construction at follow-up may contribute to mixed effects of park interventions on park visits and physical activity expenditure[1].

Limits to what we know

- One study on building new parks involved a control group, the other did not. The study involving a control group was of limited usefulness due to combination of intervention and control groups in the analysis[1].
- The studies on building new parks were conducted in the USA[1].
- The qualitative research assessing what influences people to use parks does not capture what influences people to be physically active in parks; the latter is what may influence levels of obesity. This research only captures data published prior to 2010 and the majority of studies were conducted in the US which may affect the generalisability of this evidence2.

References

1. Bennie J et al. Physical activity and the environment update, Effectiveness and Cost-Effectiveness: Evidence Review 3: Park, Neighbourhood and Multicomponent Interventions. London: National Institute for Health and Care Excellence; 2017
2. McCormack GR et al. Characteristics of urban parks associated with park use and physical activity: a review of qualitative research. Health & Place 2017; 16 (4): 712-726
3. Dadpour S et al. Understanding the Influence of Environment on Adults' Walking Experiences: A Meta-Synthesis Study. Int J Environ Res Public Health 2016: 13: 731]

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3.1.2 PABNE 2 Upgrading parks or urban green space

The availability and accessibility of parks and urban green spaces offers the opportunity for recreation and active travel for little or no cost to the individual. Upgrading park facilities (includes at least one of the following: lighting, facilities (seating or toilets), paths, greenery, gyms or landscape designs) while upgrading green spaces includes renovations, improvements, design of an urban greenway trail, greening of vacant lots, installation of family fitness zones.

Intervention: Physical change and upgrading of park facilitates including at least one of the following: lighting, facilities (seating or toilets), paths, greenery, gyms or landscape designs, or promotion/ encouragement of the use urban green space/development of new or improved or combinations.

Outcome: Self-reported physical activity and recorded or measured physical activity.

What the evidence says: Overall, the evidence on upgrading parks and urban green spaces to increase physical activity is inconclusive. In part this is because there has been little good quality research in this field and because demonstrating a change in physical activity specifically from an improvement to park environments is not straightforward. Measuring change in the use of parks would be a more appropriate first step along with evidence that shows whether the availability of parks has an impact on physical activity. There is evidence that the actual or perceived quality and safety of the environment has an impact on use and levels of activity.

Policy / strategy implications: Improving access to open public spaces is a key policy area of the Create Active Environments objective in the WHO Global Action Plan for Physical Activity 2018-2030. The current Welsh Government strategy Prosperity for All also clearly indicates the importance of parks and green spaces within two of the strategy's key themes; Healthy and Active and United and Connected.

These interventions require robust evaluation and opportunities to undertake more research and evaluation in this area should be actively considered when park improvement or upgrading is being undertaken in Wales. It is likely that no single intervention of this type will bring about a measurable population benefit in terms of physical activity and that they will have a role in a wider multi-component programme. There is also a need to recognise that there may be other health and wellbeing benefits to improvements in park facilities that promotes increased use by local communities beyond physical activity.

Related summary: Building new parks, Community wide multi–component physical activity interventions.

Upgrading parks or urban green space

Environment size: Micro	**Environment type:** Physical

Directional thinking

The evidence on upgrading parks to increase physical activity is inconsistent and it is not possible to draw a conclusion[1].
[1 systematic review including 9 studies]

Evidence on the effects of development or improvement of green space on physical activity is inconsistent[2].
[1 systematic review including 9 studies]

Evidence that changing the microenvironment within parks (for example by changing or removing seating) increases physical activity is lacking[1].
[1 systematic review including 1 study]

Evidence about the effectiveness of multi-component interventions to improve green space increasing the proportion of individuals engaging in leisure walks, leisure cycling or sports weekly is lacking[1].
[1 systematic review including 1 study]

Other things to consider

- People report that their use of parks is influenced by specific features and condition of a park, access to it, aesthetics, safety and whether it offers a social environment[3].
- People report that safety and security, environmental aesthetics, social relations, convenience and efficiency influence their walking experiences[4].
- Poor perception of personal security appears to be a significant deterrent to using existing or new parks and trails however while interventions tend to result in improved perceptions of personal security, there is not always increased park or trail use and physical activity[1].
- The complexity and scale of the interventions in parks and neighbourhoods makes this an extremely challenging area of research[1]. Studies assessing urban green space examine complex interventions with multiple interacting factors at the individual, community and population levels. A number of scientific and evaluative challenges arise for example, aligning research timetables with timelines, rapidly recruiting a baseline assessment prior to implementation of the intervention and measuring confounders and levels of exposure[2].

