

1 **Neighbourhood food environments: food choice, foodscapes and**
2 **planning for health**

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14 Abstract

15 The burden of obesity contributes to increasing health inequality, and placing health
16 care systems under huge strain. Our modern society could broadly be described to
17 support unhealthful eating patterns and sedentary behaviour; also described as
18 obesogenic. Obesity prevention and treatment has focused on educational and
19 behavioural interventions, with limited overall success. A sustainable approach is to
20 address the environments that promote less healthy eating and high energy intake as
21 well as sedentary behaviour. Approaches which modify the environment have the
22 potential to assist in the prevention of this complex condition, this paper focuses on
23 food environments within the context of obesogenic environments. Takeaway and
24 fast food, a fixture of our diet, is usually nutrient poor and energy dense. A
25 'concentration effect' has been observed, where there is a clustering of fast food and
26 takeaway outlets in more deprived areas. Access to food, and intake are associated,
27 however there are methodological challenges in associating the effect of the food
28 environment on obesity. While there is an imperfect evidence base relating to the
29 role of the food environment in terms of the obesity crisis; policy, practice, civic
30 society and industry must work together and take action now, where current
31 evidence suggests change. Shaping the environment to better support healthful
32 eating decisions has the potential to be a key aspect of a successful obesity
33 prevention intervention.

34 Background

35 Obesogenic environments have been defined as 'the sum of influences that the
36 surroundings, opportunities, or conditions of life have on promoting obesity in
37 individuals or populations' ⁽¹⁾. Ten years ago the Foresight 'Tackling obesities: future
38 choices' ⁽²⁾ report was published. This report described obesity in terms of complex
39 systems ⁽³⁾. While, ten years ago, this concept was relatively new, it brought together
40 evidence that linked the built and food environments in novel ways ^(4; 5). Over 10 years
41 the publications and evidence relating to obesogenic environments has grown
42 exponentially. Most focus on how aspects of the built environment may contribute to
43 current obesity levels - by influencing physical activity and dietary behaviours at the

44 individual and community level ⁽⁶⁾. The 2014 McKinsey report ⁽⁷⁾ described that
45 overcoming obesity will require multiple solutions, involving many sectors from policy
46 and practice through to industry and consumers. The report describes how we need
47 to ‘reset the default’ in order to normalise and make healthy behaviours easier,
48 relying less on the individual ⁽⁷⁾. Swinburn and colleagues have described how
49 ‘dramatic actions’ are needed, globally, to address food environments and thereby
50 impact the on the rise in obesity and diabetes ⁽⁸⁾. The worldwide rise in obesity has
51 been ‘driven’ by significant changes in the global food system ⁽⁹⁾. This food system
52 produces readily available, processed food which is marketed at populations ⁽⁹⁾.
53 Looking at trends in high, middle and low income countries, research has concluded
54 that increases in the food energy supply, alongside increasing sedentary behaviour,
55 explains the increases in population body weight, particularly in high income
56 countries ⁽¹⁰⁾. The food environment has a role to play in helping to develop obesity,
57 and therefore a role to play in preventing obesity. This paper will focus on how the
58 environment influences dietary behaviours mediated through the food environment.

59 Food Environments

60 Food choice and eating behaviours are influenced a multitude of factors from culture
61 to personal preferences. The relationship between our food choices and the
62 environment in which we make these choices is now widely acknowledged. From
63 nudging and choice architecture ⁽¹¹⁾ to conceptualizing how the local food
64 environment influences eating behaviour ⁽¹²⁾. We can define the food environment as
65 any opportunity to obtain food; it includes physical, socio-cultural, economic and
66 policy influences at both micro and macro-levels ⁽¹³⁾. The broader food environment
67 includes the home food environment, food policies and school food policies in
68 addition to the neighbourhood food environment ⁽¹⁴⁾. Story et al ⁽¹⁵⁾ have developed
69 an ecological framework to illustrate the influences on dietary behaviours. This paper
70 will focus on the neighbourhood food environment.