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Upgrading parks or urban green space

Limits to what we know

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- Studies assessing the upgrading of parks included a variety of limitations. Some studies on parks involved inadequate control groups that would not allow reduction of confounding and sometimes giving rise to contamination, with users using both control and intervention parks because of geographic proximity. There were additional problems relating to length and timing of data collection periods, lack of blinding of assessors and small sample sizes[1].
- Only one study on upgrading parks was conducted in the UK[1], [2].
- The qualitative research assessing what influences people to use parks does not capture what influences people to be physically active in parks; the latter is what may influence levels of obesity. This research only captures data published prior to 2010 and the majority of studies were conducted in the US which may affect the generalisability of this evidence[3].

References

1. Bennie J, et al. Physical activity and the environment update, Effectiveness and Cost-Effectiveness: Evidence Review 3: Park, Neighbourhood and Multicomponent Interventions. London: National Institute for Health and Care Excellence; 2017
2. Hunter RF et al. The impact of interventions to promote physical activity in urban green space: a systematic review and recommendations for future research. Soc Sci Med 2015; (124) 246-256
3. McCormack GR et al. Characteristics of urban parks associated with park use and physical activity: a review of qualitative research. Health & Place 2015; 16 (4): 712-726
4. Dadpour S et al. Understanding the Influence of Environment on Adults' Walking Experiences: A Meta-Synthesis Study. Int J Environ Res Public Health 2016; 13: 731

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3.1.3 PABNE 3 Promotion of parks and urban green space

Where parks and urban green spaces exist, understanding how to encourage their use for active leisure, exercise and recreation is important.

Intervention: Training and budget for park managers to promote available green space.

Outcomes: Impact on physical activity .

What the evidence says: The available evidence for this review was limited to one or two studies so it is very difficult to draw conclusions one way or the other. There was some evidence that using park managers to stimulate physical activity was effective at increasing physical activity and park use. Other approaches require further evaluation and good quality research.

Policy and strategic implications: Active promotion of physical activity interventions in park settings are likely to be beneficial although further cost effectiveness studies would be required. Studies to investigate other promotion and improvement programmes would be needed before any specific recommendations can be made. However, there is recognition that improvements and changes to the environment to promote physical activity need to be accompanied by strategies that motivate individuals to be active to maximise the impact.

Related summary: Community multicomponent physical activity interventions.

Promotion of parks and urban green space

Environment size: Micro	**Environment type:** Sociocultural / Physical

Directional thinking

Evidence about the effectiveness of training and resourcing of park managers to promote available green space to increase physical activity is lacking[1].
[1 systematic review including 1 study]

Evidence about the effectiveness of the development or improvement of urban greenspace in combination with promotion of its use, to increase physical activity is lacking[1].
[1 systematic review including 2 studies]

Other things to consider

- The single randomised controlled trial which investigated effects of training and resourcing park managers to promote physical activity within urban green space was assessed by systematic reviewers as being of low risk of bias and showed a significant increase in physical activity and number of park users over the follow up period of 24 months[1].
- Studies assessing urban green space examine complex interventions with multiple interacting factors at the individual, community and population levels. A number of scientific and evaluative challenges arise for example, aligning research timetables with regeneration timelines, rapidly recruiting a baseline assessment prior to implementation of the intervention and measuring confounders and levels of exposure[1].

Limits to what we know

- The studies which incorporated promotion of physical activity within green space were conducted in Australia [1 study] and the US [2 studies] which have very different climates to the UK.
- Only one of the studies investigating promotion of urban green space alongside development of, or improvement of facilities used a control group and systematic review authors noted that this study had an unclear risk of bias[1].