71

72 The neighbourhood food environment is defined as a mixture of retail outlets (for
73 example, small convenience stores to supermarkets,) as well as restaurants and take-

74 away ('fast food') outlets and is *not* limited to the residential neighbourhood ⁽¹⁴⁾. The
75 neighbourhood food environment influences individual food choice and food intake
76 through the concept of food *access*. The relatively simple concept of access, in terms
77 of the food environment actually includes five dimensions which are: *availability*,
78 *accessibility*, *affordability*, *acceptability*, and *accommodation* ⁽¹⁶⁾.¹ Research has
79 focused on the availability and accessibility of neighbourhood food outlets. Two
80 recent systematic reviews, one exploring the local food environment in relation to
81 obesity ⁽¹⁷⁾ and one exploring the food environment in relation to diet ⁽¹²⁾ have been
82 inconclusive in their findings. This is, in part, due to the complexity of the measures
83 and the quality of the studies. However some important patterns emerged; for
84 example, in adults, Cobb et al ⁽¹⁷⁾ found evidence that supermarket availability was
85 negatively associated with obesity and fast food availability was positively associated.
86 Janssen et al's ⁽¹⁸⁾ review suggested that the strongest determinants of out-of-home
87 food availability are the density of food outlets and deprivation within the built
88 environment.

89
90 Our surrounding environment is going to impact on our food choice and ultimately on
91 our eating behaviour and consequently our energy balance, weight gain and obesity
92 ⁽¹⁹⁾. Neighbourhood food environments are important and much attention has been
93 paid to fast food and takeaway outlets. We know the food served within these outlets
94 tends to be nutrient poor and energy dense ^(20; 21). Public Health England estimate
95 that in 2014 there were over 50,000 fast food and takeaway outlets, fast food
96 delivery services, and fish and chip shops in England ⁽²²⁾ and a greater proportion of
97 these are in deprived areas. Data from the UK National Diet and Nutrition Survey
98 indicates that between a fifth and a quarter of people in the UK eat meals out once
99 per week or more, with one fifth eating take-away meals at home once per week or
100 more ⁽²³⁾.

¹ See for more details: Lake, A.A., Townshend, T.G., Burgoine, T., 2017. Obesogenic Neighbourhood Food Environments, in: Buttriss, J., Welch, A., Kearney, J., Lanham-New, S. (Eds.), Public Health Nutrition: THE NUTRITION SOCIETY TEXTBOOK SERIES. Wiley-Blackwell, Oxford.

101

102 Using data from Norfolk (England), researchers report that takeaway food outlet
103 density increased from 1990 to 2008 ⁽²⁴⁾. Takeaway food outlet density was
104 significantly higher in more deprived areas at all time points. Worryingly, over the
105 time period, there were increases in socio economic disparities in takeaway food
106 outlet density ⁽²⁴⁾. This 'concentration' effect has been observed in other studies
107 where takeaway and fast food outlets tend to cluster in more deprived areas ⁽²⁵⁾.

108

109 A recent Danish cross-sectional study reported that fast food access is associated with
110 fast food intake in the capital region of Denmark ⁽²⁶⁾. Cross-sectional research in
111 Norfolk, England reported that greater exposure to fast food and a lower educational
112 level is associated with greater fast food consumption, BMI and odds of obesity ⁽²⁷⁾.
113 However this finding is not consistent with other studies. An Australian study of
114 disadvantaged women explored the longitudinal associations between the fast food
115 environment around their home and BMI ⁽²⁸⁾. Over the 5 year study they found no
116 association between increases in major chain fast food outlet availability and
117 increases in BMI over time. There are a number of reasons why fast food outlets
118 around the home are not associated with change in BMI. People lead complicated
119 lives and don't simply source food from their residential neighbourhood. Focusing on
120 residential address alone excludes other food environment exposure opportunities
121 ⁽²⁹⁾. In their study, Burgoine and Monsivais ⁽²⁹⁾ explored the difference in food
122 environments between homes, workplaces and along commuting routes between
123 home and work for residents in the East of England. Perhaps unsurprisingly there was
124 a significantly greater density of, and proximity to all food outlet types at work
125 compared with home, particularly restaurants and takeaways. Most recently, Mason
126 et al ⁽³⁰⁾ used cross-sectional baseline data from the UK Biobank (project 17380) to
127 explore associations between fast food and physical activity environments and
128 adiposity for adults in mid-life. This large and unique UK study, spanning a
129 geographically diverse area, found a weak association between access to fast food
130 and adiposity. However, they reported high densities of physical activity facilities
131 were associated with lower adiposity for these adults in mid-life. The authors