References

1. Hunter RF, et al. The impact of interventions to promote physical activity in urban green space: a systematic review and recommendations for future research. Soc Sci Med 2015; (124): 246-256

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3.1.4 PABNE 4 Community wide multi-component physical activity interventions

There has been growing recognition over recent decades that complex human behaviours need action at multiple levels at the same time. These interventions are often based on models or approaches such as the socio-ecological model which describes action at the individual, social/family, community and wider national policy levels. There has been growing interest in whole system or multi-component community wider interventions to address issues such as physical activity.

The term *community* wide generally refers to either an intervention directed at a geographic area, such as a city or a town defined by geographical boundaries or an intervention directed toward groups of people who share at least one common social or cultural characteristic.

Community wide interventions aim to improve the health risk factors of a whole population and operate at a series of levels to impact on behaviour.

Multi-component community wide interventions use improvement activities directed at communities using more than one approach in a single programme. Approaches tend to focus on changing policy and environments and involve mass media. Individual and environment focused activities are excluded from this evidence summary.

Community wide multi-component physical activity interventions which had multiple parts were based on: neighbourhoods linked to green spaces, physical activity and good health; new bus services, improvements to paths and promotional activities; bike and pedestrian coordinators, improving walking environments and physical activity; and woodland projects creating new play areas, visitor centres and cycling and walking tracks.

Interventions: Population level community wide interventions to increase physical activity typically fall into two or more broad strategies (addressing change in the individual or in the environment, through a number of options:

- Social marketing through local mass media (e.g. television, radio, newspapers).
- Using of communication strategies (e.g. posters, flyers, information booklets,) to raise awareness of the project and provide specific information to individuals in the community.
- Individual counselling by health professionals (both publicly and privately funded), such as the use of exercise referrals.
- Working with voluntary, government and non-government organisations, including sporting clubs, to encourage participation in walking, other activities and events.
- Working within specific settings such as schools, workplaces, aged care centres, community centres, homeless shelters, and shopping malls, etc.
- Environmental change strategies such as creation of walking trails and infrastructure with legislative, financial or policy requirements, and planning for the broader population.

Outcomes: Changes or participation in physical activity.

What the evidence says: There is no consistent evidence to support the effectiveness of multi-component community wide interventions to increase population levels of physical activity. However, due to key limitations in community-wide multi-component studies, there is insufficient evidence to draw any firm conclusions. The studies reported illustrate the challenges of implementing these approaches citing that they were often under-resourced to achieve population level impact; were too short term to have the desired impact across the multiple levels and had poor or inadequate evaluation strategies which made it difficult to demonstrate an impact.

Policy and strategic implications: Large scale multi-component interventions are difficult to implement and have often lacked adequate resources, sufficient time and intensity to show an effect. We cannot conclude from the evidence whether these interventions are effective however, any new studies should be rigorously designed, funded and implemented with sufficient intensity and duration to have an impact and analysed, ensuring that the measures are reliable and sensitive to change at a population level. Whole-of-community approaches where people live, work and recreate may have the opportunity to mobilise large numbers of people, however unless adequate resources can be identified, smaller scale single interventions delivered well may have greater population benefit.

Related summary: Building and improving parks, promoting parks and urban green space, walking and cycling infrastructure.

Community wide multi-component physical activity interventions

Environment size: Micro	**Environment type:** Physical / Sociocultural

Directional thinking

There is some evidence suggesting that community-wide interventions are not effective in increasing physical activity but it is not conclusive[1].
[1 systematic review including 33 poor to moderate quality studies]

There is moderate to good quality evidence that community wide multi-component interventions are unlikely to be effective in improving physical activity[1].
[1 systematic review including 4 moderate to good quality studies]

Other things to consider

- Achieving penetration and under resourcing of projects has been suggested as possible reasons for a lack of effect of community wide interventions to increase physical activity[1]. Gaining adequate funding to build, maintain and sustain promotion of facilities may not be feasible.
- Of the 33 studies, 20 included an individual counselling component and 23 a mass media component or other communication strategies alongside environmental changes, and cross sector collaboration[1].