132 attribute this to limitations in the metric and measurements used in the food
133 environment analysis, an opinion strongly supported by editorial in the same
134 publication ⁽³¹⁾.

135

136 These examples illustrate how ‘reliable’ measures of the food environment are the
137 ‘foundation’ of research that will help to inform obesity related policy ⁽³²⁾. A broad
138 evidence base is required, ranging from spatial analyses to within store audits,
139 alongside individual and neighbourhood level data ⁽¹²⁾. In a recent editorial, Cummins
140 et al ⁽³³⁾ explored the methodological challenges in estimating the effect of the food
141 environment on obesity. While the use of census tracts or postcodes to define
142 ‘exposure’ to food environments has been used in research, they don’t represent the
143 environments an individual is actually exposed to. Rather, an activity-space approach
144 is advised which considers the individual’s behaviour in space and time ⁽³⁴⁾.

145

146 As well as focusing on exposure to different types of outlets, interventions have also
147 focused on the food served in outlets, promoting healthier ready-to-eat meals (to eat
148 in, to take away or to be delivered). Hillier-Brown and colleagues ⁽³⁵⁾ conducted a
149 systematic review to assess the impact of such interventions. The majority of the
150 included studies were conducted in the US (27 out of 30), 2 in Australia and one in the
151 UK. Most studies focused on adults and 18 were within chain food outlets. The
152 quality of evidence was generally considered to be poor, however the study provides
153 useful insight on these types of interventions. ‘Intrusive’ interventions that restricted
154 or guided choice appeared to have an impact on food-outlet and customer level
155 outcomes. While interventions that enabled choice or provided intervention had little
156 impact.

157

158 However, these types of interventions are being delivered by local authorities and
159 rarely get published within the academic literature ⁽³⁶⁾. In addition to the systematic
160 review, this larger piece of work also explored what interventions were being
161 delivered by local authorities (in England) around providing healthier ready-to-eat
162 meals (to eat in, to take away, or to be delivered) ⁽³⁷⁾. This systematic mapping and

163 evidence synthesis of interventions to promote healthier ready-to-eat-food ⁽³⁷⁾ found
164 75 interventions, of which most were 'award'² type interventions. The interventions
165 were delivered by local authority staff, in most cases Environmental Health Officers.
166 Interventions tended to be time-limited and evaluation was limited ⁽³⁷⁾. This research
167 suggested that there was much activity across local authorities in England (as well as
168 elsewhere) and that sharing good practice as well as robust evaluation would be
169 beneficial. The analyses suggested that business owners were generally positive
170 about such interventions. Those that were cost neutral and that were not obvious to
171 their customers were perceived more positively. This programme of research has
172 also explored the perspectives of intervention deliverers ⁽³⁸⁾. Interviews found
173 barriers and facilitators to interventions including lack of funding for interventions
174 and the difficulties of dealing with this sector of the food industry ⁽³⁸⁾.

175

176 In the developed world, a sophisticated food supply chain and food system as well as
177 the domination of a small number of companies has been noted in the literature ⁽³⁹⁾.
178 While there has been much focus on fast food, there is a lack of clarity about the role
179 of supermarkets in terms of obesity ⁽⁴⁰⁾. Using a large UK sample, Burgoine and
180 colleagues ⁽⁴⁰⁾ explored the independent and combined associations of supermarket
181 distance and education with body mass index, overweight and obesity. Their results
182 indicated that greater supermarket distance was independently associated with
183 higher body mass index and odds of both overweight and obesity ⁽⁴⁰⁾.

184

185 Food outlets selling low cost energy dense food is one aspect of the modern UK high
186 street. Townshend has coined the term 'toxic high street' to describe the co-location
187 of money lenders, betting shops and fast food restaurants in more deprived
188 neighbourhoods ⁽⁴¹⁾. Since the economic recession of 2007/8, Townshend has
189 described how this scenario has become embedded as a feature of the British high
190 street, in contrast to more affluent areas where bistros, delis and boutiques flourish.

² Defined as those that involved an assessment of food outlet practice(s) targeted by the intervention using pre-defined criteria, together with some sort of accreditation if the food outlet met the criteria.

191 While some areas have empty boarded up shops, other areas have an unhealthy or
192 'toxic' mix of uses including; takeaways and 'all you can eat' buffet style restaurants;
193 sub-prime money lenders (offering instant cash and 'pay-day' loans at high interest
194 rates); and betting shops; also tanning salons, body piercing parlours, shops selling
195 cut price (sometimes counterfeit) alcohol and tobacco ⁽⁴¹⁾.

196 Food environments and eating behaviours

197 Few studies have explored individual's diets in relation to their food environment,
198 mainly due to the fact it is time consuming and methodologically challenging.
199 Focusing on young adults (n=86, mean age 17 years), Tyrrell et al.'s study ⁽⁴²⁾ provided
200 detailed information regarding *where* young people obtain food and the nutritional
201 consequences of choosing those food environments. Their respondents completed a
202 4-day self-complete food diaries, recorded *what* food they consumed and *where* food
203 was sourced. Sources of food items were coded as home (including friends or
204 relatives homes), and out-of-home. Food items sourced out-of-home were further
205 classified using an updated and modified version of Lake et al.'s food environment
206 classification tool ⁽⁴³⁾. The tool contained 15 out-of-home food outlet categories with
207 88 detailed sub-categories. With the addition of 'home', use of 16 possible food
208 environments were recorded. Food was obtained by these young adults from a wide
209 range of environments. Over four days of observation, all respondents sourced food
210 from home and from an average of 3.3 different out-of-home food environments.
211 Excluding home and school, 'takeaway and fast food' environments were the most
212 commonly used with 53% of respondents sourcing food from these environments;
213 41% obtained food from convenience stores, at least once over the four-day period.
214 Food sourced from specialist outlets, convenience outlets, and retail bakers (i.e.
215 national commercial bakers) were the most energy dense. The highest percent energy
216 from fat was from foods sourced from retail bakers, 'takeaway and fast food' and
217 specialist outlets (47%, 43% and 42%, respectively) ⁽⁴²⁾. This work highlights the
218 eating behaviours of this transitional age-group and points to the importance of
219 interventions around schools, colleges (the school fringe) and the wider food

220 environment. The importance of the school fringe has been highlighted in a number
221 of studies ^(44; 45; 46).

222

223 In a larger cross-sectional study of 839 mothers with young children, Vogel et al ⁽⁴⁷⁾
224 used a survey including a food-frequency questionnaire, demographic characteristics
225 and frequently visited locations. The authors developed scores for the mother's diet
226 and their food environment. Using Geographical Information Systems (GIS) alongside
227 demographic information their findings suggested that there is a relationship
228 between health and place as well as educational attainment for these mothers. For
229 example, less healthy food environment scores was associated with better dietary
230 quality in mothers with degrees, but poorer dietary quality in mothers with lower
231 educational attainment. Their findings also suggested that the majority of
232 respondents were exposed to less healthy food environments. These studies ^(42; 47),
233 both cross sectional and both with their limitations, link the environment to food
234 behaviours of two population groups and highlights the importance of the
235 environment in relation to eating behaviour.