Limits to what we know

- Short duration of studies and poor outcome measures to detect potential effects have been identified as reasons for failure by authors of the primary studies included in the review[1].

References

1. Baker-Philip RA et al. Community wide interventions for increasing physical activity. Cochrane Database of Syst Rev 2015, Issue 1, Art. No. CD008366: DOI: 10.1002/14651858.CD008366.pub3

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3.1.5 PABNE 5 Standing or treadmill workstations

From a public health perspective, the workplace presents an ideal setting for the delivery of initiatives to promote physical activity, overcoming commonly cited barriers such as a 'lack of time' and providing access to a large and diverse intersection of society. The workplace also has a captive and relatively stable population and provides a setting where multilevel interventions intrapersonal, interpersonal, organisational, and environmental can be facilitated. Moreover, individuals can spend more than a third of their waking hours at work, so the potential for exposure to workplace intervention activities is considerable.

Intervention: Active workstations.

Outcomes: Health, energy expenditure, cognition, quality of life, computer task performance, productivity, absenteeism, independent living, cognitive decline and academic achievement What the evidence says: There is some evidence that using standing desks reduces the amount of time that people spend sitting still and that treadmill workstations may increase physical activity. However, there is insufficient evidence of a long term effect or of cost effectiveness compared to other interventions to recommend widespread adoption.

Policy and strategic implications: Wales has a well-developed programme of work and commitment to supporting action to improve health at work through initiatives such as Healthy Working Wales. Workplace interventions require action at many levels and while increasing opportunities to be less sedentary would be a helpful component, it is important that the range of opportunities to reduce sedentary behaviour using other methods are also explored an evaluated.

Related summary: Community wide multi-component physical activity interventions.

Standing or treadmill workstations

Environment size: Micro	**Environment type:** Physical

Directional thinking

There is some evidence that standing workstations reduce sitting time but it is not conclusive[1].
[1 systematic review including 4 poor to moderate quality studies]

There is some evidence supporting the use of treadmill workstations to increase energy expenditure but it is not conclusive[1].
[1 systematic review including 7 poor to moderate quality studies]

Other things to consider

- It is not clear in the systematic review assessing workstations whether primary study authors assessed the potential compensatory physical activity outside of the workplace.

Limits to what we know

- Research assessing treadmill workstations has limited ability to assess maintenance of effects; the longest study was of 29 weeks duration[1].
- The studies assessing treadmill workstations were very small and may not adequately reflect the impact that might be observed in larger, more diverse populations.

References

1. Torbeyns T et al. Active workstations to fight sedentary behaviour. Sports Medicine 2014; 44 (9): 1261-1273

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3.1.6 PABNE 6 Subsidised public transport

The availability and use of public trasport can encourage physical activity. Research has shown that people who use public transport tend to be more active than those who commute by private vehicle. Interventions which promote the use of public transport are one component of whole systems approaches to promote physical activity.

Intervention: Financial incentives relating to any mode of traveling, subsidised transport passes. Outcomes: Active travel, physical activity, obesity.

What the evidence says: There is some evidence that subsidised public transport interventions may be effective at increasing public transport use and as a result physical activity, although the evidence is based on a limited amount of research of variable quality.

Policy and strategy implications: There are a wide range of health and wellbeing benefits to promoting the use of mass transport options compared to private vehicles including physical activity. Improving the quality of research and evaluation in relation to changes in public transport systems and the impact on health and wellbeing outcomes is an important area for further work. Wales has a policy commitment to active travel and ensuring that the promotion of public transport use is a component of this work should be a priority. Understanding whether subsidised public transport for specific groups is the most cost effective way of achieving this is important, as is recognising that there are other wider outcomes which these policies seek to achieve as their primary outcomes e.g. reducing social isolation; improving access to employment.

Related summary: Community wide multi-component physical activity interventions.