236

237 **Urban planning and the food environment**

238 The environment has been acknowledged as a determinant of health ⁽⁴⁸⁾. Historically,
239 the urban planning and public health professions originated from the same need to
240 deal with the health inequalities due to both the rapid industrialisation and
241 urbanisation of the 19th century ⁽⁴⁹⁾. In the 21st century it is internationally
242 acknowledged that professions need to work together to address our 'dynamic,
243 complex and interconnected health concerns' ⁽⁴⁹⁾. Examples of this collaboration
244 include The Healthy Cities movement which, amongst other things links planning and
245 health has raised awareness around healthy urban planning ⁽⁴⁸⁾.

246

247 An acknowledgment of the potential role of the built environment and planning in
248 creating healthier communities was reflected in the in the 2012 National Planning
249 Policy Framework (NPPF) for England ⁽⁵⁰⁾. In England, in 2013, many public health

250 responsibilities were moved from the National Health Service (NHS) to local
251 authorities ⁽⁵¹⁾. This included responsibility for obesity, community nutrition and
252 increasing physical activity ⁽⁵²⁾. A recent umbrella literature review ⁽⁵³⁾ assessed the
253 impact of the built and natural environment on health. The review concentrated on
254 five key built environment topics: neighbourhood design, housing, healthier food,
255 natural and sustainable environment, and transport. These are environmental issues
256 that can be shaped by planners and have the potential to influence health.

257

258 Policy documents have highlighted the role that local authorities have in tackling
259 obesity ^(54; 55; 56). There has been a recent interest in the role of local authorities in
260 shaping the food environment ⁽²²⁾, particularly in engaging with small businesses ⁽⁵⁷⁾
261 and with planning departments ⁽⁵⁸⁾.

262

263 Planning policy in relation to the food environment has tended to focus on the
264 restriction of hot-food takeaways. Using The Town and Country Planning (Use Class)
265 Order 1987, outlets are classified according to the use class order³ of the premises
266 they occupy, dependent upon their primary operating model and premise size.
267 However, differences between categories may be unclear. For example restaurants
268 and cafes (classified as A3), may also sell food to takeaway and hot food takeaways
269 may have small seating areas. Classifications of interest are in Box 1. An increasing
270 number of local authorities are using Supplementary Planning Documents (SPD) ⁴ to
271 control fast food outlet proliferation ⁽¹⁴⁾. It is one of mechanisms suggested by PHE for
272 local government to influence the out-of-home food environment ⁽²²⁾, alongside use
273 of the local plans, joint strategic needs assessments, joint health and wellbeing

³ The [Town and Country Planning \(Use Classes\) Order 1987](http://www.legislation.gov.uk/ukSI/1987/764/made) The Secretary of State for the Environment (1987) <http://www.legislation.gov.uk/ukSI/1987/764/made> (as amended) puts uses of land and buildings into various categories known as 'Use Classes'.

⁴ Supplementary Planning Documents (SPDs) provide detail to support policy in higher level Development Plan Documents (DPDs). SPDs are a material consideration in the assessment and determination of any planning application. (ref from <http://www.newcastle.gov.uk/planning-and-buildings/planning-policy/supplementary-planning-documents>)

300 strategies sustainability and transformation plans and the use of Health in all Policies
301 (HiAP).

302

303 However, not all takeaway outlets are necessarily unhealthy. Moreover, where
304 seating is provided food outlets are classified as restaurants and therefore are exempt
305 from takeaway restrictions. This system of classification, in relation to food outlets
306 requires an overhaul, but the planning system is probably never going to be nuanced
307 enough to differentiate between healthy and unhealthy outlets.

308

Box 1 The Town and Country Planning (Use Class) Order³

A1, retail – includes sandwich bars and internet cafes

A3, restaurants and cafes

A5, hot food takeaways

309

310

311 Barking and Dagenham ⁽⁵⁹⁾ was one of the first planning authorities to produce a SPD
312 aimed at restricting permission for hot-food takeaways (A5 use). It has been reported
313 that in 7 years, this London borough has reduced fast food outlets by 15% from 187
314 to 160 ⁽⁶⁰⁾. The major of London has recently announced a double pronged approach
315 to limit new takeaways opening within 400m of schools and health standard to boost
316 baked or grilled food rather than fried ⁽⁶¹⁾.

317

318 A review by Dr Foster Intelligence in 2011 ⁽⁶²⁾ found four main approaches taken by
319 local planning authorities to curb fast food proliferation:

320 1. Only allowing takeaway outlets in specified areas. By defining only certain
321 locations, for example existing shopping areas, where further takeaway
322 outlets are deemed acceptable; however, this may introduce issues of
323 *concentration and clustering*.

324 2. Restricting concentration and clustering. If a location is suitable, local
325 authorities can seek to restrict the number of takeaway outlets in a row (for

326 example, to 2, or 3) or the percentage of frontage (ground floor use facing the
327 street) given over to takeaways (for example, 5% has been used).

328 3. Restricting proximity to other uses. This means setting out buffer zones (for
329 example 400m) around land uses such as schools, parks and children's
330 centres, where the development of takeaway outlets is forbidden

331 4. Clamping down on 'back door' applications. Fast food outlets have their
332 own 'classification' in UK planning terms – referred to as 'A5' Hot Food
333 Takeaways. Developers can sometimes try to circumvent takeaway restrictions
334 by opening outlets under different classifications, primarily 'A3' Restaurants
335 and Cafes, where the intention is that food will be primarily consumed on the
336 premises. For example, this might be done by adding in a nominal seating area
337 on plans submitted to the local planning authority.

338 Some planning authorities have sought to charge a levy, or fee, where planning
339 permission is granted for a new takeaway, with funds raised going to initiatives to
340 tackle childhood obesity, for example, improving green spaces to encourage physical
341 activity ⁽¹⁴⁾.

342

343 Since this review (2011), the number of local authorities producing supplementary
344 planning documents (SPDs) to tackle fast food outlet proliferation has increased and
345 guidelines have been developed to meet local situations. Estimates are that there are
346 at least 20 SPDs in place to tackle hot food takeaways ⁽⁶⁰⁾. Gateshead Council's
347 Supplementary Planning Document ⁽⁶³⁾, prevents new permissions for A5 use in wards
348 where more than 10% of year 6 pupils are obese. This has effectively barred any new
349 hot food takeaways in the borough.

350 While authorities may object to food outlets being added to their foodscape, civic
351 society also has a perspective. Also in England, Spence and colleagues ⁽⁶⁴⁾ analysed
352 local residents' opposition to a multinational fast food company submitted to the
353 planning enquiry. While there were many health reasons to oppose this particular
354 development, including its close proximity to a school (within 400m) the main

355 concerns by local residents included traffic, the effect on the environment (littering
356 etc.) there were also concerns about noise and safety. This research highlights the
357 importance of cross sectorial working in local governments, and to consider engaging
358 with residents about health impacts of proposed new food outlets ⁽⁶⁴⁾.

359

360 Our recent qualitative work ⁽⁵²⁾ sought to understand the views of individuals working
361 in public health and those working in spatial planning within local government on
362 their respective responsibilities for addressing obesity through spatial planning. One-
363 to-one interviews aimed to explore respondents' perceptions concerning the wider
364 issue of their role in public health before asking them about tackling issues of obesity,
365 community nutrition, and increasing levels of physical activity. Eight interviews were
366 conducted with three Directors of Public Health (DsPH), one Deputy Director and four
367 planners with a range of seniority from across five local authorities within the North
368 East of England. The findings, from this relatively small study, illustrate what tackling
369 a global problem is like on the front line of local government. It identified a range of
370 barriers to engaging with planners, including an insufficient understanding of the
371 causes of obesity and the primacy of addressing obesity via multiagency approaches,
372 fragmentation in the health system and conflicting priorities. Our research indicates
373 that planners could be better engaged in the obesity agenda via formal incentives
374 (e.g. written within planners' job descriptions or regulations), and aligning priorities
375 via 'soft approaches' (e.g. public health leadership roles) ⁽⁵²⁾. Since this research, the
376 Local Government Association and Public Health England have published a briefing
377 document about a Whole Systems approach to obesity; this practical guide will be
378 published in 2019 ⁽⁶⁵⁾.