Subsidised public transport

Environment size: Micro	**Environment type:** Economic

Directional thinking

There is some evidence suggesting that that provision of subsidised public transport passes is associated with increasing use of public transport but it is not conclusive[1].
[1 systematic review including 3 studies, 2 of which are of weak/inappropriate design to determine effectiveness of an intervention]

There is some evidence that provision of subsidised public transport passes is associated with increases in physical activity but it is not conclusive[1].
[1 systematic review including 2 studies of inappropriate design to determine effectiveness of an intervention]

Other things to consider

- Two of the studies examining the relationship between subsidised public transport passes and public transport use involved free public transport passes[1].

Limits to what we know

- Only one study examining subsidy of public transportation with passes utilised a design appropriate to determine intervention effectiveness and this study only had a follow up of 6 weeks[1].

References

1. Martin A et al. Financial incentives to promote active travel: an evidence review and economic framework. Am J Prev Med 2012; 43 (6): e45-e57

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3.1.7 PABNE 7 Congestion charging

Congestion charging is a form of traffic demand management aimed at reducing the opportunity cost and loss of productivity associated with traffic congestion at peak times or on peak routes. There are various types of congestion pricing schemes in cities around the world including Singapore, London, Stockholm, Gothenburg and Milan. It is believed that there are potential physical activity related effects of congestion charging.

Intervention: Congestion charging scheme.

Outcomes: Shift in behaviour from use of motor vehicle transport to walking, cycling or public transport; physical activity.

What the evidence says: There is limited evidence that congestion charging may be associated with increases in active travel, public transport use and physical activity however the quality of the evidence was considered to be low. This is partly because physical activity outcomes were not measured as part of the evaluation of these schemes as they were introduced for other reasons e.g. congestion or air quality.

Policy and strategy implications: There is sufficient evidence to suggest that congestion charging approaches should be considered as part of a package of interventions to reduce the use of individual motor vehicles in congested areas. Where these are introduced, opportunities should be sought to evaluate the impact on a wide range of outcomes including health and wellbeing.

Related summary: Community wide multi-component physical activity interventions, subsidised public transport.

Congestion charging

Environment size: Micro	**Environment type:** Economic

Directional thinking

There is some evidence that introduction of road pricing/congestion charging is associated with decreases in car use and increases in active travel but the evidence is not conclusive[1].
[1 systematic review including 4 studies of weak/inappropriate design to determine effectiveness of an intervention]

There is some evidence suggesting that the introduction of congestion charging is associated with increases in public transport use but it is not conclusive[2].
[1 systematic review including 5 studies of weak/inappropriate design to determine effectiveness of an intervention]

The evidence suggesting that there is an association between congestion charging and physical activity is inconsistent and it is not possible to draw a conclusion[2].
[1 systematic review including 3 studies, 2 of which were of weak/inappropriate design to determine effectiveness of an intervention].

Other things to consider

- There is a paucity of evidence that has been collected from real world implementation of congestion pricing schemes[2].
- The quality of the available evidence on congestion pricing schemes was considered to be low[2].
- Many potential studies investigating the impacts of congestion pricing schemes could not be included in the systematic review as they failed to collect data on physical activity or modal shift effects[2].
- The fact that there is still no clearly defined measure of physical activity and that data on active transport behaviours rarely comprehensively collected are significant barriers to a better understanding of potential population health impacts[2].

Limits to what we know

- Studies identified by systematic review authors investigating the effects of road pricing interventions are all of weak/inappropriate design to determine the effectiveness of an intervention[1].
- All studies related to congestion charging were likely susceptible to some form of bias through low quality data collection and reporting[2].

References

1. Martin A, et al. Financial incentives to promote active travel: an evidence review and economic framework. Am J Prev Med 2012; 43 (6): e45-e57 Brown V et al. Congestion pricing and active transport-evidence from five opportunities for natural experiment. J Transp Health 2015; 2 (4): 568-579

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3.1.8 PABNE 8 Walking and cycling infrastructure

Walking and cycling are accessible forms of physical activity and are used as a means of transport in addition to being recreational activities. Understanding how the physical environment influences people to walk or cycle is important to encouraging the uptake of these activities.