379 Discussion

380 Despite our increased knowledge of how the environment, particularly the food
381 environment drives eating behaviours and obesity, there is still a tendency to
382 continue to focus on individual level solutions described as 'lifestyle drift' ⁽⁶⁶⁾. While
383 policy examples in the UK and abroad, for example The Soft Drinks Industry Levy
384 (SDIL) due to be enforced from April 2018 exist, the focus remains on the individual.

385 There are few upstream approaches that are tackling marketing and the sale of
386 cheap unhealthy food. There is an urgent need to shift our focus to more upstream
387 (or macro-level) strategies. This can be achieved through whole systems approaches
388 to obesity ⁽⁶⁵⁾ using cross-sector and multi-agency working to consider the multiple
389 factors involved in the aetiology of obesity that influence individual determinants.
390 Examples of upstream approaches could be through use of planning laws ⁽⁵²⁾ or
391 through the taxation of unhealthy foods ⁽⁶⁷⁾. In the four years that have followed the
392 first significant nationwide tax on sugar-sweetened beverage (SSB) in Mexico (2014),
393 we have seen a global increase in taxes on SSB and a trend for this type of
394 intervention to become the 'norm' ⁽⁶⁸⁾. Perhaps the London mayor's new
395 announcement will set a global precedent for use of planning restrictions ⁽⁶¹⁾. The
396 need for a systems wide change in the global food market, for there be to
397 accountability across the private sectors, public sectors and government and
398 commitment to creating healthy food environments ⁽⁸⁾.

399

400 As discussed in this paper, the current planning laws in this country are not nuanced
401 enough, we know local government are using supplementary planning documents
402 and local plans to shape a healthier food environment but this is fragmented and
403 there is a lack of a joined up approach across local governments. Despite this, there is
404 significant will and movement towards establishing ways of working across disciplines
405 at local and national levels.

406

407 While the methodological issues around measuring individual's exposure to food
408 environments remains, there exists convincing international evidence to suggest that
409 exposure to less healthy food results in an increased intake of such foods, which
410 consequently leads to weight gain and ultimately obesity. Our food environment is a
411 sophisticated and complex system, which requires a complex system approach ⁽⁶⁹⁾.

412

413 This paper has limitations in that it has only focused on certain aspects within the
414 neighbourhood food environment and has not considered other factors such as the

415 choice architecture of stores or food outlets ⁽⁷⁰⁾, the cost of food ⁽⁷¹⁾ and the issues
416 around food insecurity and austerity ⁽⁷²⁾. While studies described have been from
417 more than one country, the urban planning section has focused on English planning
418 policy. Additionally, future research might also consider the influence of a wider
419 multiagency approach to address the food environment, including; education,
420 industry and civic society as the significant actors in addressing obesity.

421 **Conclusions**

422 No country has managed to reverse their obesity trends ⁽⁷³⁾. Obesity is complex,
423 multifactorial and challenging to address ⁽⁶⁾. What we do know is that takeaway and
424 fast food is, on the whole, nutrient poor and energy dense and that it is a fixture of
425 our diet. There is a 'concentration effect', with a clustering of these outlets in more
426 deprived areas. Access and intake are associated, however there are methodological
427 challenges in associating the effect of the food environment on obesity. Tackling
428 obesity requires joined up approaches from across the professional spectrum,
429 leadership and political will.

430 The future of interventions in the food environment field, is to adopt a systems
431 approach, to encourage professionals in local governments and national governments
432 to work together to develop policies and practices which are championed by the
433 population, supported by all sectors including industry to enable healthier behaviours.
434

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