Intervention: A range of interventions including multi-component whole community action to increase cycling; the introduction of cycle lanes and trails; street closures and bicycle sharing schemes.

Outcomes: Levels of walking or cycling; levels of physical activity.

What the evidence says: There is some evidence that multi component whole community interventions to promote cycling and the introduction of cycle lanes on road may be effective at promoting cycling but this is not conclusive. The evidence for cycle trails, street closures and bicycle sharing is lacking however, this will in part be due to the lack of evidence rather than being evidence that these interventions do not work.

Policy and strategy implications: In Wales, the Government policy is to encourage more walking and cycling in Wales. As part of this policy the Welsh Government is promoting active travel. The Active Travel (Wales) Act 2013, provided a transformation framework for planning and building Wales' walking and cycling infrastructure. There is guidance provided on the planning, design, construction and maintenance of active travel networks and infrastructure. When investment is made in improving cycling or walking infrastructure in Wales, active consideration should be given to building in rigorous research and evaluation that helps to contribute to the evidence base in this area. There is also a need to understand what types of infrastructure improvements have the greatest impact, and in what contexts.

Related intervention: N/A

Walking and cycling infrastructure

Environment size: Micro	**Environment type:** Physical

Directional thinking

There is some evidence that cycle demonstration towns and other interventions to encourage cycling increase active commuting[1].
[1 systematic review, including 3 poor to moderate quality studies]

There is some evidence supporting the use of on-street cycle lanes to increase cycling volume but it is not conclusive[1].
[1 systematic review including 4 poor to moderate quality studies]

The evidence that interventions to improve or build trails and paths to increase walking and cycling is inconsistent and it is not possible to draw a conclusion1.
[1 systematic review including 9 studies]

Evidence about the effectiveness of street closures for increasing physical activity is lacking[1].
[1 systematic review including 1 study]

Evidence about the effectiveness of bicycle sharing schemes to increase cycling or overall physical activity is lacking[2].
[1 systematic review including 1 study]

Other things to consider

- Improvements to and walking and cycling infrastructure are more likely to impact people living close by[1].
- Investment in cycling infrastructure can be effective in some cities/towns but not in others. A study assessing the Cycling Cities and Towns initiative in England found differential effects across towns and authors of a primary study note that there is uncertainty about whether cycling would in general increase if comparable investments were made in other towns. Larger effects were found in towns placing greater emphasis on workplace cycling initiatives[1].
- While on street cycle lanes may significantly increase levels of cycling, the absolute increase, in terms of number of individuals, is likely to be very small[1].
- Changes to physical infrastructure did not always result in participants increasing their physical activity levels significantly more than control group. It is possible that this may have been the result of the groups not being different enough in terms of distance to observe an effect[1].
- Increases in physical activity levels may not be in those people who were previously inactive but rather the result of infrastructure changes funnelling existing cyclists and walkers to new paths/streets/trails[1].

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Limits to what we know

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- Insufficient follow up times may impact whether interventions were found to significantly increase physical activity levels; adequate time is required to allow behaviour change to take place[1].
- Several included studies did not provide enough information on the control group to determine whether it is sufficient to reduce confounding and others include control groups which are so close to intervention areas geographically that they are likely to have caused contamination[1].
- Some included studies did not consider possible influence of outside influences on outcomes[1].
- Some included studies are likely to have been affected by self-selection as participants applied for funding for particular projects or were involved in projects that were generated by area demand[1].
- Some included studies had behavioural elements which may have impacted the outcomes reported, but which could not be separated from environmental aspects[1].
- For some studies, evaluation methods were inconsistent[1].
- Self-reported data was widely used and may be subject to social desirability bias[1].

References

1. Bennie J et al. Physical activity and the environment update, Effectiveness and Cost-Effectiveness: Evidence Review 2: Ciclovia and Street Closures, Trails and Safe Routes to Schools. London: National Institute for Health and Care Excellence; 2017
2. Mayne SL et al. Impact of policy and built environment changes on obesity-related outcomes: a systematic review of naturally occurring experiments. Obes Rev 2015;16 (5): 362-375

4 Discussion

The evidence base for tackling obesity is multifaceted and the underlying relationship between weight loss and weight gain is multifactorial. The relationship between each of the individual factors causing excessive weight gain (diet, nutrition, physical activity, wider determinants) and the end point of weight loss interventions are complex both at the individual, environment and population levels.

This means that intermediary outcomes may need to be considered/ included when looking at the evidence of effectiveness or impact (for example interventions that result in increases in purchasing of healthier foods should be considered not just those with weight related outcomes).

An additional complication is the inherent difficulty in conducting research to assess the impact of environment change on excessive weight gain.

Understanding the evidence related to the built and natural environment, physical activity interventions and obesity is particularly challenging as many of the interventions that have been considered for inclusion in systematic reviews may not have been introduced with health outcomes in mind but for other reasons.

Significant investment is made each year in Wales in improving aspects of the built and natural environment. Increasing the opportunities to connect academic experts in this field with local authorities and Government is critical to develop greater understanding of this important topic.

5 Conclusion

Generally the research is limited in both quantity and quality and professional judgement is needed to bridge the gap between the academic research and its interpretation and implementation. Much more good quality research is needed in this area, particularly physical activity related.

It is likely that Public Health Wales will be undertaking more detailed reviews which consider primary studies not just systematic review so that we can better understand the evidence in this area and use this as part of our ongoing work to increase physical activity levels and address obesity in the Welsh population.

6 Appendix A Evidence grading scheme

Interventions

A (dark green): This intervention is supported by good quality evidence of its effectiveness.	Systematic review, of mostly good quality studies, with meta-analysis or majority of studies favouring intervention effect.
B (light green): This intervention is supported by moderate quality evidence of its effectiveness.	Systematic review of moderate to good quality studies with majority, or meta - analysis favouring intervention effect.
C (yellow): There is some evidence supporting the use of this intervention but it is not conclusive.	Systematic review of moderate to poor quality studies with majority, or meta - analysis favouring intervention effect or systematic review where the number of studies favouring intervention effect is too small to allow firm conclusions to be drawn.
D (orange): The evidence is inconsistent and it is not possible to draw a conclusion.	Systematic review of studies with inconsistent findings or systematic review including one study with mixed findings.
E (pink): There is some evidence suggesting that this intervention is ineffective but it is not conclusive.	Systematic review of moderate to poor quality studies with majority or meta - analysis favouring no effect intervention or where the number of studies favouring no effect is too small to allow firm conclusions to be drawn.
F (red): There is moderate to good quality evidence that this intervention is unlikely to be effective.	Systematic review of moderate to good quality studies with majority in favour of control/no effect of intervention.
G (purple): There is high quality evidence of ineffectiveness or a specific recommendation that these interventions should not be introduced in the UK.	There is high quality review level evidence from meta-analysis of good quality studies suggesting s no effect of the intervention.
H (grey): Evidence about the effectiveness of the intervention is lacking.	Systematic review, or Public Health Wales reviewers conclude that no reliable evidence of effectiveness or ineffectiveness, is available either because there are no relevant studies of appropriate design or because a systematic review found one study of poor quality.

Modification for associations

Used when the study design is not sufficiently robust to evaluate the effectiveness of an intervention or to test an hypothesis.

C2 (yellow): There is some evidence suggesting that there is an association between the exposure of interest and the outcome but the evidence is not conclusive	Systematic review including only studies with weak and/or inappropriate designs or where the majority of studies have weak and/or inappropriate designs.
D2 (orange): The evidence suggesting that there is an association between the exposure of interest and the outcome is inconsistent and it is not possible to draw a conclusion	Systematic review including only studies with weak and/or inappropriate designs or where the majority of studies have weak and/or inappropriate designs with inconsistent findings.
H (grey): Evidence about the relationship between the exposure of interest and outcome is lacking	Systematic review that found one study of poor quality.